106th Congress, 2d Session – – – – – – – – – – – – House Document 106–191

# RESTORATION PROJECT FOR OAKLAND HARBOR, CALIFORNIA

## COMMUNICATION

FROM

## THE ASSISTANT SECRETARY (CIVIL WORKS), THE DEPARTMENT OF THE ARMY

TRANSMITTING

THE AUTHORIZATION OF A DEEP DRAFT NAVIGATION AND ECOSYSTEM RESTORATION PROJECT FOR OAKLAND HARBOR, CALIFORNIA

FEBRUARY 8, 2000.—Referred to the Committee on Transportation and Infrastructure and ordered to be printed

U.S. GOVERNMENT PRINTING OFFICE

62-376 WASHINGTON : 2000

# CONTENTS


Letter of Transmittal ..... V
Comments of the Office of Management and Budget ..... IX
Comments of the State of California ..... X
Comments of the Department of the Interior ..... XI
Comments of the Department of Transportation ..... XIII
Comments of the Environmental Protection Agency ..... XIV
Report of the Chief of Engineers ..... 1
Information Report Corrections and Updates to the Final EIS/EIR ..... 9
1.0 Overview of Corrections and Updates ..... 12
2.0 Alternatives F10 and F11 ..... 12
3.0 Supplemental Analysis ..... 14
3.1 Air Quality ..... 14
3.2 Biology ..... 19
3.3 Cultural resources ..... 19
3.4 Hazardous Materials and Contaminated Wastes ..... 20
3.5 Hydrology ..... 21
3.6 Noise ..... 21
3.7 Transportation ..... 26
3.8 Ballast Water ..... 26
4.0 Conclusion ..... 28
5.0 References ..... 29
VOLUME I: Final Revised Feasibility Report ..... 30
1.0 Introduction ..... 38
1.1 Study Authorization ..... 38
1.2 Study Purpose and Scope ..... 39
1.3 Local Sponsor ..... 39
1.4 Previous Studies ..... 40
1.5 Planning Process of the Corps of Engineers ..... 41
1.6 Report Organization ..... 42
2.0 Study Area Description ..... 43
2.1 Description of the Study Area ..... 43
2.2 Environmental Conditions ..... 52
3.0 Problems and Needs ..... 61
3.1 General ..... 61
3.2 Public Concerns ..... 61
3.3 Problems and Opportunities ..... 62
3.4 Planning Objectives ..... 66
3.5 Planning Constraints ..... 67
4.0 Plan Formulation ..... 68
4.1 Overview ..... 68
4.2 "Without Project" Plan ..... 68
4.3 Channel Components and Turning Basin Location ..... 69
4.4 Dredged Material ..... 75
4.5 Formulation of the Plan ..... 87
4.6 Dredged Material Reuse/Disposal ..... 89
4.7 Final Array of Alternative Plans ..... 93
4.8 Channel Depth Determination and Sensitivity Analysis ..... 93
4.9 Plan Valuation ..... 102
4.10 Plan Evaluation by Resource Account ..... 104
5.0 Selected Plan ..... 108
5.1 Considerations in Plan Section ..... 108
5.2 Description of the Plans ..... 112
5.3 Dredging Plan ..... 122
5.4 Operations and Maintenance Requirements ..... 124
5.5 Project Economics ..... 126

Page

VOLUME I—Continued
5.0 Selected Plan—Continued
5.6 Real Estate Requirements ..... 145
5.7 Environmental Impacts ..... 149
5.8 Mitigations Plans/Other Commitments ..... 149
5.9 Risk and Uncertainty ..... 149
5.10 Selected Plan ..... 150
5.11 Plan Implementation ..... 151
6.0 Coordination and Public Involvement ..... 155
6.1 Public Meetings, Workshops, and Report Circulation ..... 155
6.2 Feasibility Study Involvement ..... 155
6.3 Circulation of Feasibility Report ..... 155
6.4 Views of the Local Sponsor ..... 156
7.0 Conclusions and Recommendations ..... 157
VOLUME II: Final Environmental Impact Statement/Environmental Impact Report ..... 159

VOLUMES ACCOMPANYING THE REPORT PREPARED BY THE PORT OF OAKLAND

(Not Printed)

VOLUME III: Appendices A through E
A. Engineering Report
B. Cost Estimate and Optimization
C. Real Estate Plan
D. Geotechnical Investigation
E. Hydrogeological Investigation
VOLUME IV: Appendices F through M
F. NOP/NOI and Scoping Comments Overview
G. Regulatory Agency Framework and Compliance
H. Sediment Characterization
I. Air Quality
J. Air Quality Conformity Determination
K. Middle Harbor Enhancement Area Dredging and Disposal Plan
L. Endangered Species Act Section 7 Biological Assessment—Executive Summary
M. Inner Harbor Turning Basin Information
VOLUME V: Appendices N through V, and Appendix X
N. USFWS Coordination Act Document
O. Modeling of Water Quality Analysis
P. Clean Water Act Section 404(b)(1) Evaluation
Q. Human Health Risk Assessment
R. Mitigation Monitoring and Reporting Plan
S Ground Transportation Information
T. Construction Process
U. Hydrodynamic Modeling of Middle Harbor Enhancement Area
V. National Historic Preservation Act Section 106 Documentation
X. Responses to Comments on the Draft EIS/R/FS
VOLUME VI: Appendix W1
W1. Comments on the Draft EIS/R/FS from Agencies and Environmental or Community Groups
VOLUME VII: Appendix W2
W2. Comments from Businesses and Individuals on the Draft EIS/R/FS
VOLUME VIII: Executive Summary of the Final Environmental Impact Statement/
Environmental Impact Report

# LETTER OF TRANSMITTAL

DEPARTMENT OF THE ARMY
OFFICE OF THE ASSISTANT SECRETARY
CIVIL WORKS
108 ARMY PENTAGON
WASHINGTON DC 20310-0108

REPLY TO
ATTENTION OF

28 JAN 2000

Honorable J. Dennis Hastert
Speaker of the House
of Representatives
Washington, D.C. 20515

Dear Mr. Speaker:

Pursuant to Section 203 of the Water Resources Development Act (WRDA) of 1986, the Secretary of the Army recommends authorization of a deep draft navigation and ecosystem restoration project for Oakland Harbor, California. The project is described in the report of the Chief of Engineers dated April 21, 1999, and was authorized by Section 101(a)(7) of WRDA 1999. Accompanying the report of the Chief of Engineers is the feasibility report prepared by the Port of Oakland under the authority of Section 203 of WRDA 1986. The views of the State of California, the Departments of the Interior and Transportation, and the Environmental Protection Agency are set forth in the enclosed report.

The Secretary of the Army recommends Plan F-II as developed by the Port of Oakland. Plan F-11 involves the deepening of the Oakland Harbor Entrance Channel, Outer Harbor Channel, Outer Harbor turning basin, Inner Harbor Channel, and Inner Harbor turning basin, all to a depth of 50 feet below mean lower low water (MLLW). The existing channels have a depth of 42 feet below MLLW. The entrance channel would be widened to a maximum width of 1,000 feet at its western entrance, tapering to the existing width of 900 feet at its eastern end. A limited amount of widening of the Outer Harbor Channel would be done to accommodate the widening of the Outer Harbor turning basin from a diameter of 1,480 feet to a diameter of 1,600 feet. The Inner Harbor Channel would be widened and straightened to a width of about 750 feet for about 1.8 miles from the Middle Harbor Channel to the "APL" Terminal, with no widening east of the "APL" Terminal. The Inner Harbor Channel turning basin would be widening from a diameter of 1,200 feet to a diameter of 1,500 feet. No separable fish and wildlife or cultural resources mitigation is required due to either the implementation or the operation and maintenance of the proposed navigation improvements.

Construction of the project will require the dredging and disposal of approximately 12.8 million cubic yards (mcy) of material, with about 12.2 mcy from the dredging of the navigation channels, and about 0.6 mcy from the dredging of non-Federal berthing areas. Approximately 7.0 mcy of dredged material would be deposited in the Middle Harbor Enhancement Area; approximately 2.5 mcy of dredged material would be disposed of at the Hamilton Army Airfield Wetlands Restoration Project; approximately 2.9 mcy of dredged material would be disposed of at the existing non-Federal Montezuma Wetlands Restoration project; approximately 0.3 mcy of dredged material would be disposed of at the non-Federal Vision 2000 site and used as construction fill; and approximately 0.1 mcy of contaminated sediments and debris would be disposed of at any of several existing Bay Area landfills. Material dredged from the non-Federal berthing areas would be disposed of at the Middle Harbor Enhancement Area.

The project was developed to maximize ecosystem restoration opportunities. The placement of dredged material at both the Hamilton Army Airfield Wetlands Restoration Project, and the Montezuma Wetlands Restoration Project will result in the restoration of a total of about 770 acres of wetland habitats. In addition, disposal of dredged material at the Middle Harbor Enhancement Area will create a shallow water habitat that will mitigate for the loss of eelgrass beds that would be removed as part of the channel widening in the Inner Harbor Channel, while also enhancing the vitality and productivity of local wildlife.

At October 1999 price levels, the Army Corps of Engineers estimates that the total first cost of the project is about $265,920,000, with the Federal cost of about $135,000,000, and a non-Federal cost of about $130,920,000. This first cost includes about $152,300,000 for cost shared general navigation features; about $53,090,000 for the additional cost of using dredged material for ecosystem restoration that is cost shared with the non-Federal sponsor; about $45,660,000 in non-Federal costs associated with the dredging of berthing areas and for the construction and development of other local service facilities; about $14,600,000 for non-Federally provided lands, easements, rights-of-way, and relocations; and, about $270,000 for the Federal relocation of aids to navigation.

The cost sharing noted above includes the additional 10 percent non-Federal share of the cost of the general navigation features required by Section 101 of the Water Resources Development Act of 1986. The Corps estimates that the increase in the existing Oakland Harbor Project's annual operation, maintenance, repair, rehabilitation, and replacement requirements would be about $450,000, of which about $310,000 would be a Federal cost, and about $140,000 would be a non-Federal cost. The non-Federal sponsor for the project is the Port of Oakland.

The incremental project cost of $53,090,000 for the beneficial use of dredged material is cost-shared at 75 percent Federal and 25 percent non-Federal. This incremental cost is the additional cost above the least-cost environmental acceptable method of disposal of the dredged material, which is ocean disposal. Of this amount, about $18,234,000 would be the incremental cost of the restoration of about 228 acres of habitat at the Hamilton Army Airfield Wetlands Restoration Project, and about $34,856,000, would be for the restoration of about 542 acres of habitat at the Montezuma Wetlands Restoration project. Disposal of dredged material at the Middle Harbor Enhancement Area is the least costly environmentally acceptable disposal method, and, as such, does not involve any incremental cost to achieve ecosystem restoration benefits. The Hamilton Army Airfield Wetlands Restoration Project is a separate environmental restoration project authorized by Section 101(b)(3) of WRDA 1999. If for some reason that project is not used, the dredged material intended to be placed in that area will be disposed of at the San Francisco Deep Ocean Disposal Site, an Environmental Protection Agency approved ocean disposal site.

The Chief of Engineers found that the plan developed by the Port of Oakland is the national economic development plan, and that the study conducted by the Port complies with Federal laws and regulations applicable to Corps feasibility studies. In accordance with Section 203(d) of WRDA 1986, the non-Federal sponsor is eligible for a credit of about $5.4 million. That amount represents one-half of the cost of the feasibility study, the normal Federal share of the cost of a feasibility study. The actual amount of the credit will be subject to an audit of the non-Federal sponsor's actual expenses, and would be applied against the non-Federal share of the cost of the construction of the project.

The Office of Management and Budget advises that there is no objection to the submission of the report to the Congress. A copy of its letter is enclosed in the report.

Sincerely,

Joseph W. Westphal
Assistant Secretary of the Army
(Civil Works)

Enclosure

# COMMENTS OF THE OFFICE OF MANAGEMENT AND BUDGET

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF MANAGEMENT AND BUDGET
WASHINGTON, D.C. 20503

November 12, 1999

The Honorable Joseph Westphal
Assistant Secretary of the Army for Civil Works
Pentagon - Room 2E570
Washington, D.C. 20310-0108

Dear Dr. Westphal:

As required by Executive Order 12322, the Office of Management and Budget has completed its review of your recommendation for Oakland Harbor, California.

The Administration supports authorization of this navigation and ecosystem restoration project for construction in accordance with the recommendation of your letter of July 30, 1999. The Office of Management and Budget does not object to submission of this report to Congress.

Sincerely,

Kathleen Peroff
Deputy Associate Director
Energy and Science

COMMENTS OF THE STATE OF CALIFORNIA

# State of California

GOVERNOR'S OFFICE OF PLANNING AND RESEARCH
1400 TENTH STREET
SACRAMENTO 95814

PETE WILSON
GOVERNOR

PAUL F MINER
DIRECTOR

June 29, 1998

ROBERT MCINTYRE
US ARMY CORPS OF ENGINEERS
7701 TELEGRAPH ROAD
ATTN: CECW-AR
ALEXANDRIA, VA 22315

Subject: OAKLAND HARBOR NAVIGATION IMPROVEMENTS (-50') PROJECT SCH #: 97072051

Dear ROBERT MCINTYRE:

The State Clearinghouse submitted the above named environmental document to selected state agencies for review. The review period is closed and none of the state agencies have comments. This letter acknowledges that you have complied with the State Clearinghouse review requirements for draft environmental documents, pursuant to the California Environmental Quality Act.

Please call Kristen Derscheid at (916) 445-0613 if you have any questions regarding the environmental review process. When contacting the Clearinghouse in this matter, please use the eight-digit State Clearinghouse number so that we may respond promptly.

Sincerely,

ANTERO A. RIVASPLATA
Chief, State Clearinghouse

## COMMENTS OF THE DEPARTMENT OF THE INTERIOR

United States Department of the Interior

OFFICE OF THE SECRETARY
Washington, D.C. 20240

ER 98/337

JUN 29 1998

Mr. David B. Sanford, Jr.
Chief, Policy Division
Directorate of Civil Works
ATTN: CECW-AR (SA)
7701 Telegraph Road
Alexandria, VA 22315-3861

Dear Mr. Sanford:

The Department of the Interior has reviewed the Chief of Engineers Proposed Report (Report) for the Oakland Harbor Navigation Improvement (-50 Foot) Project, Alameda County, California. The following comments are provided for your information and use when preparing the final Report.

The final Report should indicate the proposed width of the entrance channel (element 5 in the second paragraph) as 1,000 feet and the minimum width of the inner harbor (element 9 in the second paragraph) as at least 600 feet.

The proposed Report uses the acronym "MEA" while "MHEA" is used in previous environmental documents for the Middle Harbor Enhancement Area. The acronym used in the final Report should be checked for consistency in usage.

The proposed Report states: "... to create approximately 190 acres of shallow water and subtidal habitat in an area that is no longer needed for navigation purposes." This statement is somewhat misleading as about 55-60 acres of the fill area is already shallow subtidal and some of this fill area may not have an existing navigation purpose. The final Report should rephrase this statement to state: "... to create and enhance approximately 190 acres of shallow water and subtidal habitat."

We believe that the statement: "Creation of eelgrass beds in a portion of the MEA will mitigate for loss of ... " is misleading. The eelgrass creation is an enhancement project, intended to greatly exceed the loss, and not a mitigation project for this loss. We suggest rephrasing this statement to indicate that the created eelgrass area (expected to be at least 17 acres) will exceed the loss of about 0.12 acre.

The proposed Report indicates a preference for habitat restoration, and then states if habitat restoration options are not available, the material will be disposed in the ocean. The final Report needs to clarify the fate of 5.2 million cubic yards of dredged material and clearly indicate the Corps' commitment to habitat restoration.

Thank you for opportunity to comment.

Sincerely,

Willie Taylor

Willie Taylor, Director
Office of Environmental Policy
and Compliance

# COMMENTS OF THE DEPARTMENT OF TRANSPORTATION

U.S. Department of Transportation
United States Coast Guard

Commandant
United States Coast Guard

2100 Second Street, S.W.
Washington, DC 20593-0001
Staff Symbol: G-MOR
Phone: (202) 267-0518
FAX: (202) 267-4065

16475

JUL 1 1998

Mr. David B. Sanford, Jr.
Policy Division, Policy Review Branch
Department of the Army (CECW-AR (SA))
U.S. Army Corps of Enginners
7701 Telegraph Road
Alexandria, VA 20315-3861

Dear Mr. Sanford:

Recently you sent copies of the proposed report for the Chief of Engineers on Oakland Harbor, California and the accompanying FEIS. In addition, you sent a letter dated May 22, 1998 requesting an expedited review of these documents. We have reviewed the proposed reports and have no comments to offer.

We forwarded these documents for information purposes to the local United States Coast Guard unit for consideration. In the event they have specific concerns, those will be coordinated directly with Mr. Robert McIntyre of your staff.

Sincerely,

L. L. HERETH
Captain, U.S. Coast Guard
Chief, Office of Response
By direction of the Commandant

Copy: OST (S-10)
USCG COMDT (G-CBU)

# COMMENTS OF THE ENVIRONMENTAL PROTECTION AGENCY

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

June 25, 1998

David B. Sanford, Jr., Chief
ATTN: CECW-AR, IP
Policy Division, Directorate of Civil Works
U.S. Army Corps of Engineers
7701 Telegraph Road
Alexandria, Virginia 22315

Dear Mr. Sanford:

The U.S. Environmental Protection Agency (EPA) has reviewed the Final Environmental Impact Statement/Report (FEIS/R) for the ***OAKLAND HARBOR NAVIGATION IMPROVEMENT (-50 FOOT) PROJECT, Alameda County, California***. Our comments on the FEIS/R are provided pursuant to the National Environmental Policy Act (NEPA), Section 309 of the Clean Air Act, and the Council on Environmental Quality's NEPA Implementing Regulations (40 CFR 1500-1508). EPA has had an extensive involvement in developing and refining the proposed project's NEPA documentation and analyses concerning dredging impacts and dredged material disposal sites. We commented on the Draft EIS/R (DEIS/R) on March 27, 1998, rating it as EO-2 (Environmental Objections - Insufficient Information).

Our review of the FEIS/R and its response to comments finds that the Corps has generally addressed many of the issues of concern to EPA on the DEIS/R, although we continue to have several specific comments and concerns regarding the proposed project's NEPA documentation (attached). We request that our comments and concerns be addressed in the Record of Decision for the proposed project and in the Chief of Engineers' final report to the United States Congress.

We appreciate the opportunity to comment on the FEIS/R. Please send one copy of the Record of Decision to me (mailcode: CMD-2) at the letterhead address when it is signed by the Corps of Engineers. We look forward to continued cooperation with the Corps, the Port of Oakland and other State, Federal and local agencies on this regionally-significant project.

Sincerely,

for

David Farrel, Chief
Federal Activities Office

Attachments: 2
(a) EPA's detailed comments on FEIS/R
(b) EPA's 6/16/98 letter to BCDC

cc Brigadier General J. Richard Capka, Division Engineer, South Pacific Division
Lt. Col. Richard G. Thompson, District Engineer, SF District (ATTN: Peter LaCivita)
Jim McGrath, Port of Oakland
Loretta Barsamian, Regional Water Quality Control Board, Oakland
Will Travis, San Francisco Bay Conservation & Development Commission
Ellen Garvey, Bay Area Air Quality Management District
James M. Flint, City Manager, City of Alameda

M.I. #002902

***U.S. EPA COMMENTS ON FEIS/R - OAKLAND HARBOR NAVIGATION IMPROVEMENT (-50 FOOT) PROJECT, ALAMEDA COUNTY, CA - - JUNE 1998***

1. **Air Quality Mitigation**: The FEIS/R (Volume II, p. 5.1-11) identifies three mitigation measures to reduce air emissions associated with the proposed project's construction - - a) replace diesel-power dredges with electric powered dredges; b) retard injection timing of older diesel-powered equipment and engines which do not have mechanical injection for N0x control; and c) use reformulated diesel fuel to reduce ROG and SO2 emissions. Page 5.1-11 indicates that the Corps "will commit to implementing these measures by establishing binding agreements with construction phase contractors before the start of construction." We believe the willingness of the Corps and the Port of Oakland to implement these mitigation measures is necessary to reduce emissions in the San Francisco Bay Area. The need to significantly reduce N0x emissions is of particular concern to EPA in light of our proposed redesignation of the San Francisco Bay Area as an ozone nonattainment area. In order to ensure that these air mitigation commitments are implemented, we request that the Record of Decision for the proposed project and the Chief of Engineers' final report to the Congress reference the Corps' stated commitment to implement these air mitigation measures.

2. **Air Quality Conformity**: By cover letter dated June 9, 1998, we received the San Francisco District's draft Conformity Applicability Analysis for the proposed project. This analysis indicates that annual emissions associated with the proposed project are below the *de minimus* thresholds found in EPA's general conformity rule, and therefore a formal conformity determination for the proposed project is not required to be prepared by the Corps. The emission totals are premised on the implementation of the above-referenced mitigation measures and the assumption that dredged materials will be disposed of at Hamilton Field. The Corps' Record of Decision and final report to the Congress should acknowledge that dredged material disposal at sites which are farther from the Port of Oakland than the Hamilton Field site (i.e., Montezuma Wetlands site and San Francisco Deep Ocean Disposal Site) is possible if Hamilton Field is unable to accept dredged materials from the -50 Foot Project in an acceptable timeframe, or at the volumes identified in the FEIS/R and draft Conformity Applicability Analysis. Because of this possibility, the use of sites more distant than Hamilton Field would require that the Corps perform another conformity applicability analysis to ensure the project's emissions remain below the general conformity rule's *de minimus* thresholds. We note that the Bay Area Air Quality Management District (BAAQMD) raised this issue in its June 19, 1998 letter to the Corps' San Francisco District.

3. **Dredging & Dredged Material Disposal**: EPA believes that beneficial reuse of dredged material as generally proposed under the Port's -50 Foot Project, including aquatic habitat restoration and enhancement in the Middle Harbor and wetlands restoration at the Hamilton and possibly Montezuma project sites, would result in significant benefits to the San Francisco Bay ecosystem (please see EPA's June 16, 1998 letter to the San Francisco Bay Conservation & Development Commission on BCDC Resolution 98-03, enclosed). These projects are in accord with the goals of the Long Term Management Strategy (LTMS) for Dredged Material Placement in the San Francisco Bay Region. The proposed Middle Harbor Enhancement Area has been a controversial part of the Oakland -50 Foot Project, in part due to the possibility that it would

serve as a Confined Aquatic Disposal (CAD) site within which "contaminated" dredged material from the project would be buried. Such CAD sites can be an appropriate option for managing contaminated sediments. Similar projects have been successfully constructed elsewhere on the west coast and nationwide (although not yet in San Francisco Bay). EPA is confident that CAD could be safely incorporated in the Middle Harbor Enhancement Area if necessary. However, important new information has become available since the -50 Foot Project FEIS/S was released and BCDC Resolution 98-03 was drafted. The Port has now completed high-resolution testing of sediments that appeared to be of concern to resource and regulatory agencies based on earlier sampling. The new results confirm that a much smaller volume of sediment (approximately 100,000 cubic yards versus over one million as originally reported) actually requires confinement in an appropriate facility. On this basis there is no longer a need for the Middle Harbor Enhancement Area to be designed as a CAD site at all, as only clean, non-toxic sediments will be placed there. Thus, any concerns about contaminated or toxic sediments in Middle Harbor have been resolved.

Our comment letter on the DEIS/R identified apparent inaccuracies in the estimated volume of future dredging needed to maintain the -50 Foot Project after initial construction. This issue is important in that substantial increases in maintenance dredging were indicated for the project, while at the same time the LTMS program is calling for significant reductions in future in-Bay disposal of dredged material. Potential impacts of, and alternatives for, management of the project's increased maintenance dredging were not addressed, since the Port and the Corps chose to instead rely on the LTMS Policy EIS and the upcoming LTMS Management Plan as ensuring that impacts of future maintenance dredging and disposal would be minimized. The FEIS/R's response to comments (Volume V, Appendix X, pp. X-40 to X-44) reiterates this reliance on the LTMS Program for managing the impacts of future maintenance dredging. EPA is pleased to specifically note that the Corps and the Port are explicitly agreeing to abide by the decisions reached by the LTMS agencies about future dredged material management, including alternatives to in-Bay disposal, for maintenance material from the -50 Foot Project. Regarding expected future dredging volumes, the FEIS/R discussion at Section 2.1.3 (pages 2-17 to 2-18) attempts to clarify the future maintenance dredging volumes associated with the Federal channels and the Port's berths. Unfortunately, the revised discussion remains unclear. In particular, 370,000 cubic yards is the figure listed as the past average volume from <u>both</u> the channel and the Port's berths. If this is accurate, then the predicted future total volume (channels and berths) of 672,000 cubic yards represents a nearly 100 percent increase in maintenance dredging as a result of deepening the port. We believe that the 370,000 cubic yard figure likely represents only past channel dredging; however, the Record of Decision should clarify this and clearly state the expected maintenance volumes associated with the channels and the berths so that the LTMS Program can adequately plan for the management of that volume of dredged material.

Finally, although EPA believes the information generated to date is sufficient for the Congress to consider authorizing the Port's -50 Foot Project under the Water Resources Development Act of 1998, we believe that further design details and analyses are necessary to support permit-level decision making for the proposed project. The Corps and the Port should recognize that some modification to the proposed distribution of dredged material among the reuse sites may result from the evaluation of the detailed information. As one example, the Regional Water Quality

Control Board (RWQCB) raised concerns at the March 20, 1998 inter-agency regulatory review meeting on a need to have a sufficient level of detailed analysis in order for the RWQCB to provide water quality certification for the proposed project. Based on our evaluation of the information available to date (including the results of the latest high resolution sediment analyses discussed above), EPA agrees with the FEIS/R's conclusion that the environmentally preferred alternative includes reuse of a substantial amount of suitable dredged material for habitat enhancement in the Middle Harbor, as well as a substantial amount of suitable material for wetlands restoration at a site such as Hamilton. At a special meeting with the LTMS Management Committee, the Federal and state resource agencies concluded the size and overall design of the proposed Middle Harbor Enhancement Area would result in overall aquatic habitat enhancement. Therefore, although additional design details and analyses are needed for permit-level decisions, EPA believes that the general distribution called for in the FEIS/R's preferred alternative is reasonable, and that the -50 Foot Project as proposed is consistent with the goals of the LTMS.

4. **Noise**: The FEIS/R (Volume VIII, Executive Summary) indicates that "[s]ignificant unavoidable impacts would occur for all alternatives" in terms of noise impacts. The Executive Summary for the FEIS/R (p. ES-16) indicates that the proposed hours of dredging (which are 24 hours per day) "would not be consistent" with the City of Alameda's noise ordinance time restrictions and that construction-related dredging and pile driving in Alameda "would exceed construction noise standards." Our comment letter on the DEIS/R encouraged the Corps and the Port of Oakland to work cooperatively with the City of Alameda to resolve this issue. We reiterate our belief in the importance of trying to accommodate the noise-related concerns of the City of Alameda. We recommend that the Record of Decision and the Chief of Engineers' final report to Congress identify whether there are reasonable opportunities to "finetune" the project's construction activities to reduce adverse noise impacts in Alameda to be consistent with the City's ordinance.

5. **Mitigation and Monitoring**: In keeping with 40 CFR 1505.3(c), we request to be kept informed of the Corps' progress in carrying out the air quality, water quality, and dredged material-related mitigation measures that will be adopted, implemented and monitored by the Corps as part of its final NEPA decision.

**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**
**REGION IX**
**75 Hawthorne Street**
**San Francisco, CA 94105-3901**

June 16, 1998

Robert Tufts, Chairman
Will Travis, Executive Director
San Francisco Bay Conservation and Development Commission
30 Van Ness Avenue, Suite 2011
San Francisco, CA 94102

**Subject: Resolution No. 98-03**

Dear Chairman Tufts and Director Travis:

The Environmental Protection Agency is pleased to support, and encourage Commission adoption of, Resolution 98-03, "*Statement of Support for Federal Authorization for Bay Dredging and Wetland Restoration Projects.*" Reuse of dredged material as proposed under the Port of Oakland -50-Foot Deepening Project and at the Hamilton Wetlands Restoration Project site will result in significant environmental benefits to the San Francisco Bay ecosystem. The Oakland project will directly restore and enhance aquatic habitat values in the degraded Oakland Middle Harbor, and will "jump start" the Hamilton project by providing approximately half of the dredged material needed to restore up to 900 acres of former tidal marsh. For its part, the Hamilton Wetlands Restoration Project will be nearly three times the size of the acclaimed Sonoma Baylands Wetlands Restoration Project, which was constructed by reusing dredged material from the Port of Oakland's earlier -42-Foot Deepening Project. The BCDC Resolution will clearly communicate to Congress the broad regional support for the Port of Oakland -50-Foot Deepening Project and for beneficial reuse of the dredged material, in part, at the Hamilton Wetlands Restoration Project site.

EPA has worked closely with BCDC not only on details of the proposed Port of Oakland Deepening Project and the proposed Hamilton Wetlands Restoration Project, but also on increasing beneficial use via the interagency Long Term Management Strategy for Dredged Material Placement in the San Francisco Bay Region (the LTMS). From the dredged material reuse standpoint, EPA strongly supports both the Oakland and Hamilton projects as being fully consistent with, and in large measure necessary for the very success of, the overall LTMS goals. We believe the two proposed projects are effectively linked: without beneficial reuse of dredged material from the Oakland -50-Foot deepening project, the environmental benefits of wetland restoration at Hamilton Field will take many more years to be realized. At the same time, the Hamilton project is important not only for achieving the LTMS goal of increased beneficial reuse in general, but also specifically as part of the environmentally preferred alternative for the Oakland project. Without Hamilton as part of the solution, the Oakland deepening project will have greater overall environmental impacts than necessary, and indeed may not be economically or environmentally possible to construct at all.

EPA looks forward to continuing to work closely with BCDC as our joint LTMS effort to increase beneficial reuse of dredged material in the Bay area, and as the Oakland and Hamilton projects, move foreword. Please call me at (415) 744-2125 if there are any questions about these comments.

Sincerely,

Alexis Strauss, Acting Director
Water Division

cc: USACE (Thompson, Capka)
SFRWQCB (Barsamian)
Port of Oakland (Foster, Cardoza)

# OAKLAND HARBOR NAVIGATION IMPROVEMENT (50-FOOT) PROJECT

## REPORT OF THE CHIEF OF ENGINEERS, DEPARTMENT OF THE ARMY

DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
WASHINGTON, D.C. 20314-1000

REPLY TO
ATTENTION OF:

CECW-PE (10-1-7a) 21 APR 1999

SUBJECT: Oakland Harbor, California

THE SECRETARY OF THE ARMY

1. In response to a request from the Assistant Secretary Army for Civil Works (ASA(CW)) dated 16 February 1999, I am submitting my report on improvements to the existing -42 foot navigation project at Oakland Harbor, California, proposed by the Port of Oakland. My report is accompanied by the feasibility report prepared by the Port of Oakland (the non-Federal sponsor) which evaluates the advisability of increasing the depth of and making other improvements to Oakland Harbor, in the interest of navigation and ecosystem restoration. The Port of Oakland submitted its report to ASA(CW) pursuant to authority provided by Section 203 of the Water Resources Development Act (WRDA) of 1986, Public Law 99-662

2. Oakland Harbor is the third largest container port on the North American West Coast and the fifth largest container port in the Nation. The existing -42 foot mean lower low water (MLLW) depth constrains access for the fifth and sixth generation container ships, which have drafts of -42 to -48 feet MLLW. These container ships experience significant tidal delays entering and leaving Oakland, and as a result are only partially loaded. To address this problem the non-Federal sponsor recommends: (1) deepening the entrance channel, outer harbor channel, outer harbor turning basin, inner harbor channel and inner harbor turning basin to -50 feet MLLW; (2) widening the entrance channel (on the north side), the outer harbor turning basin (from a diameter of 1,480 feet to a diameter of 1,600 feet), the outer harbor channel (to accommodate the widening of the turning basin), and the inner harbor turning basin (from a diameter of 1,200 feet to a diameter of 1,500 feet); and, (3) widening and straightening the inner harbor channel from approximately station 40+00 to station 135+00. The recommended plan of improvement would require dredging and disposal of approximately 12.8 million cubic yards (mcy) of material. Approximately 7.0 mcy of dredged material would be deposited in the middle harbor enhancement area (MHEA); approximately 2.5 mcy of dredged material would be transported to the proposed Hamilton Wetlands Restoration project (HWRP); approximately 2.9 mcy of dredged material would be disposed of at the existing Montezuma Wetlands Restoration project (MWRP); approximately 0.3 mcy of dredged material would be transported to the Vision 2000 upland site; and approximately 0.1 mcy of dredged material would be sent to an upland land fill. About 0.6 mcy of the 12.8 million of dredged material would be from non-Federal berthing areas, which would be placed in the MHEA. Placement of dredged material at the proposed MHEA and Hamilton Army Airfield sites and existing MWRP site allows for the beneficial use of dredged material. Placement of dredged material at these sites would lead to creation of valuable wetland habitats. In addition, eelgrass

beds would be created in a portion of the MHEA to mitigate for the loss of approximately 5,000 square feet of eelgrass beds that would be removed as part of the channel widening in the inner harbor. In the event the HWRP and the MWRP are not available to receive dredged materials, then approximately 5.4 mcy of dredged material would be disposed of at the designated San Francisco Deep Ocean Disposal Site.

3. Based on October 1998 price levels, the total estimated cost of the project recommended for authorization is $208,710,000 including the general navigation features (GNF) and associated lands, easements, rights-of-way, and relocations (LERR) and beneficial use of dredged material features (BUDMF). General navigation features account for approximately $144,940,000, while $13,850,000 is associated with the non-Federal LERR requirements; and $50,370,000 with the BUDMF. The Federal share of the first cost of the GNF is estimated at $90,650,000 and the non-Federal share of the GNF is estimated at $53,840,000, including the additional 10 percent ($14,449,000) non-Federal share of GNF, less the creditable LERR of $13,850,000 required by Public Law 99-662. The remaining non-Federal cash required upon completion of construction and payable over 30 years amounts to $599,000. The GNF includes a 50 percent Federal and 50 percent non-Federal cost apportionment for the U.S. Navy sewer line relocation. However, should the city of Alameda subsequently own and use the Navy sewer pipeline, the pipeline would be reclassified as a deep draft utility relocation and not a GNF and cost shared in accordance with Section 101(a)(4) of Public Law 99-662. The Federal share also includes an estimated $37,770,000 for the BUDMF, while the non-Federal share of the BUDMF is estimated at $12,600,000. Also included in the recommended plan at 100% non-Federal responsibility are $43,320,000 in non-Federal associated costs for construction and development of berthing areas and other local service facilities, and at 100% Federal responsibility $260,000 associated with aids to navigation. With these costs, the estimated total first cost of the project is $252,290,000, with the Federal share at $128,081,000 and non-Federal share at $124,209,000, as shown below.

| | Total | Federal ($) | Non-Federal |
|---|---|---|---|
| GNF | 144,490,000 | 90,650,000 | 53,840,000 |
| LERR | 13,850,000 | | 13,850,000 |
| Beneficial Use of Dredged Material | 50,370,000 | 37,770,000 | 12,600,000 |
| Total for Navigation & Ecosystem Restoration | 208,710,000 | 128,420,000 | 80,290,000 |
| (Additional Cash Contribution Over-Time) | | (14,449,000) | 14,449,000 |
| (Credit to Sponsor for LERR Against Additional Contribution) | | 13,850,000 | (13,850,000) |
| Associated Non-Federal Requirements | | | |
| Berthing Facilities | 4,130,000 | | 4,130,000 |
| Local Service Facilities | 38,160,000 | | 38,160,000 |
| Required Owner Relocation | 1,030,000 | | 1,030,000 |
| Associated Federal Requirements | | | |
| Aids to Navigation | 260,000 | 260,000 | |
| Estimated Total First Cost | $252,290,000 | $128,081,000 | $124,209,000 |

For the BUDMF increment, providing the necessary LERR requirements for the proposed HWRP will be the responsibility of the non-Federal sponsor for the HWRP – in this case, the California Coastal Conservancy. The LERR requirements of the MWRP are included as part of the cost shared tipping fee for disposal of dredge material at the site.

4. Average annual benefits and costs, based on October 1998 price levels, a discount rate of 6.875 percent, and a 50-year period of analysis, are estimated at $187,870,000 and $23,290,000, respectively, which results in an average annual net benefit of $164,580,000. The overall benefit-to-cost ratio is 8.1 to 1. The recommended plan is both the national economic development (NED) plan and the locally preferred plan. The NED disposal plan was formulated for navigation. This plan with the least initial construction cost achieved the highest net benefits at -50 feet MLLW. A component for beneficial use of dredged material for creation of wetland habitats was added to this plan.

5. Project costs are allocated to the commercial navigation purpose and beneficial use of dredged material for creation of wetland habitats. The GNF include dredging of the channels, construction of dredged material disposal facilities, and wetland mitigation. In accordance with Section 101 of WRDA 1986, as amended by Section 201 of WRDA 1996, the non-Federal sponsor must pay 25 percent of the GNF costs for water depths between -20 feet MLLW and -45 feet MLLW, and 50 percent of the GNF costs for water depths deeper than -45 feet MLLW. After construction of the GNF are completed, the non-Federal sponsor is required to provide an additional 10 percent of the cost of GNF, less the creditable LERR, over a period not to exceed 30 years.

6. The recommendation to cost share the $50,370,000 cost of the beneficial use of dredge material increment at 75 percent Federal and 25 percent non-Federal is based on the following factors. This cost sharing is consistent with the principles established by Section 204 of WRDA 1992, as amended. Federal participation would encourage such environmentally beneficial use and avoid "wasting" the resource of dredged material. The incremental costs of such disposal are deemed justified in relation to the environmental benefits gained. The Sonoma-Baylands wetlands restoration project is an excellent example of previous beneficial use of dredged material from the -42 foot Oakland Harbor deepening project. A Long Term Management Strategy (LTMS) Plan for San Francisco Bay is in place, and its call for the beneficial use of dredged material is compelling. Such planning efforts should be encouraged to relieve the growing burden of finding dredged material disposal sites. The restoration of approximately 990 acres of wetlands at the Hamilton Army Airfield is an Administration priority, as noted in the President's Clean Water Action Plan. Also, the Army has an interest in facilitating an efficient transition of the Hamilton Army Airfield to a non-Federal interest, in this case, the California Coastal Conservancy. The HWRP would restore approximately 990 acres of habit, including approximately 570 acres of salt marsh. Salt marsh is considered especially valuable due to its scarcity, and the additional salt marsh will benefit federally listed threatened and endangered species that depend on this scarce habitat. Based on the capacity of the site and proportional amount of dredged material from the –50 foot project, approximately 228 acres of seasonal wetland habitat at the HWRP would be restored at a cost of approximately $17,300,000. Endangered and threatened species that are expected to benefit from the HWRP

include the salt marsh field mouse, California clapper rail, brown pelican, California black rail, and winter-run chinook salmon. In addition several State species of special concern are also expected to benefit. The purpose of the non-Federal MWRP is to use approved dredged material to restore approximately 1,822 acres of diked former baylands to a tidal wetland ecosystem, which includes some seasonal wetland features. The MWRP also contributes to the goals of the President's Clean Water Action Plan and contributes to the goals of the San Francisco Bay LTMS. Based on the capacity of the site and proportional amount of dredged material from the –50 foot project, approximately 542 acres of habitat at the MWRP would be restored at a cost of approximately $33,070,000. Endangered species that are expected to benefit from the MWRP include the salt marsh harvest, winter-run chinook salmon and the California clapper rail. Benefiting threatened species include the Sacramento splittail and the delta smelt. Several State species of special concern are also expected to benefit. Finally, due to its proximity to the dredging areas, disposal of dredged material at the MHEA is the least cost disposal option, as such there are no incremental cost associated with the beneficial use of dredged material at the MHEA. Disposal of dredged material at the MHEA will create a shallow water habitat area in the Middle Harbor to mitigate for the loss of eelgrass beds and enhance the vitality and productivity of local wildlife. This reuse option would create a similar habitat to that which existed in the Middle Harbor prior to the 1940's. The cost of the recommend BUDMF is justified by the restoration of approximately 770 acres of wetland habitat and provides for achieving the habitat increases in a cost effective manner. These wetland habitats are considered especially valuable due to scarcity and the dependence of certain species on these resources.

7. The average annual increase in Federal channel operations and maintenance (O&M) dredging cost is estimated to be $430,000 at a -50 foot MLLW depth. The Federal share of the average annual O&M cost is $295,000. The non-Federal share of the average annual O&M cost is $135,000. For the BUDMF increment, the O&M requirements for restored area at the HWRP will be carried out by the non-Federal sponsor for the HWRP. In this case, the California Coastal Conservancy. The O&M requirements for the restored area at the MWRP are included as part of the cost shared tipping fee for disposal of dredge material at the site.

8. In accordance with provisions of Section 203 of Public Law 99-662, if the proposed project is authorized, the Secretary shall credit towards the non-Federal share of the cost of construction of such project an amount equal to the portion of the cost of developing such study that would have been the responsibility of the United States if such study were developed by the Secretary. The non-Federal sponsor's cost for the study are estimated at $10,800,000. That portion of the study cost that would have been the responsibility of the Federal Government is currently estimated at $5,400,000. However, the actual amount of study costs eligible for credit will be subject to a detailed audit of the non-Federal sponsor's expenditures. This estimated credit of $5,400,000 is not reflected in Federal/non-Federal project cost sharing shown in paragraph 3 above.

9. Washington level review indicates that the proposed plan is technically sound, economically justified, and environmentally and socially acceptable. The proposed project complies with

applicable U.S. Army Corps of Engineers planning procedures and regulations. Also, the views of interested parties, including Federal, State, and local agencies have been considered. I concur with the findings and conclusions of the Port of Oakland. Accordingly, I recommend that deep-draft navigation improvements for Oakland Harbor, California, and beneficial use of dredged material for creation of wetland habitats be authorized generally in accordance with the recommended plan, with such modifications as in the discretion of the Chief of Engineers may later be advisable. My recommendation is subject to cost sharing, financing, and other applicable requirements of WRDA 1986 and WRDA 1996 for this kind of project. I further recommend that the non-Federal sponsor receive credit under Section 203 of Public Law 99-662 for the Federal portion of study costs, subject to an audit of the non-Federal sponsor's actual expenditures. Also, this recommendation is subject to the non-Federal sponsor agreeing to comply with applicable Federal laws and policies, including the following requirements:

a. Enter into an agreement, which provides, prior to execution of the project cooperation agreement, 25 percent of design costs;

b. Provide, during construction, any additional funds needed to cover the non-Federal share of design costs;

c. Provide, during the period of construction, a cash contribution equal to the following percentages of the total cost of construction of the general navigation features (which include the construction or improvement of land-based and aquatic dredged material disposal facilities that are necessary for the disposal of dredged material required for project construction, operation, or maintenance and for which a contract for the Federal facility's construction or improvement was not awarded on or before October 12, 1996):

(1) 25 percent of the costs attributable to dredging to a depth in excess of -20 feet below MLLW but not in excess of -45 feet below MLLW;

(2) 50 percent of the costs attributable to dredging to a depth in excess of -45 feet below MLLW;

(3) 25 percent of the costs attributable to dredging disposal for maximum habitat reuse at the Hamilton and Montezuma wetlands restoration;

d. In the case of project features greater than -45 feet below MLLW in depth, provide 50 percent of the excess cost of operation and maintenance of the project over that cost which the Secretary determines would be incurred for operation and maintenance if the project had a depth of -45 feet below MLLW;

e. Pay with interest, over a period not to exceed 30 years following completion of the period of construction of the project, up to an additional 10 percent of the total cost of construction of

general navigation features depending upon the amount of credit given for the value of lands, easements, rights-of-way, and relocations provided by the non-Federal sponsor for the general navigation features. If the amount of credit exceeds 10 percent of the total cost of construction of the general navigation features, the non-Federal sponsor shall not be required to make any contribution under this paragraph, nor shall it be entitled to any refund for the value of lands, easements, rights-of-way, and relocations in excess of 10 percent of the total cost of construction of the general navigation features;

f. Provide all lands, easements, and rights-of-way, and perform or ensure the performance of all relocations determined by the Federal Government to be necessary for the construction, operation, maintenance, repair, replacement, and rehabilitation of the general navigation features (including all lands, easements, and rights-of-way, and relocations necessary for dredged material disposal facilities). The San Francisco Bay Area Rapid Transit District (BART) anode cable relocation costs are currently estimated at $2,060,000. The non-Federal sponsor will receive a 50 percent LERR credit pursuant to Section 101(a)(4) of Public Law 99-662 for a currently estimated amount of $1,030,000. The LERR costs do not include an estimated $1,030,000 in funds that will be provided by BART for 50 percent of the anode cable relocation costs;

g. Provide, operate, maintain, repair, replace, and rehabilitate, at its own expense, the local service facilities in a manner compatible with the project's authorized purposes and in accordance with applicable Federal and State laws and regulations and any specific directions prescribed by the Federal Government;

h. Accomplish all removals determined necessary by the Federal Government other than those removals specifically assigned to the Federal Government;

i. Grant the Federal Government a right to enter, at reasonable times and in a reasonable manner, upon property that the non-Federal sponsor owns or controls for access to the general navigation features for the purpose of inspection, and, if necessary, for the purpose of operating, maintaining, repairing, replacing, and rehabilitating the general navigation features;

j. Hold and save the United States free from all damages arising from the construction, operation, maintenance, repair, replacement, and rehabilitation of the project, any betterments, and the local service facilities, except for damages due to the fault or negligence of the United States or its contractors;

k. Keep, and maintain books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to the project, for a minimum of 3 years after completion of the accounting for which such books, records, documents, and other evidence is required, to the extent and in such detail as will properly reflect total cost of construction of the general navigation features, and in accordance with the standards for financial management systems set forth in the Uniform Administrative Requirements for Grants and Cooperative Agreements to State and Local

Governments at 32 CFR, Section 33.20;

l. Perform, or cause to be performed, any investigations for hazardous substances as are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. 9601-9675, that may exist in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be necessary for the construction, operation, maintenance, repair, replacement, or rehabilitation of the general navigation features. However, for lands that the Government determines to be subject to the navigation servitude, only the Government shall perform such investigation unless the Federal Government provides the non-Federal sponsor with prior specific written direction, in which case the non-Federal sponsor shall perform such investigations in accordance with such written direction;

m. Assume complete financial responsibility, as between the Federal Government and the non-Federal sponsor, for all necessary cleanup and response costs of any CERCLA regulated materials located in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be necessary for the construction, operation, maintenance, repair, replacement, and rehabilitation of the general navigation features;

n. To the maximum extent practicable, perform its obligations in a manner that will not cause liability to arise under CERCLA;

o. Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended by Title IV of the Surface Transportation and Uniform Relocation Assistance Act of 1987, and the Uniform Regulations contained in 49 CFR Part 24, in acquiring lands, easements, and rights-of-way required for construction, operation, maintenance, repair, replacement, and rehabilitation of the general navigation features, and inform all affected persons of applicable benefits, policies, and procedures in connection with said act;

p. Comply with all applicable Federal and State laws and regulations, including, but not limited to, Section 601 of the Civil Rights Act of 1964, Public Law 88-352 (42 U.S.C. 2000d), and Department of Defense Directive 5500.11 issued pursuant thereto, as well as Army Regulation 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army;"

q. Provide a cash contribution equal to the non-Federal cost sharing percentage of the project's total historic preservation mitigation and data recovery costs that are in excess of of the total amount authorized to be appropriated for the project; and

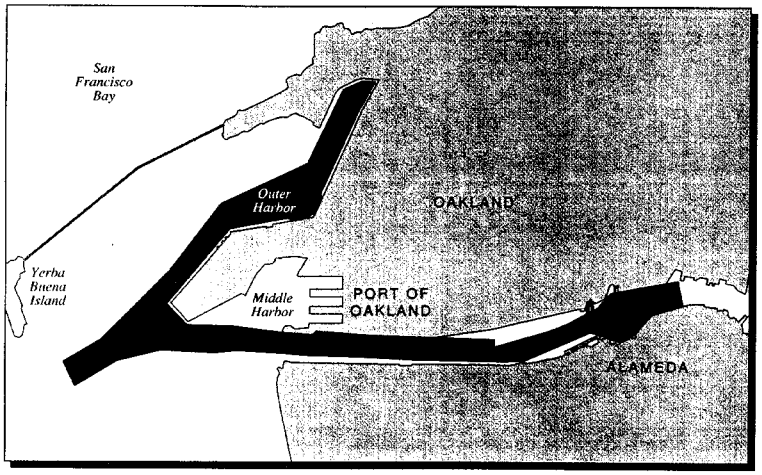
r. Do not use Federal funds to meet the non-Federal sponsor's share of total project costs unless the Federal granting agency verifies in writing that the expenditure of such funds is authorized.

10. The recommendation contained herein reflects the information available at this time and current departmental policies governing formulation of individual projects. It does not reflect program and budgeting priorities inherent in the formulation of a national civil works construction program nor the perspective of higher review levels within the executive branch. Consequently, the recommendation may be modified before it is transmitted to Congress as a proposal for authorization and implementation funding. However, prior to transmittal to Congress, the Port of Oakland, the non-Federal sponsor; the State of California; interested Federal agencies; and other parties will be advised of any modifications and will be afforded an opportunity to comment further.

JOE N. BALLARD
Lieutenant General, U.S. Army
Chief of Engineers

# Oakland Harbor Navigation Improvement (-50 Foot) Project

## Information Report
## Corrections and Updates to the Final EIS/EIR




*Prepared by*

**U.S. Army Corps of Engineers**
**San Francisco District**
Federal Lead Agency

**Port of Oakland**
State Lead Agency

MARCH 1999

## TABLE OF CONTENTS

1.0 OVERVIEW OF CORRECTIONS AND UPDATES ..... 12

2.0 ALTERNATIVES F10 AND F11 ..... 12

3.0 SUPPLEMENTAL ANALYSIS ..... 14

- 3.1 AIR QUALITY ..... 14
- 3.2 BIOLOGY ..... 19
- 3.3 CULTURAL RESOURCES ..... 19
- 3.4 HAZARDOUS MATERIALS AND CONTAMINATED WASTES ..... 20
- 3.5 HYDROLOGY ..... 21
- 3.6 NOISE ..... 21
- 3.7 TRANSPORTATION ..... 26
- 3.8 BALLAST WATER ..... 26

4.0 CONCLUSION ..... 28

5.0 REFERENCES ..... 29

## TABLES

1 Summary of Total Bay Area Air Basin Emissions Associated with Each Alternative.....15

2 Distribution of Dredge Material, Trips, Load Factors, and Travel Time Allocations .....17

3 Port of Oakland 50-Foot Deepening Project (Final EIS/R Assumptions) Emission .....18
Source Data Associated with Handling and Transport and Material to Landfill Handling and Transport of Material (100,000 cy) to Landfill (b)

4 Port of Oakland 50-Foot Deepening Project (Final EIS/R Assumptions) Emission .....18
Source Data Associated with Handling and Transport and Material to Landfill Handling and Transport of Material (700,000 cy) to Landfill (b)

5 Summary of Project Construction Noise Levels at Sensitive Noise Receptors .....24

6 Summary of Cumulative Construction Noise Levels at Sensitive Noise Receptors ..... 25

7 Estimated Ballast Water Discharge (Metric Tons) ..... 27

## FIGURES

1 Oakland and Alameda Noise-Sensitive Receptors ..... 23

# INFORMATION REPORT

This Information Report supplements the May 1998 Final Environmental Impact Statement/Environmental Impact Report for the Oakland Harbor Navigation Improvement (-50 Foot) Project ("50-foot Project FEIS/R"; USACE and Port of Oakland 1998). The Information Report has been prepared to update and correct information contained in the 50-foot Project FEIS/R and to provide updated alternatives for the 50-foot Project. This Information Report is divided into 4 sections. Section 1 provides an overview of the corrections and updates. Section 2 describes the added alternatives in detail, and Section 3 presents the updated information and revised impact analysis. Section 4 provides the conclusions.

## 1. 0 OVERVIEW OF CORRECTIONS AND UPDATES

In the nine months since the 50-foot Project FEIS/R was prepared, three types of new information have become available. First are corrections in the information presented in the FEIS/R's description of air quality and noise impacts from project construction. Second are updates to the FEIS/R's discussions of ballast water discharges and the Todd Shipyard cultural resources issue. The third category consists of improved sediment characterization data and improved information regarding the likely disposition of dredged sediments (including information pertaining to rehandling, reuse, and disposal). This information has led to the identification of two new project alternatives described in section 2 below.

None of the new information analyzed in this Information Report reveals any significant environmental impact that was not already identified in the FEIS/R. In several instances, the new information demonstrates that impacts discussed in the FEIS/R would be less significant than previously believed.

## 2.0 ALTERNATIVES F10 AND F11

The 50-foot Project FEIS/R identified Alternative F2 as the "preferred alternative." Under Alternative F2, 12.8 million cubic yards (mcy) of dredged material would be disposed of and reused as follows:

0.5 mcy to Vision 2000 Upland
7.0 mcy to Middle Harbor Enhancement Area (MHEA)
5.2 mcy to Hamilton
0.1 mcy to Various Landfills
12.8 mcy Total

At the time of the 50-foot Project FEIS/R, final sediment suitability determinations by the regulatory agencies for the material proposed to be dredged had not been completed. The project sponsors therefore decided that the FEIS/R should include conservative assumptions regarding the amount of dredged material that might be contaminated. Therefore, of the 12.8 mcy, the FEIS/R assumed that a total of approximately 2.1 mcy could be: (1) "wetland non-cover material," *i.e.*, material that could not be used at the surface of a wetland but could be used to create wetlands if capped with a minimum of 3 feet of " wetland cover" quality material; (2) contaminated material suitable for use as construction fill; or (3) more contaminated material that would require disposal at a landfill. Preferred Alternative F2 evaluated a reuse/disposal scenario that included up to 1.5 mcy of wetland non-cover material used as confined fill for the MHEA, up to 0.5 mcy of contaminated material used as construction

fill at the Vision 2000 Upland area, and up to 0.1 mcy of the most contaminated material disposed of at landfills. The FEIS/R studied the impacts of all of these disposal and reuse options.

In the nine months since the FEIS/R was completed, developments have occurred that affect the identification of the "Selected Alternative." First, the project sponsors have decided to include an alternative in which dredged material is reused at both the Hamilton and Montezuma wetland restoration projects, rather than at only one or the other site, assuming both reuse sites are ready to accept material from the 50-foot Project at the required time. This approach maximizes potential habitat benefits by supporting the initial development of tidal and seasonal wetland habitats at two locations, and improves the flexibility of the construction process.

Second, the sediment testing has continued and the improved sediment characterization data have revealed that of the 12.8 mcy proposed to be dredged, no more than 0.7 mcy (rather than 2.1 mcy) may consist of wetland non-cover and contaminated material. The project sponsors believe that this 0.7 mcy figure remains a conservative estimate of the actual volume.

Third, after consultation with regulatory agencies and environmental organizations, the project sponsors have decided that although reuse of wetland non-cover material to fill the MHEA poses no threat of environmental harm, this material shall not be reused at that site. This means that the wetland non-cover material originally proposed for reuse at the MHEA must now be placed at one or more of several alternate locations, including Montezuma (if permitted to accept this material), Vision 2000 Upland, or Various Landfills.

Fourth, the project sponsors have determined that it may be necessary to send more than 100,000 cy of the contaminated material to landfills. While it currently appears that the existing reuse/disposal sites will be able to accept all but 100,000 cy of the most contaminated material, some uncertainties remain. These uncertainties include the ultimate availability of the Montezuma project to accept wetland non-cover material, and the ability to coordinate reuse of the dredged material from the 50-foot Project with the development of the Vision 2000 area. Thus, by analyzing the disposal of up to 700,000 cy at a landfill, the potential worst case impacts associated with landfill disposal will have been evaluated.

Finally, the construction timing may also affect the location of the rehandling facility for dredged sediment requiring upland reuse or disposal. The FEIS/R indicated that the rehandling facility would be located at the Berth 55 Fill Area (on newly-created fastland). Since then, it has become apparent that the currently used and permitted Berth 10 rehandling facility constructed by the Port of Oakland for a prior terminal construction project, may also be available to the 50-foot Project. The Berth 10 rehandling facility has a capacity of 30,000 cy in two 15,000 cy cells, compared to the 100,000 cy rehandling facility that would constructed at the Berth 55 Fill Area. If the Berth 10 rehandling facility is used, the duration of rehandling activities would increase, and traffic and equipment use patterns would change relative to the Berth 55 Fill Area rehandling facility analyzed in detail in the FEIS/R. The supplemental analysis for the Berth 10 rehandling facility is reflected in the analyses conducted as part of this Information Report.

With these considerations in mind, the project sponsors have identified two new project alternatives to be added to the 15 project alternatives identified in the FEIS/R. The new alternatives are F10 and F11 (numbered to follow the last Option F alternative identified in the FEIS/R, Alternative F9). The sediment distribution for the two new alternatives is shown below.

*Alternative F10*

7.0 mcy to MHEA
2.5 mcy to Hamilton (minimum)
2.9 mcy to Montezuma (including 0.3 mcy of non-cover quality material)
0.4 mcy to Various Landfills (all contaminated material) *or* 0.1 mcy to Various Landfills and 0.3 mcy to Vision 2000 Upland
12.8 mcy Total

Alternative F10 corresponds to the Locally-Preferred Plan (LPP)/Selected Plan presented in the Final Revised Feasibility Study for the proposed Project (SAIC and Port of Oakland, 1999).

*Alternative F11*

7.0 mcy to MHEA
5.1 mcy to the ocean
0.7 mcy to Various Landfills
12.8 mcy Total

Alternative F11 represents the least-cost alternative.

Finally, under all alternatives (including new Alternative F10) that include the reuse of clean dredged material at Hamilton or Montezuma, it is possible that if Hamilton and/or Montezuma are not available at the appropriate time, some of the clean dredged material would be stockpiled at the former NAS Alameda for reuse in future development there. The impacts of transporting dredged material to NAS Alameda were studied in the FEIS/R for the 50-foot Project and are not reanalyzed here.

## 3.0 SUPPLEMENTAL ANALYSIS

The corrections, updates, and new Alternatives described above merit supplemental discussion of certain aspects of Air Quality, Ballast Water, Biology, Cultural Resources, Hazardous Materials and Contaminated Wastes , Hydrology, Noise, and Transportation impacts. No other resource areas addressed in the 50-foot Project FEIS/R are affected by these changes.

### 3.1 Air Quality

Revised calculations of emissions from construction activities for each of the alternatives analyzed in the FEIS/R, plus calculations of emissions from construction activities for the two additional alternatives described in this document, are presented in Table 1. The mitigated emissions shown in this table are based on the mitigation measures described in section 5.1 (Volume II) of the FEIS/R.

Emissions from previously identified alternatives have been recalculated because assumptions regarding emissions from tugs have been refined since publication of the FEIS/R. In addition, two project alternatives have been added that may result in 400,000 to 700,000 cy of dredged material being trucked to landfills, as opposed the 100,000 cy studied in the FEIS/R. In all cases, emissions from the previously studied alternatives (Alternatives F1 through F9 and B1 through B6) are lower than reported in the FEIS/R. The FEIS/R's conclusion that emissions from construction activities will be less than significant remains unchanged.

**Table 1. Summary of Total Bay Area Air Basin Emissions Associated with Each Alternative**

| | EMISSIONS (TOTAL TONS DURING PROJECT CONSTRUCTION PERIOD) | | | | | |
|---|---|---|---|---|---|---|
| *Alternative* | *ROG* | *CO* | *$NO_x$* | *$SO_2$* | *$PM_{10}$* | *TOTAL* |
| **B1** | 23.3 | 61.1 | 188.6 | 4.3 | 15.9 | 293.2 |
| **B2** | 22.1 | 61.3 | 166.0 | 3.9 | 13.5 | 266.8 |
| **B3** | 23.8 | 64.4 | 181.7 | 4.2 | 15.0 | 289.2 |
| **B4** | 30.8 | 74.1 | 267.9 | 5.9 | 23.3 | 402.1 |
| **B5** | 24.0 | 65.4 | 181.4 | 4.2 | 14.9 | 290.1 |
| **B6** | 25.4 | 65.2 | 208.8 | 4.7 | 17.7 | 321.9 |
| **F1** | 25.5 | 63.7 | 220.0 | 4.9 | 19.0 | 333.1 |
| **F2** | 23.8 | 64.0 | 187.7 | 4.3 | 15.7 | 295.5 |
| **F3** | 26.2 | 68.5 | 210.1 | 4.8 | 17.7 | 327.4 |
| **F4** | 20.1 | 54.9 | 160.8 | 3.8 | 13.4 | 252.9 |
| **F5** | 19.2 | 55.0 | 144.0 | 3.4 | 11.6 | 233.4 |
| **F6** | 24.1 | 67.7 | 186.0 | 4.3 | 15.5 | 297.5 |
| **F7** | 23.0 | 67.8 | 166.1 | 4.0 | 13.4 | 274.4 |
| **F8** | 17.9 | 47.2 | 144.0 | 3.3 | 12.0 | 224.5 |
| **F9** | 19.8 | 55.9 | 152.3 | 3.6 | 12.5 | 244.0 |
| **F10** | 29.5 | 96.2 | 262.1 | 6.6 | 21.5 | 415.9 |
| **F11** | 34.5 | 127.2 | 344.0 | 9.0 | 28.1 | 542.8 |

*Tug Emissions*

Construction emissions for each alternative have been recalculated based on refined information about the following: (1) tugboat load factors, (2) loaded and unloaded travel time to and from the dredged material disposal/reuse locations, (3) tugboat horsepower size required for the various disposal/reuse destinations, and (4) scow capacity for the various disposal/reuse locations.

The FEIS/R calculated tug emissions based on a load factor of 80 percent regardless of whether the barge was loaded or unloaded. The revised calculations correct this assumption to reflect an 80 percent load factor when the barge is loaded and a 20 percent load factor when the barge is unloaded. The revised calculations also reflect the fact that the barge loads must now be smaller than previously assumed (to address overflow concerns) so that there will be more barge trips, and the engine size for tugs traveling to SF-DODS will increase from 1,800 hp to 3,000 hp. The revised data is provided in Table 2. Table 2 also shows, by destination, the number of trips that would be required for a given amount of dredged material.

*Landfill Volumes*

Disposal of 400,000 to 700,000 cy of dredged material (under Alternatives F10 and F11, respectively) at the Altamont, Redwood, or Vasco Road landfill would produce more emissions than disposal of 100,000 cy of dredged material at the same landfills. The increase in emissions would not be in direct proportion to the amount of material disposed because of changes in operating conditions and processing times assumed for the rehandling facility since the time of the FEIS/R preparation. In particular:

- Larger 20–cy end-dump trucks would be used;
- The number of truck trips would be 75 per day (on average during the times when sediment is being off-hauled);
- The facility hours of operation would increase from 6 hours per day to 10 hours per day;
- The number of days of facility operation may increase from 334 to up to 1075 days to account for days when material drying would be the only activity occurring; and
- The number of days that trucks would be hauling material to the landfill may increase to up to 467 days.

Tables 3 and 4 show comparisons between the equipment and time involved in this new scenario compared to that studied in the FEIS/R.

*Summary*

As shown on Table 1, the estimated emissions for NOx, ROGs, and CO are less than 400 tons each for the entire construction period. The total project duration is estimated to be 4 to 5 years. Thus, the project construction would be phased so that emissions of each pollutant remain below the conformity threshold of 100 tons per year.

For the operations phase of the project, air quality impacts of Alternatives F10 and F11 would be the same as the impacts of the 15 alternatives previously studied.

**Table 2. Distribution of Dredge Material, Trips, Load Factors, and Travel Time Allocations**

| *Dredge Site/ Disposal Site* | *Total Quantity (mcy)* | *No. of Scow Trips* | *Travel Time To* | *Travel Time From* | *Idle Time/ Trip* | *Composite Tugboat Load Factor (a)* | *Scow Size* | *Loading Capacity* | *Cubic Yards/ Scow (b)* | *Tugboat HP* |
|---|---|---|---|---|---|---|---|---|---|---|
| Outer Harbor/ Hamilton | 5.2 | 1,444 | 3 hours (c) | 2 hours (d) | 1.5 hours | 0.44 | 5,000 cy | 0.9 | 3,600 | 1,800 |
| Outer Harbor/ Montezuma | 5.2 | 1,444 | 4 hours (e) | 3 hours (f) | 1.5 hours | 0.46 | 5,000 cy | 0.9 | 3,600 | 1,800 |
| Outer Harbor/ SF-DODS | 6.9 | 2,156 | 12 hours (g) | 8.5 hours (h) | 0.5 hour | 0.54 | 5,000 cy | 0.8 | 3,200 | 3,000 |
| Inner Harbor/ Vision 2000 Site | 2.6 | 722 | 0.3 hours (i) | 0.2 hours (j) | 1.0 hour | 0.22 | 5,000 cy | 0.9 | 3,600 | 800 |
| Outer Harbor/ New Berth 21 | 1.165 | 324 | 0.3 hours (i) | 0.2 hours (j) | 1.0 hour | 0.22 | 5,000 cy | 0.9 | 3,600 | 800 |
| Inner Harbor/ MHEA | 1.0 | 278 | 0.4 hours (k) | 0.3 hours (l) | 1.0 hour | 0.25 | 5,000 cy | 0.9 | 3,600 | 800 |
| Outer Harbor/ MHEA | 0.583 | 162 | 0.4 hours (k) | 0.3 hours (l) | 1.0 hour | 0.25 | 5,000 cy | 0.9 | 3,600 | 800 |

*Notes:*
(a) Composite load factor based on the following load factors: 0.8 (loaded scow), 0.2 (empty scow), and 0.05 (idle).
(b) Assumes scow load is 20% water; so at a loading capacity of 90%, a 5,000-cy capacity scow carries 3,600 cy: e.g., 0.9 x 5,000 cy x 0.8 = 3,600 cy.
(c) 16 nmi. @ 7 knots
(d) 16 nmi. @ 9 knots
(e) 27 nmi. @ 7 knots
(f) 27 nmi. @ 9 knots
(g) 58 nmi. @ 5 knots
(h) 58 nmi. @ 7 knots
(i) 1 nmi. @ 3.3 knots
(j) 1 nmi. @ 5 knots
(k) 1.5 nmi. @ 3.75 knots
(l) 1.5 nmi. @ 5 knots

**Table 3. Port of Oakland 50-Foot Deepening Project (Final EIS/R Assumptions) Emission Source Data Associated with Handling and Transport of Material to Landfill Handling and Transport of Material (100,000 cy) to Landfill (b)**

| | *Horse Power (Hp)* | *Load Factor* | *Number Active* | *Fuel Use (Gal/Hr)* | *Hours Per Day* | *Work Days (a)* | *Total Fuel Usage* |
|---|---|---|---|---|---|---|---|
| *Activity/Equipment Type* | | | | | | | |
| D-8 Bulldozer | 300 | 0.50 | 1 | 9.90 | 6 | 334 | 19,840 |
| Loader | 300 | 0.50 | 2 | 19.80 | 6 | 334 | 39,679 |
| End-Dump Truck (10-12 cy) | 220 | 0.50 | 10 | 72.60 | 6 | 334 | 145,490 |

*Note:* a Work days for transport based on the use of 10 trucks per day, 3 trips per truck per day, and 10 cy per trip.
b Contaminated material will be hauled to either the Altamont, Redwood, or Vasco Road landfill. Since each of these landfills is approximately the same distance from the rehandling facility (approximately 35 miles), the transport emissions are expected to be the same regardless of which location is used.

**Table 4. Port of Oakland 50-Foot Deepening Project (Final EIS/R Assumptions) Emission Source Data Associated with Handling and Transport of Material to Landfill Handling and Transport of Material (700,000 cy) to Landfill (b)**

| | *Horse Power (Hp)* | *Load Factor* | *Number Active* | *Fuel Use (Gal/Hr)* | *Hours Per Day* | *Work Days (a)* | *Total Fuel Usage* |
|---|---|---|---|---|---|---|---|
| *Activity/Equipment Type* | | | | | | | |
| D-8 Bulldozer | 300 | 0.50 | 1 | 9.90 | 6 | 1075 | 63,856 |
| Loader | 300 | 0.50 | 2 | 19.80 | 10 | 467 | 92,466 |
| End-Dump Truck (10-12 cy) | 220 | 0.50 | 10 | 247.5 | 10 | 467 | 1,155,825 |

*Note:* a Work days for bulldozer based on total number of days to fill, dry, and empty 700,000 cy in the two cells at the rehandling facility. Work days for transport based on the use of 25 trucks per day, 3 trips per truck per day, and 20 cy per trip.
b Contaminated material will be hauled to either the Altamont, Redwood, or Vasco Road landfill. Since each of these landfills is approximately the same distance from the rehandling facility (approximately 35 miles), the transport emissions are expected to be the same regardless of which location is used.

### 3.2 Biology

The increase of landfill disposal from 100,000 cy to 400,000 or 700,000 cy, as described in Alternatives F10 and F11, would not affect biological resources. The material would be taken to existing landfills where sensitive species or habitats would not be affected. Consistent with the evaluation presented in the 50-foot Project FEIS/R, biological impacts from landfill disposal of dredged material would remain insignificant.

Alternative F10 includes the reuse of dredged material at both the Hamilton and Montezuma wetland restoration sites, whereas the FEIS/R alternatives included one or the other, but not both. This new alternative uses volumes of sediment within the ranges previously evaluated in the FEIS/R, although not with the two project sites in combination. The success of both projects depends on a reliable source of sediment so that restoration can be planned and carried out in a timely manner. Assuming both restoration/disposal projects are permitted and available for use concurrent with the Port's need for disposal sites, the Port's use of both sites in combination would have added benefits by facilitating restoration efforts at both sites, rather than at one to the exclusion of the other. In this respect, relative to other alternatives evaluated in the FEIS/R, F10 would maximize the beneficial reuse of dredged materials for the restoration of tidal and seasonal wetlands and subtidal eelgrass habitat.

### 3.3 Cultural Resources

In May 1998, when the FEIS/R was issued, it had not yet been determined that Todd Shipyard, located on Alameda Island, was eligible for listing on the National Register of Historic Places and, therefore, the California Register of Historic Resources. At that time, however, the possibility that Todd Shipyard was eligible had arisen. Therefore, the FEIS/R addressed the possibility that the Todd Shipyard was NRHP/CRHR eligible.

The FEIS/R also considered the possibility that the Inner Harbor Turning Basin expansion proposed as part of the 50-foot Project would remove structures from Todd Shipyard, and the possibility that those removals would significantly impact the shipyard. The FEIS/R recommended the following mitigation measures in the event that a significant impact were found:

> Mitigation measures for the potentially NRHP-eligible Todd Shipyard would include consultation with the Pacific Coast Great Basin Systems Support Office, National Park Service, San Francisco, prior to the demolition of any contributory structures to determine an appropriate level of recordation and documentation. At a minimum, documentation and recordation would meet the standards of the Historic American Building Survey/Historic American Building Record (HABS/HAER). Relocation of buildings to other locations within the shipyard would also be considered in consultation with the property owners. Treatment measures would be formalized in a Memorandum of Agreement among the Corps (San Francisco District), the California State Historic Preservation Officer, and the Advisory Council on Historic Preservation.

Since the FEIS/R was released, the State Historic Preservation Officer (SHPO) has determined that Todd Shipyard is eligible for listing on the NRHP and CRHR as the "Todd Shipyard Historic District." Twenty-four buildings and structures, four of which do not contribute to the shipyard's historic significance, are situated in the District.

Continuing design studies indicate that the 50-foot Project would affect either four or five contributing buildings and structures (rather than the six reported in the FEIS/R) and one, rather than two, non-contributing structures. Because design work has not yet been completed (the ship simulation studies that will determine the minimum required size of the inner harbor turning basin are currently in progress), the project sponsors have not yet determined whether the 50-foot Project would cause a significant impact on the Todd Shipyard Historic District. Therefore, this impact is treated as potentially significant and the project sponsors are pursuing the following mitigation measures:

- Replacement of the ship repair working space (consisting of approximately 1200 feet of linear space with adjoining deep water) that would be eliminated by the 50-foot Project, so that ship repair operations could continue at the District;
- Consideration of relocation of buildings to other locations within the District, which would depend on the agreement of property owners and the physical condition of the buildings;
- Documentation and recordation of affected portions of the District; and
- Execution of a Memorandum of Agreement for treatment measures, to be entered into between the Corps, SHPO and the Advisory Council on Historic Preservation.

### 3.4 Hazardous Materials and Contaminated Wastes

The only new potential hazards arise from the increased volume of dredged material to be hauled to a landfill. This material will require drying prior to being off-hauled. The potential impacts associated with the increased volume of material to be dried and off-hauled are described below.

*Exposure of the Public*

As described in Appendix Q of the FEIS/R (Volume II), potential exposures to all receptors except rehandling facility workers were evaluated assuming a 4-year exposure duration. This 4-year duration was based on the entire duration of the project, instead of the actual period of time that sediment would most likely be transported. Based on the current information, the transport of contaminated sediments would occur over a period of approximately 3 years, rather than the 4 years evaluated in the FEIS/R. During this time, there would be a very slight risk of spills of contaminated sediments if the trucks carrying the materials are involved in an accident. The FEIS/R evaluated the potential risk associated with this type of release, and concluded that the potential impact was less than significant. The potential impact remains less than significant even if the quantity transported to a landfill increases from 100,000 cy to 400,000 or 700,000 cy.

*Exposure of Workers*

The increased transport of material to a landfill would increase the duration of exposure for workers handling the material (i.e., rehandling facility workers and truck drivers hauling the material to the landfill). The FEIS/R evaluated potential exposures to truck drivers assuming a 4-year exposure duration, thus the increase in sediment rehandling would not affect the potential exposures to truck drivers. The only change in exposure assumptions resulting from the increase in the quantity of dredged material off-hauled to a landfill is the change in exposure duration for rehandling facility workers. The calculations in Appendix Q assumed that 100,000 cy of dredged material would be transferred through a rehandling facility. The estimated duration of these rehandling activities was up to 6 months. The currently proposed scenarios assume that 400,000 to 700,000 cy of dredged sediment would be transferred through the rehandling facility. This increase in dredged material requiring rehandling increases the duration of rehandling activities to as much as 3 years. (The increase in sediment rehandling

does not correlate directly with the time required to process 100,000 cy because the overall rate of transfer of material through the rehandling facility has increased slightly.)

Because the previous analysis assumed that the most contaminated material would be transferred through the rehandling facility, the increase in dredged material rehandling duration has only a very small impact on the overall risk to rehandling facility workers. As stated in Appendix Q, if the worst-case material from the Inner Harbor turning basin remains in the rehandling facility for more than 90 days, a potentially significant impact could result. The current information indicates that the longest period that the most-contaminated material would remain in the rehandling facility is 75 days. This estimate is based on the total quantity of the most contaminated material (20,000 - 30,000 cy; EVS 1998) and the estimated cycle time for both cells in the rehandling facility. Thus, the potential risks associated with handling the most contaminated material are less than significant due to the small quantity of the material.

The potential risk associated with other sources of dredged material increases linearly with the duration of rehandling activities; thus, for the duration proposed, the potential risk increases by a factor of 3.0 compared to that calculated in Appendix Q. A 3-fold increase in potential risk to rehandling facility workers could result in the cumulative risk for the duration of the dredging activity potentially slightly exceeding $1 \times 10^{-6}$. The potential impacts can be mitigated to less than significant using the mitigation measures described in Appendices Q and R of the FEIS/R. No new mitigation measures are required.

### 3.5 Hydrology

Water quality impacts might, absent mitigation, be affected by the increase in landfill disposal to between 400,000 and 700,000 cy. This increase would increase the use of the Berth 10 rehandling facility, as described under "Hazardous Materials and Contaminated Waste" above. However, the permit for the Berth 10 rehandling facility contains mitigations that address water quality concerns. Implementation of these mitigations makes use of the facility acceptable to regulatory agencies and would ensure that extended use of the Berth 10 facility would not cause any significant water quality impact.

The mitigation measures that were identified for the rehandling facility at the Berth 55 Fill Area would apply as long as that facility is in use. There would be no new impacts as a result of increasing the volume of material transferred through the rehandling facility.

### 3.6 Noise

The analysis of construction noise for the 50-foot Project has been updated to reflect the following six changes that have occurred since the FEIS/R was completed. First, electric dredges, originally recommended as mitigation measures, are now proposed as part of the project itself. Second, a better understanding of the use of tender boats and tugs associated with dredges, along with direct measurement of tender boat noise, has led to adjustments in the projections of noise from dredging activities. Third, the changes in tug sizes, load factors, and trip distribution for transportation of dredged material to Hamilton, Montezuma, and SF-DODS, described above under Air Quality, have been considered, but do not significantly affect projected noise levels. Fourth, the proposed increase in the off-haul of contaminated dredged material to landfills would not increase daily truck trips or the associated noise effects. Fifth, the former NAS Alameda Officers Housing was unoccupied at the time of the original noise analysis. Some of the homes have since become occupied. Accordingly, noise measurements have been taken at the Officers Housing to reflect current ambient noise conditions. Sixth, the Port's noise analysis for the proposed Berths 55-58 Project employed several assumptions and methodologies that differed from those used in the 50-foot Project FEIS/R. The noise analysis for the 50-foot Project has been brought into conformity with the Berths 55-58 Project noise

analysis in the following areas: (1) barrier attenuation from the Cypress Freeway and associated soundwalls has been reduced to 6 dBA from the 15 dBA used in the 50-foot FEIS/R, increasing the noise that is assumed to reach West Oakland; and (2) pile driving noise is now estimated in $L_{eq}$ as well as $L_{max}$, allowing more direct comparison of pile driving noise to Oakland Noise Ordinance standards. Figure 1 shows the noise sensitive receptors.

*Project Impacts*

As a result of the changes in the project as well as updated adjustment factors and ambient noise levels, the project noise analysis for construction has been revised (see Table 5). These revisions show that construction noise from the 50-foot Project still would have no significant noise impact in West Oakland or on Yerba Buena Island.

The revisions also show that significant impacts on Alameda Island, as measured under Oakland Noise Ordinance standards, would be reduced, and those that did occur would require less mitigation to reach a less-than-significant level, than was reported in the FEIS/R. Thus the sensitive receptors requiring mitigation would be the Mosley Avenue neighborhood (Coast Guard Housing) which requires mitigation of pile-driving noise emanating from the Alameda Gateway vicinity on the south side of the Inner Harbor Turning Basin. As measured by the Oakland Noise Ordinance standards, no significant noise impacts would remain after mitigation. This is a change from the FEIS/R, which reported that impacts at four to eight residential units on Mosley Avenue would remain significant after mitigation. Construction noise impacts on Alameda would remain significant and unmitigable only because dredging is proposed to occur at hours that conflict with the City of Alameda Noise Ordinance.

*Cumulative Impacts*

The cumulative impacts analysis has been revised to take into account both the changes in the 50-foot Project noise analysis and the most recent information regarding construction noise from the proposed Berths 55-58 and Joint Intermodal Terminal (JIT) projects (See Table 6). In West Oakland, cumulative noise levels would exceed daytime weekend and nighttime standards. These exceedances are attributable to the JIT project, which is the closest to the West Oakland neighborhood. Implementation of the noise control measures that will be recommended in the JIT EIR (in progress; Draft EIR expected to be released in March 1999) would reduce the combined noise levels sufficiently to comply with Oakland noise standards.

In Alameda, the mitigation of pile-driving noise on the south side of the Inner Harbor Turning Basin, described above, will avoid any significant cumulative impact at Mosley Avenue or the Former NAS Alameda Officers Housing.

The Enlisted Bachelors Housing at former NAS Alameda is currently unoccupied. If that housing becomes occupied for residential uses by the time construction would begin, mitigation may be required to avoid a significant cumulative impact. On weekend days, mitigation consisting of controls on pile-driving noise on the south side of the Inner Harbor Turning Basin (part of the 50-foot Project); controls on earth-moving equipment and pile drivers for the proposed Berths 55-58 Project, and controls on bulldozer noise at the potential former NAS Alameda stockpile site would be more than sufficient to mitigate cumulative impacts to less than significant. At night, noise controls on earth-moving equipment and pile drivers for the Berths 55-58 Project would be more than sufficient to avoid any cumulative impact at the Enlisted Bachelors Housing.

Thus, the changes in assumptions and analytical methods set forth here result in little change from the results set forth in the FEIS/R, but demonstrate that several noise impacts from construction are less significant than previously reported.

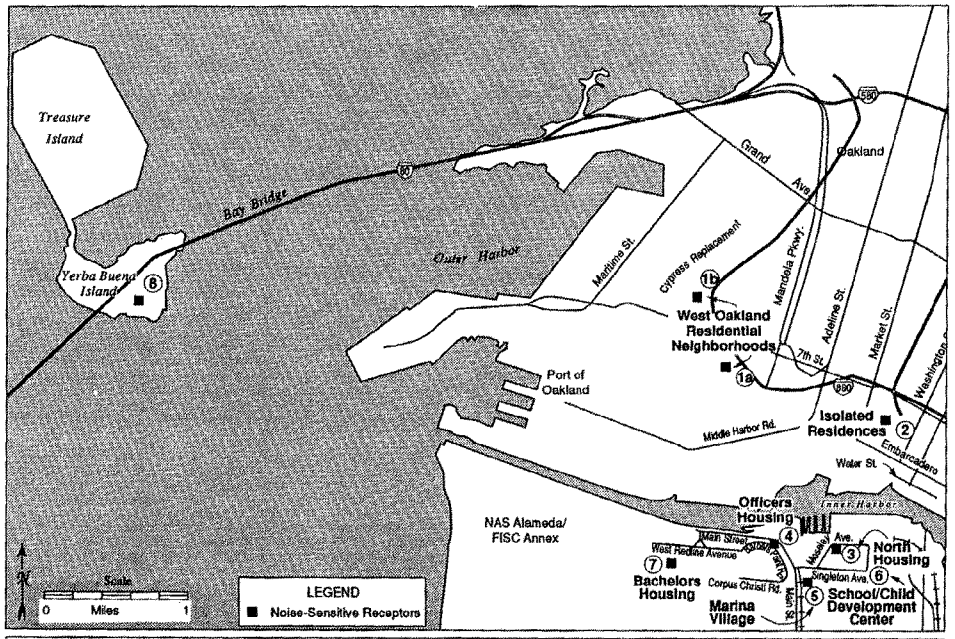



**Figure 1**

**OAKLAND AND ALAMEDA NOISE-SENSITIVE RECEPTORS**

**Table 5. Summary of Project Constru .oise Levels at Sensitive Noise Receptors**

| Receptor Location | Time Period | Highest Noise Level at Receptor due to Project: Inner Harbor Turning Basin | Inner Harbor | Middle Harbor Enhance. Area | Outer Harbor | Alameda Cons. Fill | Combined Noise Level (Without Mit.) | Combined Noise Level (With Mitigation) | Oakland Noise Ordinance Standard | Exceeds Standards Standards After Mitigation? |
|---|---|---|---|---|---|---|---|---|---|---|
| #1a-3rd & Peralta Neighborhood (Oakland) | Weekday Day | 42 | 26 | 25 | 27 | - | 42 | 42 | 65 | No |
| | Weekend Day | 42 | 26 | 25 | 27 | - | 42 | 42 | 55 | No |
| | Nighttime | 26 | 26 | 25 | 27 | - | 31 | 31 | 52 | No |
| #1b - 8th & Pine Neighborhood (Oakland) | Weekday Day | 27 | 13 | 19 | 34 | - | 36 | 36 | 65 | No |
| | Weekend Day | 27 | 13 | 19 | 34 | - | 36 | 36 | 55 | No |
| | Nighttime | 11 | 13 | 19 | 34 | - | 33 | 33 | 52 | No |
| #2 - Brush & 4th Vicinity (Oakland) | Weekday Day | 48 | 31 | - | - | - | 48 | 48 | 65 | No |
| | Weekend Day | 48 | 31 | - | - | - | 48 | 48 | 55 | No |
| | Nighttime | 32 | 31 | - | - | - | 34 | 34 | 52 | No |
| #3 - North Housing on Mosley (Alameda) | Weekday Day | 66 | 39 | - | - | 32 | 66 | 65 | 65 | No |
| | Weekend Day | 66 | 39 | - | - | 32 | 66 | 53 | 55 | No |
| | Nighttime | 50 | 39 | - | - | 32 | 50 | 50 | 52 | No |
| #4 - NAS Alameda - Officers Housing | Weekday Day | 63 | 55 | 19 | - | 44 | 64 | 63 | 65 | No |
| | Weekend Day | 63 | 55 | 19 | - | 44 | 64 | 55 | 55 | No |
| | Nighttime | 46 | 51 | 19 | - | 0 | 52 | 52 | 55 | No |
| #5 - Marina Village (Alameda) | Weekday Day | 63 | 33 | - | - | 32 | 54 | 54 | 65 | No |
| | Weekend Day | 63 | 33 | - | - | 32 | 54 | 54 | 55 | No |
| | Nighttime | 37 | 33 | - | - | 0 | 39 | 39 | 52 | No |
| #6 - Miller School & Child Dev. Center (Alameda) | Weekday Day | 53 | 32 | - | - | 24 | 53 | 53 | 65 | No |
| | Weekend Day | 53 | 32 | - | - | 24 | 53 | 53 | 55 | n/a |
| | Nighttime | 37 | 32 | - | - | 24 | 38 | 38 | 52 | n/a |
| #7 - NAS Alameda - Bachelors Housing | Weekday Day | 44 | 42 | 27 | - | 54 | 55 | 55 | 65 | No |
| | Weekend Day | 44 | 42 | 27 | - | 54 | 55 | 55 | 55 | No |
| | Nighttime | 28 | 42 | 27 | - | 0 | 42 | 42 | 47 | No (a) |
| #8 - Yerba Buena Island (Alameda) | Weekday Day | - | - | - | 32 | - | 32 | 32 | 65 | No |
| | Weekend Day | - | - | - | 32 | - | 32 | 32 | 55 | No |
| | Nighttime | - | - | - | 32 | - | 32 | 32 | 45 | No |

Source: Geier & Geier Consulting, Inc. (1999)

Note: "-" Noise Level does not measurably contribute to combined noise level.

(a) The nighttime noise standard is based on ambient noise levels. At Bachelors Housing, which is currently unoccupied, the existing ambient noise level at night is 47 dBA. If Bachelors Housing becomes occupied, the ambient noise level is expected to increase.

**Table 6. Summary of Cumulative Const[illegible] Noise Levels at Sensitive Noise Receptors**

| Receptor Location | Time Period | Highest Noise Level at Receptor due to Project | | | | | | | | | Combined Noise Level (Without Mit.) | Combined Noise Level (With Mitigation) | Oakland Noise Ordinance Standard | Exceeds Standards Standards After Mitigation? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Inner Harbor Turning Basin | Berths 55-58 | FISCO Demolition | Inner Harbor | Middle Harbor Enhance. Area | Outer Harbor | New Berth 21 | JIT | Alameda Cons. Fill | | | | |
| #1a-3rd & Peralta Neighborhood (Oakland) | Weekday Day | 42 | 46 | 40 | 26 | 25 | 27 | 20 | 57 | - | 58 | 58 | 65 | No |
| | Weekend Day | 42 | 46 | 40 | 26 | 25 | 27 | 20 | 57 | - | 58 | 55 | 55 | No |
| | Nighttime | 26 | 46 | 0 | 26 | 25 | 27 | 20 | 57 | - | 57 | 52 | 52 | No |
| #1b - 8th & Pine Neighborhood (Oakland) | Weekday Day | 27 | 40 | 34 | 13 | 19 | 34 | 31 | 57 | - | 57 | 57 | 65 | No |
| | Weekend Day | 27 | 40 | 34 | 13 | 19 | 34 | 31 | 57 | - | 57 | 55 | 55 | No |
| | Nighttime | 11 | 40 | 0 | 13 | 19 | 34 | 31 | 57 | - | 57 | 52 | 52 | No |
| #2 - Brush & 4th Vicinity (Oakland) | Weekday Day | 48 | 28 | - | 31 | - | - | - | - | - | 48 | 48 | 65 | No |
| | Weekend Day | 48 | 28 | - | 31 | - | - | - | - | - | 48 | 48 | 55 | No |
| | Nighttime | 32 | 28 | - | 31 | - | - | - | - | - | 35 | 34 | 52 | No |
| #3 - North Housing on Mosley (Alameda) | Weekday Day | 66 | 40 | - | 39 | - | - | - | - | 32 | 66 | 65 | 65 | No |
| | Weekend Day | 66 | 40 | - | 39 | - | - | - | - | 32 | 66 | 54 | 55 | No |
| | Nighttime | 50 | 40 | - | 39 | - | - | - | - | 32 | 51 | 51 | 52 | No |
| #4 - NAS Alameda - Officers Housing | Weekday Day | 63 | 52 | - | 55 | 19 | - | - | - | 44 | 64 | 63 | 65 | No |
| | Weekend Day | 63 | 52 | - | 55 | 19 | - | - | - | 44 | 64 | 55 | 55 | No |
| | Nighttime | 46 | 52 | - | 51 | 19 | - | - | - | 0 | 56 | 53 | 55 | No |
| #5 - Marina Village (Alameda) | Weekday Day | 63 | 36 | - | 33 | - | - | - | - | 32 | 54 | 54 | 65 | No |
| | Weekend Day | 63 | 36 | - | 33 | - | - | - | - | 32 | 54 | 42 | 55 | No |
| | Nighttime | 37 | 36 | - | 33 | - | - | - | - | 0 | 41 | 39 | 52 | No |
| #6 - Miller School & Child Dev. Center (Alameda) | Weekday Day | 53 | 33 | | 32 | - | - | - | - | 24 | 53 | 53 | 65 | No |
| | Weekend Day | 53 | 33 | | 32 | - | - | - | - | 24 | 53 | 41 | 55 | n/a |
| | Nighttime | 37 | 33 | | 32 | - | - | - | - | 24 | 39 | 38 | 52 | n/a |
| #7 - NAS Alameda - Bachelors Housing | Weekday Day | 44 | 55 | 42 | 42 | 27 | - | - | - | 54 | 59 | 59 | 65 | No |
| | Weekend Day | 44 | 55 | 42 | 42 | 27 | - | - | - | 54 | 59 | 55 | 55 | No |
| | Nighttime | 28 | 55 | 0 | 42 | 27 | - | - | - | 0 | 57 | 47 | 47 | No (a) |
| #8 - Yerba Buena Island (Alameda) | Weekday Day | - | - | - | - | - | 32 | - | - | - | 32 | 32 | 65 | No |
| | Weekend Day | - | - | - | - | - | 32 | - | - | - | 32 | 32 | 55 | No |
| | Nighttime | - | - | - | - | - | 32 | - | - | - | 32 | 32 | 45 | No |

Source: Geier & Geier Consulting, Inc. (1999)

Note: "-" Noise Level does not measurably contribute to combined noise level.

(a) The nighttime noise standard is based on ambient noise levels. At Bachelors Housing, which is currently unoccupied, the existing ambient noise level at night is 47 dBA. If Bachelors Housing becomes occupied, the ambient noise level is expected to increase.

### 3.7 Transportation

*Ground Transportation*

Of the project changes described above in this report, only the changes that affect the volume of material going to the various landfills would affect ground transportation.

Increasing the volume of material that would be taken to a landfill would not increase daily traffic beyond that described in the FEIS/R (in fact, if the Berth 10 rehandling facility is used, daily truck trips would be greatly reduced), but would extend the duration of dredged material processing. For Alternative F10, material would be hauled intermittently over approximately 20 to 24 months. For Alternative F11, the hauling period would be extended to about 2.9 to 3.5 years. The traffic generated by material hauling operations would be limited by the throughput of the selected rehandling facility (either the Berth 10 rehandling facility or the proposed rehandling facility at the Berth 55 Fill Area). The total project impacts from construction activities would remain less than significant with mitigation.

The operations phase of Alternatives F10 and F11 would, like the previously studies alternatives, result in significant level-of-service (LOS) impacts at certain intersections. These impacts would be less than significant with the implementation of the mitigation measures previously identified in the FEIS/R. Cumulative LOS impacts on Bay Area freeways would be potentially significant. Although the project's contribution to those impacts would be minimal, this impact remains identified as significant and unmitigable.

*Vessel Transportation*

Impacts on vessel transportation from Alternatives F10 or F11 would remain unchanged from those originally analyzed in the FEIS/R.

### 3.8 Ballast Water

This revision to the ballast water analysis focuses on the assignment of vessel calls to the 50-foot project. The ballast water analysis in the 50-foot FEIS/R was based on the Port's estimate of increases in vessel calls associated with all of the Port's proposed new maritime projects as projected at the time the FEIS/R was published. Subsequently, the Port recognized that allocating all of the vessel calls to the 50-foot project was inconsistent with the container cargo allocation analysis[1] that formed the basis for other components of the project analysis. The container cargo allocation analysis was developed by Jordan, Woodman, Dobson (JWD 1997). The Port therefore retained JWD to expand their analysis to include vessel calls (JWD 1998). The JWD analysis estimated the vessel calls associated with each maritime project individually and cumulatively.

Table 7, below, shows the revised estimated ballast water discharge from the 50-foot Project if only the future vessels attributable to the 50-foot Project (JWD 1998) are included in the

---

[1] The container cargo allocation analysis was designed to distribute the total project container growth resulting from the 50-foot Project and the Vision 2000 projects among the three projects to allow accurate analysis of potential environmental impacts associated with each project individually.

**Table 7. Estimated Ballast Water Discharge (Metric Tons)[1]**

| *Vessel Capacity (TEUs)* | *Estimated Average Ballast Water Discharge per Ship Call* | *Fleet Mix in 1996 (Table 5.7-1)* | *Estimated Ballast Water Discharge in 1996* | *Fleet Mix w/o Project in 2010 (Table 8.3-4)* | *Estimated Ballast Water Discharge w/o Project in 2010* | *Fleet Mix w/ Project in 2010[2]* | *Estimated Ballast Water Discharge w/ Project in 2010* |
|---|---|---|---|---|---|---|---|
| Panamax Vessels | | | | | | | |
| <2,000 | 4,000 | 489 | 1,956,000 | 0 | 0 | 0 | 0 |
| 2,000-3,000 | 4,000 | 577 | 2,308,000 | 154 | 616,000 | 49 | 196,000 |
| 3,000-4,000 | 4,000 | 396 | 1,584,000 | 665 | 2,660,000 | 195 | 780,000 |
| Post-Panamax Vessels | | | | | | | |
| 4,000-5,000 | 1,000 | 119 | 119,000 | 205 | 205,000 | 243 | 243,000 |
| >5,000 | 1,000 | 49 | 49,000 | 0 | 0 | 486 | 486,000 |
| Total | | 1,630 | 6,016,000 | 1,024 | 3,481,000 | 973 | 1,705,000 |

1. This table assumes that all vessels calling at the Port of Oakland will discharge ballast water, whereas some vessels have the capability to transfer ballast water internally and typically do not discharge. The table does not distinguish between vessels that perform oceanic ballast water exchange from those that do not.
2. The number of vessel calls in this column is based on a total of 973 vessel calls for 2010 (see row #4 [dredging only scenario] and column E in Table A6 from the JWD Report [JWD 1998]) x the distribution of vessel calls by class size for 2010 (Table A2 from the JWD Report).

calculations. The other table numbers referenced in Table 7 refer to tables in the FEIS/R. Table 7 is a revision of Table 1 in FEIS/R Volume V, Appendix X, page X-8, line 32. Table 7 shows that the total estimated ballast water discharge in the year 2010 with the 50-foot Project would be 1,705,000 metric tons; this volume was reported as 3,256,000 metric tons in Table 1 in the ballast water analysis in the FEIS/R (Volume V, Appendix X, page X-8) when all the future ship calls attributable to all the Port's planned maritime projects were considered.

The remainder of the description of the ballast water issue, as contained in the FEIS/R (see Volume V, Appendix X, page X-6, line 22 through page X-11, line 10) still applies.

Using the JWD (1998) estimates of vessel calls, the Port estimates that implementation of the related Berths 55-58 project (without channel deepening) could increase the volume of ballast discharges associated with vessels calling on the Port by 5 percent over existing levels. The Port has proposed to mitigate the impacts of its Berths 55-58 project by adopting an ordinance requiring ships calling at Port facilities to conduct ballast water exchange at sea. This ordinance is modeled on a regulation currently in effect at the Port of Vancouver, Canada. By flushing ballast water from distant ports out of their ballast tanks in the open ocean, ships leave potentially invasive species in the ocean (to which they are not adapted, and in which they are unlikely to survive). The ships then enter the Port carrying seawater that is largely free of species likely to survive in nearshore and estuarine environments. The Port's proposed ordinance, like the Vancouver Order, requires oceanic ballast water exchange except when conditions would make such an exchange hazardous to a vessel or its crew; requires ships to provide records of their ballast water practices; and includes sanctions for noncompliance. The data collected under the ordinance would be public information and would, therefore, be available to the scientific community for further research.

The proposed ballast water ordinance would apply to all vessels calling at existing and future Port terminal facilities, not just the Berths 55-58 project terminals (Port of Oakland 1998). By reducing the volume of discharge of ballast water that originates from exotic nearshore and estuarine environments from *all* ships using the Port, this ordinance would go far beyond mitigating the 5 percent increase in ballast water volume that would result from the proposed Berths project.

## 4.0 CONCLUSIONS

As discussed in this Information Report, new, updated, and corrected information has become available since the completion of the FEIS/R for the 50-foot Project in May 1998. As a result the Port performed supplemental analysis to determine whether this information would result in a change in project impacts. Minor changes in impacts were identified. No new significant impacts were identified, and most potential impacts were shown to be reduced slightly. No new mitigation measures are required to address the changes identified since the completion of the FEIS/R.

## 5.0 REFERENCES


EVS. 1998. Comprehensive Final Sediment Analysis Report. Prepared by EVS Environmental Consultants. June.

JWD. 1998. *Container Movement Growth Scenario — Vision 2000 Developments through 2010.* Prepared by Jordan, Woodman, Dobson for the Port of Oakland. October 13.

Port of Oakland. 1998. *Berths 55-58 Project — Draft Environmental Impact Report.* SCH No. 97102076. Prepared by URS Greiner Woodward Clyde, Oakland, CA. December 11.

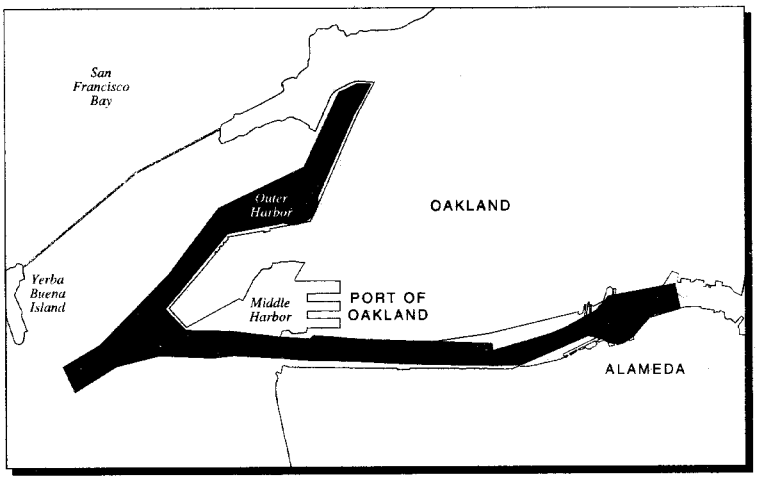
USACE and Port of Oakland. 1998. *Oakland Harbor Navigation Improvement (-50-Foot) Project — Final Environmental Impact Statement/Environmental Impact Report.* SCH No. 97072051. Prepared by Science Applications International Corporation, Santa Barbara, CA. May.

# Oakland Harbor Navigation Improvement (-50 Foot) Project

## Volume I:

## Final Revised Feasibility Study

SCH No. 97072051




*Prepared by*

**Port of Oakland**
State Lead Agency

*With Assistance from*

**U.S. Army Corps of Engineers**
**San Francisco District**
Federal Lead Agency

**FEBRUARY 1999**
**(WITH REVISIONS THROUGH APRIL 1999)**

## TABLE OF CONTENTS

1.0 INTRODUCTION ..... 38

1.1 STUDY AUTHORIZATION ..... 38

1.2 STUDY PURPOSE AND SCOPE ..... 39

1.3 LOCAL SPONSOR ..... 39
1.3.1 Study Participant ..... 39
1.3.2 Study Coordination ..... 39

1.4 PREVIOUS STUDIES ..... 40

1.5 PLANNING PROCESS OF THE CORPS OF ENGINEERS ..... 41

1.6 REPORT ORGANIZATION ..... 42

2.0 STUDY AREA DESCRIPTION ..... 43

2.1 DESCRIPTION OF THE STUDY AREA ..... 43
2.1.1 Harbor Location and Description ..... 43
2.1.2 Existing Navigation Project ..... 45
2.1.3 Population Centers ..... 50
2.1.4 Transportation ..... 50

2.2 ENVIRONMENTAL CONDITIONS ..... 52
2.2.1 Physical Conditions ..... 52
2.2.2 Biological Resources ..... 56
2.2.3 Socio-Economic Conditions ..... 58

3.0 PROBLEMS AND NEEDS ..... 61

3.1 GENERAL ..... 61

3.2 PUBLIC CONCERNS ..... 61

3.3 PROBLEMS AND OPPORTUNITIES ..... 62
3.3.1 Problem No. 1: Navigational Inefficiencies ..... 62
3.3.2 Problem No. 2: Navigational Safety ..... 64
3.3.3 Opportunity No. 1: Growth of Containerized Cargo ..... 65
3.3.4 Opportunity No. 2: Wetland Enhancement ..... 65
3.3.5 Opportunity No. 3: Creation of Shallow Water Habitat ..... 66

3.4 PLANNING OBJECTIVES ..... 66

3.5 PLANNING CONSTRAINTS ..... 67

4.0 PLAN FORMULATION ..... 68

4.1 OVERVIEW ..... 68

4.2 "WITHOUT PROJECT" PLAN ..... 68

4.3 CHANNEL COMPONENTS AND TURNING BASIN LOCATION ..... 69
4.3.1 Entrance Channel ..... 69
4.3.2 Outer Harbor Channel ..... 69
4.3.3 Inner Harbor Channel ..... 69
4.3.4 Navigation Considerations ..... 69
4.3.5 Outer Harbor Turning Basin ..... 74
4.3.6 Inner Harbor Turning Basin ..... 74

4.4 DREDGED MATERIAL ..... 75
4.4.1 Sediment Quality ..... 75
4.4.2 Dredged Material Reuse/Disposal Site Options ..... 76
4.4.3 Dredged Material Reuse/Disposal Sites Retained for Further Consideration ..... 82
4.4.4 Dredging Methods ..... 86

4.5 FORMULATION OF THE PLAN ..... 87
4.5.1 Plan A - "Without Project" Plan ..... 87
4.5.2 Plan B - Full Project Plan ..... 87
4.5.3 Plan C - Full Inner Harbor Improvements ..... 87
4.5.4 Plan D - Full Outer Harbor Improvements ..... 87
4.5.5 Plan E - Full Outer Harbor Improvements and Selected Inner Harbor Improvements ..... 89
4.5.6 Plan F - Selected Outer Harbor Improvements and Full Inner Harbor Improvements ..... 89

4.6 DREDGED MATERIAL REUSE/DISPOSAL SCENARIOS ..... 89
4.6.1 Scenario I: Habitat Reuse and Ocean Disposal ..... 90
4.6.2 Scenario II: Maximum Habitat Reuse ..... 90
4.6.3 Scenario III: Habitat Reuse with HWR ..... 90
4.6.4 Scenario IV: Habitat Reuse with MWP ..... 90
4.6.5 Scenario V: Ocean Disposal ..... 92
4.6.6 Scenario VI: Wetland Reuse ..... 92
4.6.7 Scenario VII: Wetland Reuse and Ocean Disposal ..... 92
4.6.8 Summary ..... 92

4.7 FINAL ARRAY OF ALTERNATIVE PLANS ..... 93

4.8 CHANNEL DEPTH DETERMINATION AND SENSITIVITY ANALYSIS ..... 93
4.8.1 Channel Depth Optimization ..... 95
4.8.2 Sensitivity Analysis ..... 95
4.8.3 Selected Channel Depth ..... 102

4.9 PLAN EVALUATION ..... 102
4.9.1 Effectiveness ..... 102
4.9.2 Efficiency ..... 103
4.9.3 Completeness ..... 103
4.9.4 Acceptability ..... 103

4.10 PLAN EVALUATION BY RESOURCE ACCOUNT ..... 104
4.10.1 National Economic Development (NED) Account ..... 104
4.10.2 Environmental Quality (EQ) Account ..... 105
4.10.3 Regional Economic Development (RED) Account ..... 105
4.10.4 Other Social Effects (OSE) Account ..... 106

5.0 SELECTED PLAN ..... 108

5.1 CONSIDERATIONS IN PLAN SELECTION ..... 108

5.2 DESCRIPTION OF THE PLANS ..... 112
5.2.1 General Design Considerations ..... 112
5.2.2 Channel Design ..... 112
5.2.3 Design Vessel ..... 112
5.2.4 Navigation Considerations for Channel Design ..... 118
5.2.5 Channel Side Slopes ..... 119
5.2.6 Design of Channels ..... 119
5.2.7 Local Service Facilities ..... 120
5.2.8 Reuse/Disposal Sites ..... 120

5.3 DREDGING PLAN ..... 122

5.4 OPERATIONS AND MAINTENANCE REQUIREMENTS ..... 124
5.4.1 Estimated Operations and Maintenance Dredging Quantities ..... 124
5.4.2 Capacity of Sites for Operation and Maintenance Dredging Material ..... 125
5.4.3 Operations and Maintenance During Construction ..... 125
5.4.4 Operations and Maintenance of Disposal/Reuse Sites ..... 126

5.5 PROJECT ECONOMICS ..... 126
5.5.1 Cost Estimate Assumptions ..... 127
5.5.2 Description of the NED and the Selected Plan ..... 133
5.5.3 Project Costs for the -45 Foot Plan ..... 133
5.5.4 Project Economic Benefits ..... 134
5.5.5 Calculation of Average Annual Cost ..... 136
5.5.6 Calculation of Net Benefit and Benefit to Cost Ratios ..... 136
5.5.7 Determination of NED Plan ..... 143
5.5.8 Cost Apportionment ..... 143
5.5.9 Cost Sharing Calculations ..... 145

5.6 REAL ESTATE REQUIREMENTS ..... 145

5.7 ENVIRONMENTAL IMPACTS ..... 149

5.8 MITIGATION PLANS/OTHER COMMITMENTS ..... 149

5.9 RISK AND UNCERTAINTY ..... 149

5.10 SELECTED PLAN ..... 150

5.11 PLAN IMPLEMENTATION ..... 151
5.11.1 Institutional Requirements ..... 151
5.11.2 Division of Responsibilities ..... 152

6.0 COORDINATION AND PUBLIC INVOLVEMENT ..... 155
6.1 PUBLIC MEETINGS, WORKSHOPS, AND REPORT CIRCULATION ..... 155
6.2 FEASIBILITY STUDY INVOLVEMENT ..... 155
6.3 CIRCULATION OF FEASIBILITY REPORT ..... 155
6.4 VIEWS OF THE LOCAL SPONSOR ..... 156

7.0 CONCLUSIONS AND RECOMMENDATIONS ..... 157

# APPENDICES

A. Engineering Report
- A.1 BART Tube Study
- A.2 Sewer Relocation Study
- A.3 Wharf Structural Capacity Study
- A.4 Hydrodynamic Study
- A.5 San Francisco Bar Pilots Squat Requirements
- A.6 -42' Project Turning Basin Ship Simulation Study
- A.7 Economic Model Results
- A.8 Economic Model Supporting Information
- A.9 Proposed Project Schedule
- A.10 Documentation of Local Sponsor's Ability to Pay
- A.11 Updated Sediment Testing Results

B. Cost Estimate and Optimization
- B.1 Supporting Information/Channel Design
- B.2 Estimate of Incremental Maintenance Dredging Quantities
- B.3 Cost Estimate Assumptions
- B.4 MCACES Summaries
- B.5 Interest During Construction
- B.6 Channel Depth Optimization Sensitivity Analysis
- B.7 Hamilton/Oakland Cost Estimate Comparison
- B.8 Cost-Share Allocation
- B.9 Cost Estimate for the -45 foot MLLW Project Increment

C. Real Estate Plan

D. Geotechnical Investigation

E. Hydrogeological Investigation

## FIGURES


2.1 PROJECT LOCATION ..... 44

2.2 PORT OF OAKLAND TERMINAL FACILITIES ..... 46

2.3 TYPICAL BERTHS AND CRANES ..... 47

2.4 EXISTING OAKLAND HARBOR NAVIGATION IMPROVEMENTS ..... 48

2.5 MAJOR FREEWAYS, PORTS, AND AIRPORTS ..... 51

3.1 EVOLUTION OF CONTAINER SHIPS ..... 63

4.1 OAKLAND OUTER HARBOR CONFIGURATION #1 ..... 70

4.2 OAKLAND OUTER HARBOR CONFIGURATION #2 ..... 71

4.3 OAKLAND INNER HARBOR ..... 72

4.4 POTENTIAL REUSE/DISPOSAL OPTIONS ..... 77

4.5 ACTION PLAN F ..... 94

4.6 NATIONAL ECONOMIC DEVELOPMENT PLAN OPTIMIZATION CURVE: SCENARIO I ..... 99

4.7 NATIONAL ECONOMIC DEVELOPMENT PLAN OPTIMIZATION CURVE: SCENARIO II ..... 100

4.8 NATIONAL ECONOMIC DEVELOPMENT PLAN OPTIMIZATION CURVE: SCENARIO V ..... 101

5.1-A DEEPENING AND WIDENING OF ENTRANCE CHANNEL ..... 113

5.1-B DEEPENING AND WIDENING OF INNER HARBOR CHANNEL ..... 115

5.1-C DEEPENING AND WIDENING OF OUTER HARBOR CHANNEL ..... 117

5.1-D DEEPENING AND WIDENING OF INNER TURNING BASIN ..... 119

5.1-E DEEPENING AND WIDENING OF OUTER TURNING BASIN ..... 121

## TABLES


4.1 SUMMARY OF DISPOSAL SITES ..... 79

4.2 SUMMARY OF EVALUATION AND SCREENING OF CHANNEL DESIGN OPTIONS CONSIDERED ..... 88

4.3 DREDGED MATERIAL REUSE/DISPOSAL COMBINATIONS CONSIDERED ..... 91

4.4-1 ANNUAL NET BENEFITS: SCENARIO I ..... 96

4.4-2 ANNUAL NET BENEFITS: SCENARIO II ..... 97

4.4-3 ANNUAL NET BENEFITS: SCENARIO V ..... 98

5.1 SUMMARY OF IMPACTS BY SYSTEM OF ACCOUNTS -- ACTION PLANS F-I, F-II, F-V, AND NO ACTION PLAN ..... 109

5.2-1 SUMMARY OF DREDGING VOLUMES AND FIRST COSTS: SCENARIO I ..... 130

5.2-2 SUMMARY OF DREDGING VOLUMES AND FIRST COSTS: SCENARIO II ..... 131

5.2-3 SUMMARY OF DREDGING VOLUMES AND FIRST COSTS: SCENARIO V ..... 132

5.3 AVERAGE ANNUAL BENEFITS ..... 135

5.4-1 AVERAGE ANNUAL COSTS: SCENARIO I ..... 137

5.4-2 AVERAGE ANNUAL COSTS: SCENARIO II ..... 138

5.4-3 AVERAGE ANNUAL COSTS: SCENARIO V ..... 139

5.5-1 ANNUAL NET BENEFITS: SCENARIO I ..... 140

5.5-2 ANNUAL NET BENEFITS: SCENARIO II ..... 141

5.5-3 ANNUAL NET BENEFITS: SCENARIO V ..... 142

5.6-1 COST SHARE ALLOCATION USING STANDARD ALLOCATION FORMULAS: SCENARIO I ..... 146

5.6-2 COST SHARE ALLOCATION USING STANDARD ALLOCATION FORMULAS: SCENARIO II ..... 147

5.6-3 COST SHARE ALLOCATION USING STANDARD ALLOCATION FORMULAS: SCENARIO V ..... 148

# OAKLAND INNER AND OUTER HARBORS
**Alameda and San Francisco Counties, California**

# REPORT ON THE FEASIBILITY STUDY FOR DEEP DRAFT IMPROVEMENTS

## 1.0 INTRODUCTION

### 1.1 STUDY AUTHORIZATION

This study has been prepared pursuant to the authority provided by the Congress of the United States through the Water Resources Development Act of 1986 (P.L. 99-662) §203 (§203 WRDA 86), which reads:

**SEC. 203 STUDIES OF PROJECTS BY NON-FEDERAL INTEREST**

1. Submission to Secretary.-A non-Federal interest may on its own undertake a Feasibility Study of a proposed harbor or inland harbor project and submit it to the Secretary. To assist non-Federal interests, the Secretary shall, as soon as practicable, promulgate guidelines for studies of harbors or inland harbors to provide sufficient information for the formulation of studies.

2. Review by Secretary.-The Secretary shall review each study submitted under subsection (a) for the purpose of determining whether such study and the process under which such study was developed comply with Federal laws and regulations applicable to Feasibility Studies of navigation projects for harbors or inland harbors.

3. Submission to Congress.-Not later than 180 days after receiving any study submitted under subsection (a), the Secretary shall transmit to the Congress, in writing, the results of such review and recommendations the Secretary may have concerning the project described in such plan and design.

4. Credit and Reimbursement.-If a project for which a study has been submitted under subsection (a) is authorized by any provision of Federal law enacted after the date of such submission, the Secretary shall credit toward the non-Federal share of the cost of construction of such project an amount equal to the portion of the cost of developing such study that would be the responsibility of the United States if such study were developed by the Secretary.

## 1.2 STUDY PURPOSE AND SCOPE

The purpose of this study is to evaluate the need for improved deep draft navigation channels in the Oakland Inner and Outer Harbors and to determine the solution that best serves related economic, physical, social and environmental considerations. Pursuant to Section 203 WRDA 86 and the implementation guidance contained in Engineering Regulation No. 1165-2-122 dated 26 August, 1991 (ER 1165-2-122), this study is directed at determining the extent of both the Federal and the non-Federal participation in improving the Oakland Harbor channels and at identifying the National Economic Development plan, which has the greatest net economic benefit consistent with protecting the Nation's environment.

## 1.3 LOCAL SPONSOR

The local sponsor for this Study is the Port of Oakland located in Oakland, California. This Study is being funded in its entirety by the Port of Oakland, which is conducting the Study consistent with § 203 WRDA 86. Study participants and coordination are described below.

### 1.3.1 Study Participants

The study participants are the Port of Oakland (Port) and the U.S. Army Corps of Engineers (Corps).

### 1.3.2 Study Coordination

This Study is being prepared pursuant to §203 WRDA 86. On September 23, 1996, the Port of Oakland (the local sponsor) and the Corps of Engineers signed a Memorandum of Agreement, prepared pursuant to the Intergovernmental Cooperation Act, providing for the Port to hire the Corps to prepare portions of the Feasibility Study. The Corps filed a Notice of Intent (NOI) to prepare an Environmental Impact Statement (EIS) for the study on July 16, 1997. The Port filed a Notice of Preparation (NOP) of an Environmental Impact Report (EIR) to comply with the California Environmental Quality Act on July 18, 1997. On August 5, 1997 the Port and the Corps conducted an EIS/R/FS scoping meeting to initiate the Feasibility phase of the study. The Notice of Availability for the Draft Environmental Impact Statement/Report on the Oakland Harbor Deep Draft Navigation Improvement Project was filed on February 13, 1998. The public comment period on the Draft EIS/R closed on March 30, 1998.

Because any new work could have water quality, air quality, and ocean water impacts, close coordination with Region 9 of the U.S. Environmental Protection Agency (EPA) is being conducted as per the Clean Water Act, the Clean Air Act and the Marine Protection, Research and Sanctuaries Act (MPRSA, "Ocean Dumping Act").

Coordination with the U.S. Fish and Wildlife Service (USFWS) was initiated in August 1997 when the Corps prepared and began to negotiate the scope of work to prepare the Coordination Act Report. USFWS provided a planning aid letter in January 1998. In May 1998, USFWS provided a Final Coordination Act Report. The Port and Corps have submitted a Section 7 Endangered Species Act Biological Assessment to the USFWS. A Draft Biological Opinion was released by USFWS in June 1998; a Final Biological Opinion is expected in October 1998.

Coordination with other agencies and the general public has also occurred at various points during study execution. Other agencies include the National Marine Fisheries Service, U.S. Coast Guard, California Department of Fish and Game, the California Coastal Conservancy, the San Francisco Bay Regional Water Quality Control Board (SFBRWQCB), the Bay Area Air Quality Management District, the San Francisco Bay Conservation and Development Commission (BCDC), the State Historic Preservation Officer (SHPO), Oakland Landmarks Preservation Board, City of Oakland, City of Alameda, U.S. Navy, U.S. Army, Oakland Base Reuse Authority (OBRA), Alameda Reuse and Redevelopment Authority (ARRA), San Francisco Bar Pilots Association, Alameda County Public Works Agency, and the East Bay Regional Parks District. Public coordination included inclusion of the Sierra Club, the Save San Francisco Bay Association, and the Golden Gate Audubon Society in the planning process.

A public hearing was held on March 4, 1998 to solicit comments on the Draft Feasibility Report and EIS/R, the results of which have been included in this revised final Feasibility Report and the final EIS/R.

## 1.4 PREVIOUS STUDIES

The Oakland Harbor has developed over a long period of time, with the Inner Harbor beginning in what was a natural estuary known as San Antonio Creek. The first Federal improvement was authorized by the Rivers and Harbors Act adopted 23 June 1874. The most recent improvements (dredging to -42 feet mean lower low water [MLLW]) were authorized by Section 202 of the Water Resources Development Act of 1986 (P.L. 99-662), and completed in July 1998. Some departures from the Project Document Plan on types of dredging equipment used, project cost, and plan for disposal of dredged material were described in a General Design Memorandum prepared by the San Francisco District Corps in June 1994.

In addition to studies specifically related to improvements to the Oakland Harbor, some of which are included as appendices to this FS or the accompanying final EIS/R, numerous reports have been prepared concerning San Francisco Bay. The major reports and legislative documents of interest to this study are listed below.

1. Hydrodynamic Evaluation for Oakland Inner Harbor Channel: Hartman Consulting Group - 1997.

2. Waterborne Commerce of the United States (1997) - These annual statistics on Pacific Coast ports show the cargo tonnage handled by the Port of Oakland.

3. San Francisco Bay Plan and Amendments: Bay Conservation and Development Commission - 1996.

4. Long-term Management Strategy (LTMS) for the Placement of Dredged Material in the San Francisco Bay Region, Draft Policy Environmental Impact Statement/Programmatic Environmental Impact Report: U.S. Environmental Protection Agency - 1996.

5. Waterborne Geophysical Surveys of the Oakland Inner and Outer Harbor: Pelagos - 1994.

6. Final Supplemental Environmental Impact Report/Environmental Impact Statement Oakland Harbor Deep Draft Navigation Improvement - 1994.

7. Oakland Harbor 42-foot Deep Draft Navigation Improvement Project General Design Memorandum - 1994.

8. Waterborne Geophysical Surveys of the Oakland Inner and Outer Harbor: John Chance - 1994 and Waterways Experiment Station - 1992.

9. Evaluation of Upland Disposal of Oakland Harbor, California, Sediment; Volume I: Turning Basin Sediments - 1992.

10. Ecological Evaluation of Proposed Dredged Material from Oakland Harbor Berthing Areas - 1992.

11. Long Term Management Strategy for Dredged Material Disposal in the San Francisco Bay Region - 1992.

12. Evaluation of Upland Disposal of Oakland Harbor, California, Sediment; Volume II: Inner and Outer Harbor Sediments - 1991.

13. Historical Research of Land Use and Industry in the Federal Ship Channel Study Area, Oakland, California - 1990.

14. San Francisco Bay Area Seaport Plan and Amendments: Bay Conservation and Development Commission and Metropolitan Transportation Commission - 1982 (approved 1989).

## 1.5 PLANNING PROCESS OF THE CORPS OF ENGINEERS

To ensure that the Feasibility Study meets the requirements of the Corps, the Port used the Corps' planning methodology. Six major steps comprise the Corps' planning methodology. These include: (1) specification of water and related land resources problems and opportunities; (2) inventory, forecast, and analysis of water and related land resource conditions within the study area; (3) formulation of alternative plans; (4) evaluation of the effects of the alternative plans; (5) comparison of alternative plans; and (6) selection of the recommended plan based upon the comparison of the alternative plans. Planning is a dynamic process requiring iteration of the various steps. Through iteration of the various planning steps, the study becomes refined as new data are gathered. These planning steps are conducted and reported in a two-stage planning process consisting of a Reconnaissance phase and a Feasibility phase. The Reconnaissance phase was completed in July 1997.

As described in section 1.1, this Feasibility Study is being undertaken by a non-Federal sponsor, the Port of Oakland, located in Oakland, California. The Port has conducted its own Reconnaissance activities for this proposed project. Port Maritime Economics staff identified problems including transportation inefficiencies and loss of cargo volumes, and opportunities to improve service. Port Engineering staff evaluated several preliminary project plans at a comparative level of detail. The Port has conducted on-going community relations activities to identify potential concerns and opportunities that could be addressed through water and related land resources planning.

The second and final phase of the planning process, the Feasibility Study phase, which is the focus of this report, further evaluates the plans to address the planning objectives. The alternative plans are evaluated and a plan is selected and recommended for implementation. The approved Revised Final Feasibility Report will be presented to the Congress of the United States through the Water Resources Development Act of 1999.

## 1.6 REPORT ORGANIZATION

This Feasibility Report is divided into seven Chapters. Chapter 2 (Study Area Description) which follows, provides a description of the San Francisco Bay and Oakland Harbor and of the physical, biological, and socio-economic conditions of the area. Chapter 3 describes the problems and needs which are the focus of this study. Chapter 4 focuses on the development of a recommended plan based on the evaluation of the planning objectives, construction options, environmental constraints, and engineering considerations. Chapter 5 presents a detailed description of the National Economic Development (NED) plan based on the Corps' economic model, and of the Selected Plan. Coordination and public involvement are discussed in Chapter 6 and the study conclusions and recommendations are presented in Chapter 7.

# 2.0 STUDY AREA DESCRIPTION

## 2.1 DESCRIPTION OF THE STUDY AREA

### 2.1.1 Harbor Location and Description

The Port of Oakland and the Oakland Inner and Outer Harbors are located on the eastern side of the San Francisco Bay in the counties of Alameda and San Francisco, California (Figure 2.1).

The Port of Oakland is a complete multi-faceted transportation and distribution center providing access to modern marine terminals specializing in containerized shipments of cargo from Pacific Rim and other Asian countries, and Europe. This world-class Port is the largest on the San Francisco Bay, the third largest container port on the North American West Coast and the fifth largest container port in the nation. The Port is located on the east side of the San Francisco Bay, about 8 miles inside the Golden Gate. Oakland Harbor consists of the Outer Harbor and the Inner Harbor. The tidal range between mean lower low water (MLLW) and mean higher high water (MHHW) is approximately 6.4 feet (from approximately 0 feet MLLW to +6.4 feet MLLW). Observed extreme water levels at NOAA Station 941-4750 at Alameda indicate that the estimated highest high water level is +9.25 feet MLLW, and the estimated extreme lowest low water level is -2.75 feet MLLW.

The Outer Harbor is located immediately south of the San Francisco-Oakland Bay Bridge. The authorized Federal channel in the Outer Harbor is maintained at -42 feet MLLW and provides access to the Port of Oakland's berthing areas which serve container, break-bulk, and roll-on/roll-off deep-draft vessels.

The Inner Harbor, locally called "the estuary," separates the cities of Alameda and Oakland and was developed in the natural estuary of San Antonio Creek, which extends landward to Brooklyn Basin. The Inner Harbor begins at Project Mile 0.45. It includes an Entrance Reach, Inner Harbor Reach, Grove Street to Brooklyn Basin Reach, Brooklyn Basin Reach, Park Street Reach, and a Tidal Canal that connects with the San Leandro Bay at Project Mile 8.5. The Entrance Reach and Inner Harbor Reach are maintained at -42 feet MLLW. Upper reaches of the Inner Harbor serve privately-owned facilities along the estuary, and are maintained at lesser depths. Two submarine highway tubes between Oakland and Alameda pass under the channel at Project Mile 4.6 and 4.7. There are four bridge crossings over upstream reaches of the channel.

The San Francisco Bar channel provides access to vessel traffic entering the San Francisco Bay. The approximate location of the Bar channel is shown in Figure 2.1. The Bar channel is maintained at -55 feet MLLW. Tidal conditions, channel depth, and swells restrict operating container vessels to a draft of -50 feet MLLW.

There is a wide mix of land uses along the Inner Harbor channel. The Inner Harbor channel provides access to Port of Oakland berth areas which serve container vessels at several terminals. The farthest upstream terminals are the Howard Terminal located at the beginning of the Grove Street to Brooklyn Basin Reach, and a conventional break-bulk terminal at Ninth Avenue, adjacent to the Brooklyn basin. Other uses along the Inner Harbor include shipping and transportation operations, steel fabrication and manufacturing, residential housing, parks, and commercial establishments catering to

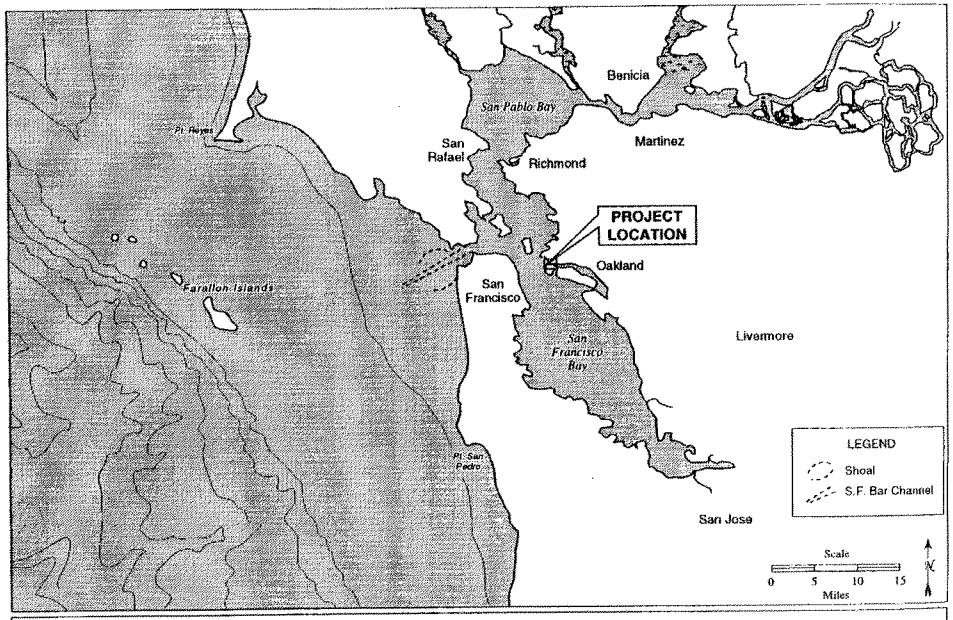



**Figure 2.1**

**PROJECT LOCATION**

recreational boaters and tourists. Leisure activities include fishing, sightseeing, and boating.

The Port is currently planning a major terminal facilities expansion project (known as Berths 55-58) and upgrade of an existing intermodal rail facility (known as the Joint Intermodal Terminal [JIT]) at the former Fleet and Industrial Supply Center Oakland (FISCO) and Port of Oakland-owned waterfront property along the Inner Harbor. These projects together are known as the Vision 2000 Program. FISCO is being conveyed to the Port of Oakland under special legislation. The FISCO conversion to civilian maritime use will result in a modern Port and effective redevelopment of former military property. A programmatic Environmental Impact Statement and Environmental Impact Report (EIS/EIR) have been prepared for the Vision 2000 Program. The Record of Decision was signed in August 1997. The Port of Oakland waterfront property along the Inner Harbor was leased to the Union Pacific (UP) Railway Company. As a result of its recent merger with Southern Pacific Lines (SP), UP is currently consolidating its operations at the nearby former SP West Oakland Yard. The Port is proceeding with supplemental environmental documentation and design for Berths 55-58 and the JIT facilities. The new facilities are scheduled to be completed (including construction of channel bank improvements) by December 2000, that is, to be fully operational prior to the completion of the dredging proposed by this Feasibility Study.

Operations along the Outer Harbor consist primarily of berth areas and portions of the Oakland Army Base, which is being closed under the BRAC Act. The Reuse Plan for the Oakland Army Base contemplates maritime use for the western portion of the Oakland Army base, consistent with on-going Port operations in the area.

The Port's location on the east side of the San Francisco Bay is near the western terminus of major rail and highway networks. Specialized Port storage and handling facilities provide a speedy and efficient means for the transfer of cargo between sea and land modes of shipment. Figure 2.2 provides the location of key terminal facilities along the Oakland Inner Harbor and Outer Harbor channels, including the location of Berths 55-58 and the JIT. Figure 2.3 shows typical specialized equipment currently being used to handle containerized cargo in the Port of Oakland.

### 2.1.2 Existing Navigation Project

Navigation channel improvements presently authorized and maintained for the Oakland Inner and Outer Harbor are shown on Figure 2.4 and include:

- Entrance Channel: 42 feet deep, approximately 1800 feet long, widening from 900 feet to 1,000 feet wide from the west entrance to the entrance to the Inner and Outer Harbor channels.

- Outer Harbor Channel: 42 feet deep and 8,700 feet long west of the Outer Harbor turning basin, and 42 feet deep and 4,000 feet long north of the Outer Harbor turning basin. In addition, there is a 1,300-foot-long "dogleg" that extends east from the northern end of the Outer Harbor channel. The western portion of the Outer Harbor channel narrows from 1,000 feet at the end of the Entrance channel to 600 feet wide 7,100 feet east of the Entrance channel, where the Outer Harbor channel bends to the east. The Outer Harbor channel then widens over the next 1600 feet to meet up with the west end of the turning basin. The northern portion of the Outer Harbor channel is 900 feet wide along

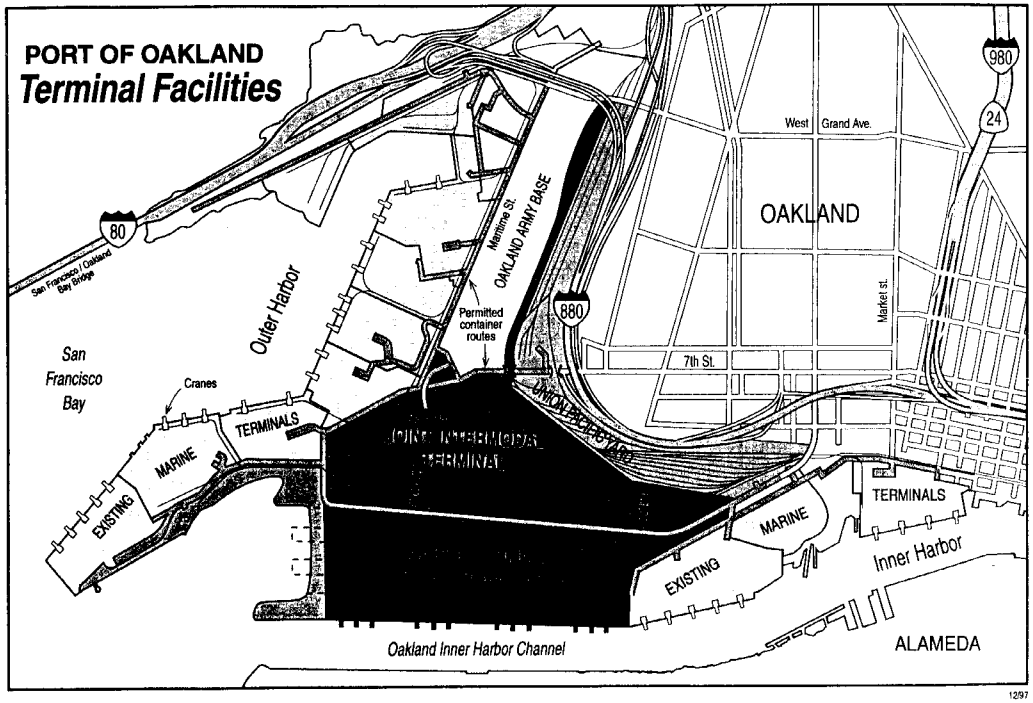
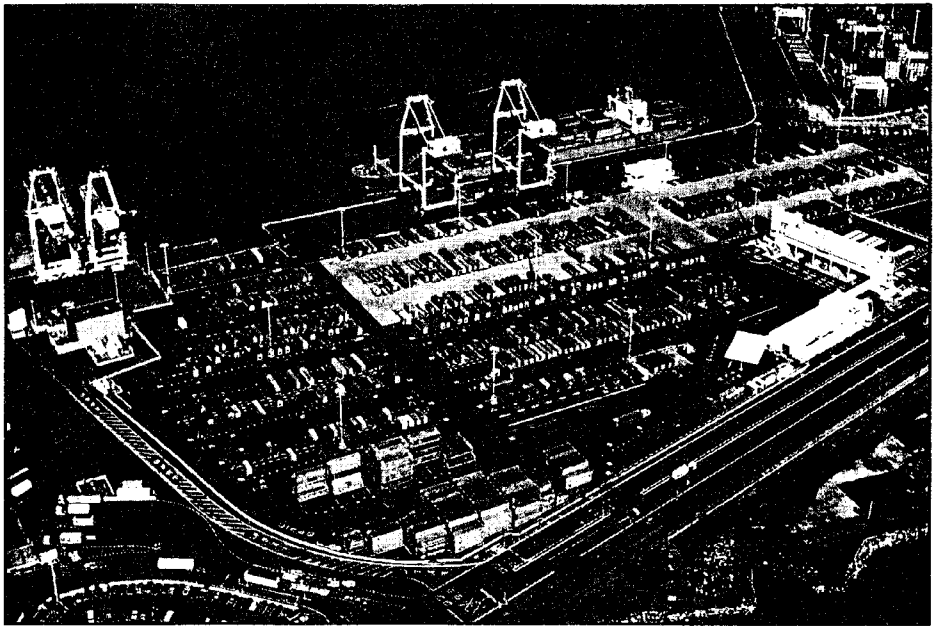
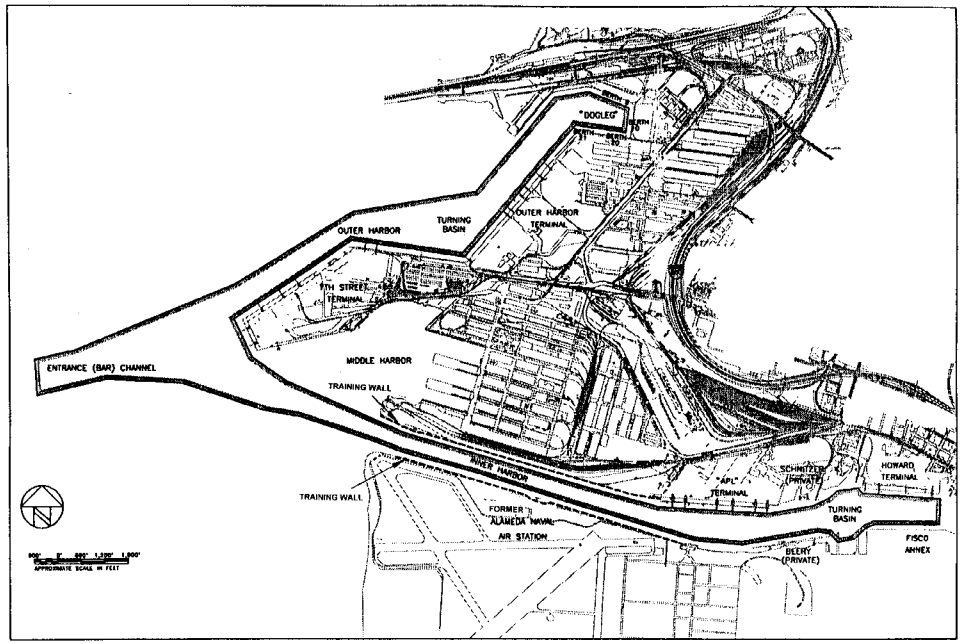

PORT OF OAKLAND
Terminal Facilities
San Francisco / Oakland Bay Bridge
80
San Francisco Bay
Outer Harbor
Cranes
EXISTING
MARINE
TERMINALS
Permitted container routes
Maritime St.
OAKLAND ARMY BASE
880
UNION PACIFIC RAILROAD
7th St.
West Grand Ave.
OAKLAND
Market st.
980
24
EXISTING
MARINE
TERMINALS
Inner Harbor
Oakland Inner Harbor Channel
ALAMEDA
12/97

Figure 2.2



**Typical Berth and Cranes**

Figure 2.3




| | | | | |
|---|---|---|---|---|
| T:\ENG\PUBLIC\MAPS\SEFTP\AME-5 (REF. BASE) | PORT OF OAKLAND<br>530 WATER STREET OAKLAND, CALIFORNIA | CHIEF ENGINEER<br>REG. ENGINEER 1B<br>APPROVED: CHIEF PORT PLANNER REG. ENGINEER 1C<br>RECOMMENDED: REG. ENGINEER 1D | PRELIMINARY DRAWING<br>ENGINEERING PROJECT MANAGEMENT DEPT.<br>EXISTING<br>OAKLAND HARBOR NAVIGATION IMPROVEMENTS<br>FIGURE 2.4 | DATE 1-22-98<br>SCALE<br>SHEET 1 OF 1 SHEET<br>FILE AA- |

its entire length; the "dogleg" narrows from 800 feet at its entrance to 600 at its eastern end.

- Inner Harbor Channel: The Inner Harbor channel is divided into six segments. The first and second segments (Entrance Reach and Inner Harbor Reach) are proposed to be part of the navigation improvement project. This portion of the channel is currently 42 feet deep, and extends 18,800 feet from the end of the Entrance channel to the Inner Harbor turning basin. A small portion of the Inner Harbor Reach extends 1,700 feet east of the Inner Harbor turning basin. The Inner Harbor channel narrows from 2,200 feet wide at the start of the Entrance Reach to 480 feet wide immediately south of the former Fleet and Industrial Supply Center Oakland (FISCO), and then widens again to 700 feet at the mouth of the turning basin. The Inner Harbor channel east of the turning basin narrows from 800 feet at the end of the turning basin to 700 feet at the end of the Inner Harbor Reach.

  The existing authorized Federal Project also includes a channel 35 feet deep and 600 feet wide from the east end of the Inner Harbor Reach to a triangular area 35 feet deep and about 2700 feet long with a maximum width of 300 feet at the western end of Brooklyn Basin/Government Island. From there, a channel 35 feet deep and 500 feet wide extends through the Brooklyn Basin south of Government Island. A channel also extends through the Brooklyn Basin on the north side of Government Island. It is 35 feet deep and 300 feet wide for 1,300 feet, then 25 feet deep and 300 feet wide for 3,700 feet. The two channels lead to a turning basin at the east end of the Brooklyn Basin which is 35 feet deep, 500 feet wide, and 1,200 feet long. Finally, the Federal Project includes a channel in the tidal canal 35 feet deep and 275 feet wide from the east end of Brooklyn Basin to Park Street, and a channel 18 feet deep from Park Street to San Leandro Bay. The total Inner Harbor channel length is 8.5 miles from San Francisco Bay to San Leandro Bay.

- Outer Harbor Turning Basin: The Outer Harbor turning basin is located at the main bend in the Outer Harbor channel, with its mouth located approximately 8,700 feet east of the eastern end of the Entrance channel. It is currently maintained at 42 feet deep and 1,480 feet wide.

- Inner Harbor Turning Basin: The Inner Harbor turning basin is located approximately 18,800 feet east of the entrance to the Inner Harbor. The Inner Harbor turning basin is 42 feet deep, and 1,200 feet wide.

- Middle Harbor: The Middle Harbor is located near the entrance to the Inner Harbor channel. It served the FISCO piers and wharves when FISCO was operational. The Middle Harbor area would be converted to an aquatic habitat area as part of the proposed project. The proposed aquatic habitat area is referred to as the Middle Harbor Enhancement Area (MHEA).

Existing Navigation Project features include parallel rubble-mound jetties at the entrance to the Inner Harbor. These jetties were constructed during the late 1800s as training walls to confine the flow of the San Antonio Estuary to scour a channel. The north jetty is 9,500 feet long, and the southern jetty is 12,000 feet long. The jetties serve no navigational function, but have been determined to be eligible for inclusion in the National Register of Historic Places. A portion of the north jetty will be removed as part of the construction of Berths 55-58.

Four bridges cross the tidal canal. No bridges cross the channel within the proposed project limits. The authorized project for deepening the Outer Harbor and Entrance channel to -42 feet was completed in May 1997. The Inner Harbor channel deepening was completed in July 1998. The San Francisco Bar channel, which provides access to the Oakland Harbor is maintained at -55 feet MLLW.

### 2.1.3 Population Centers

**California.** The state of California is the third largest state in the Union in terms of land mass and the largest in terms of population. The state's location on the west coast of the United States makes it a part of the Pacific Rim and therefore a critical link in the Pacific Rim trade with the growing markets of Asia, the Philippines, and other countries on the Rim.

**San Francisco Bay Area.** The San Francisco Bay Area includes Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma counties with 6.5 million people distributed over 7,000 square miles of land. The San Francisco Bay has a surface area of 435 square miles, surrounded by 276 miles of shoreline. San Francisco Bay has some natural deep water channels, but 40 percent of the Bay is less than 6 feet deep at low tide. Harbor development in the Bay began more than 140 years ago in support of trade and transportation needs of pioneer gold miners and merchants. Development and maintenance of shipping channels in the San Francisco Bay has been an important mission of the U.S. Army Corps of Engineers since Congressional authorization of the first Federal navigation improvement project in 1868.

**Alameda County.** Alameda County is one of nine counties touching the San Francisco Bay. It is one of the largest counties of California, both in terms of population and in terms of land area. The County population is approximately 1.4 million. [1] The principal cities are Oakland, Alameda, San Leandro, and Hayward.

### 2.1.4 Transportation

The San Francisco Bay Area is served not only by water-borne transportation, but also by highways, rail, and air transportation. Figure 2.5 shows the major freeways, ports and airports in the San Francisco Bay Area. Two major rail lines, the Burlington Northern/Santa Fe (BNSF) and UP serve the Bay Area. Interstate Highway 80 and its many spurs (280, 380, 580, 680, 780, 880, and 980) comprise the major highway system serving the San Francisco Bay Area. Interstate Highway 80 connects San Francisco (its western terminus) with the East Coast (New Jersey is its eastern terminus). The Oakland/Alameda County area is served by portions of Interstate Highways 80, 580, 880, and 980. Portions of Interstate Highway 880 adjacent to the Port were destroyed in the 1989 Loma Prieta earthquake. A portion of Highway 880, from East 23rd Street to the Bay Bridge, was rebuilt and reopened in July of 1997. Highway 880 will open in its entirety by December 1998, improving traffic flow in and out of the Port

Interstate Highway 5 runs north-south along the western U.S. coast from the Canadian to the Mexican border. The Oakland/Alameda County area is connected to Interstate

---

[1] Source: State of California, Department of Finance, Demographic Research Unit, updated September 17, 1997.

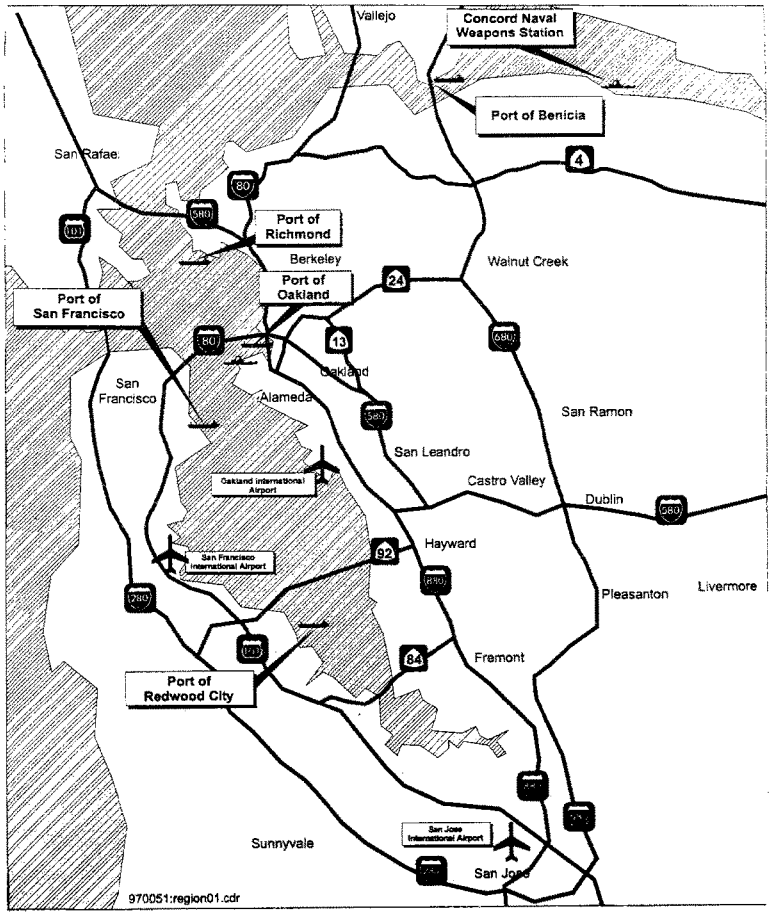



*Figure 2.*
*Major Freeways, Ports & Airport*

Highway 5 south via Interstate Highways 580 and 205, and Interstate Highway 5 north via Interstate Highway 80.

Railroad service connects the Oakland/Alameda County area with the rest of the nation. Several major east-west rail lines terminate in Oakland. Direct service is available to all major cities east of California. In addition, the area is served by several major north and south rail routes, providing direct links to Los Angeles, Portland, and Seattle, as well as numerous smaller communities.

The Bay Area is served by three major airports that provide commercial airline passenger and freight service. The airport closest to the project area is the Metropolitan Oakland International Airport (MOIA), located at the southern edge of the City of Oakland. MOIA is part of the Port of Oakland, and handles the highest volume of air cargo of the three Bay Area airports. The other two airports are San Francisco International Airport and San Jose International Airport.

Water-borne transportation includes the Port of Oakland, as well as the various smaller/specialty ports (such as the ports of San Francisco and Richmond), and several fuel terminals associated with petroleum refineries in the Bay Area. Passenger traffic is accommodated via an extensive network of ferries. In the future, ferry service may also be used to transport local cargo. Water-borne transportation within the Port of Oakland is discussed in detail in section 3 of this Feasibility Report.

## 2.2 ENVIRONMENTAL CONDITIONS

The following is an overview of the environmental conditions of Oakland Inner and Outer Harbors and the San Francisco Bay. The EIS/R accompanying this Feasibility Report provides a detailed discussion of the information summarized below.

### 2.2.1 Physical Conditions

Climate. The climate of the project area is classified as Mediterranean, characterized by cool, dry summers and mild, wet winters. The major influence on the regional climate is the Eastern Pacific High, a strong persistent anticyclone. Seasonal variations in the position and strength of this system are a key factor in producing weather changes in the area.

The Eastern Pacific High attains its greatest strength and most northerly position during the summer, when it is centered west of Northern California. In this location, the High effectively shelters California from the effects of polar storm systems from the North Pacific. Due to the large-scale atmospheric subsidence associated with the High, an elevated temperature inversion often occurs along the West Coast. The base of this inversion is usually located from 1,000 to 3,000 feet above mean sea level, depending on the intensity of subsidence and the prevailing weather condition. Vertical mixing is often limited to the base of the inversion, trapping air pollutants in the lower atmosphere. Marine air trapped below the base of the inversion is often condensed in fog and stratus clouds by the cool Pacific Ocean. This condition is typical of the warmer months of the year from roughly May through October. Typically, the stratus forms offshore and moves into coastal areas during the evening hours. As the land heats up the following morning, the clouds will burn off to the immediate coastline, then move back onshore the following evening.

As the winter approaches, the High begins to weaken and shift to the south, allowing polar storms to pass through the region. These storms produce periods of cloudiness, strong shifting winds, and precipitation. The number of days with precipitation can vary greatly from year to year, resulting in a wide range of annual precipitation totals. Storm conditions are usually followed by periods of clear skies, cool temperatures, and gusty northwest winds as the storm systems move eastward. Precipitation is generally lowest along the coastline and increases inland toward higher, mountainous terrain. Annual precipitation totals for the Metropolitan Oakland International Airport ranged from 8.64 to 29.37 inches during a 38-year period of record (1948 through 1986), with an annual average of 18.05 inches (NOAA 1986). About 90 percent of rainfall occurs during the months of November through April.

The average high and low temperatures at the Metropolitan Oakland International Airport in July are 70.9°F and 56.9°F, respectively. January average high and low temperature are 55.2°F and 42.0°F. Extreme high and low temperatures recorded from 1948 through 1986 were 107.0°F and 7.0°F, respectively (NOAA 1986). Temperatures within the Bay are generally less extreme, due to the moderating effect of the Pacific Ocean.

The proximity of the Eastern Pacific High and a thermal low pressure system in the Central Valley region to the east produces a general west to northwest air flow along the Central and Northern California coast for most of the year. The persistence of these breezes is a major factor in minimizing air quality impacts on the people that live in the region. As this flow is channeled through the Golden Gate Bridge, once inside the Bay, it branches off to the northeast and southeast. As a result, winds often blow from the southwest in the Berkeley area and from the northwest in the South Bay. Easterly winds that blow toward the offshore water also occur, but are mainly nocturnal and wintertime land breezes. These land breezes may extend many miles offshore during the colder months of the year until daytime heating reverses the flow onshore.

**Geology.** The proposed project and reuse/disposal sites are located within the general region of the San Francisco Bay, an irregular group of connected water bodies (including Suisun and San Pablo bays) totaling approximately 400 square miles. The San Francisco Bay and the Bay Area are located within the Coast Ranges Geomorphic Province of California, which is characterized by a system of northwest-southeast trending longitudinal mountain ranges and valleys that are controlled by faulting and folding. The Bay itself started to form in the Late Pleistocene due to subsidence associated with localized oblique displacements on the San Andreas and Hayward Faults. Flooding of the area occurred several times with Pleistocene sea level fluctuations.

Oakland Harbor was constructed in a natural drainage channel, San Antonio Creek, that is located within the broad low-lying plain that borders the eastern shore of San Francisco Bay. Elevations on the Bay plain in the vicinity of the Oakland Harbor vary from 0 to about 30 feet above mean sea level, and continue in a gradual rise to the base of the Berkeley-Oakland Hills further to the east. Materials beneath the Bay plain consist of relatively thick, unconsolidated sediments of marine and continental origin deposited during Pleistocene and Recent geologic time. Bedrock underlying the sediments is Franciscan age sandstone and shale, which forms the eastward dipping floor of a trough-like depression created by regional warping and faulting. The lower several hundred feet of these deposits in the part of the Bay that includes the Oakland Harbor have been designated the Alameda Formation. The Alameda Formation, which consists of clays and sands, was dissected and eroded prior to deposition of the Old Bay

Mud (Yerba Buena Formation). After deposition, the Old Bay Mud was eroded, and the Merritt Sand of the San Antonio Formations was deposited. The Merritt Sand is a dune sand deposit. The Merritt Sand deposits were in turn eroded, and the deeper channels filled with soft, unconsolidated marine clays and silts (Young Bay Mud) as the sea level rose. In the project area, the older formations are 400 to 600 feet thick, while the thickness of the Young Bay Mud varies from a few feet along the northeast side of the Outer Harbor area to over 50 feet in the western reaches.

**Hydrology.** According to the SFBRWQCB Basin Plan, the Oakland Harbor is located within the East Bay Plain groundwater basin. The primary aquifers in the east Bay Plain are the San Antonio Formation (between the Young and the Old Bay Muds), and the Alameda Formation. The Merritt Sand member of the San Antonio Formation contains some groundwater, but is not considered a primary water supply aquifer because of its limited distribution and thickness. In addition, withdrawal of substantial quantities of water may lead to saltwater intrusion. The Merritt Sand has historically produced an aggregate yield of less than 330 gallons per minute, with a single highest well yield of 110 gallons per minute. The general groundwater flow direction is toward the harbor channels; however, groundwater gradients are very flat, especially at high tide.

Hydrogeological testing conducted in support of the proposed project (Appendix E) indicated that the groundwater quality in the Merritt Sand aquifer within the project area is considered poor due to its high salinity. The high salinity is the result of seawater intrusion. Seawater intrusion is not a recent occurrence, and its effects can be seen at a distance from the harbor channels.

**Sedimentation.** The proposed project is located within the San Francisco Bay/Delta estuarine system. The San Francisco Bay/Delta estuarine system drains over 40 percent of the land area in the state of California. Shoaling of navigation channels results from a combination of new sediments entering the system (primarily from the Sacramento/San Joaquin rivers) and resuspension of existing sediment resulting from fluvial, tidal, and wind-driven waves and currents. Annual amounts of new and resuspended sediments for the entire San Francisco Bay Area are estimated to be 8 million cubic yards (mcy) and 100 mcy, respectively. Average annual maintenance dredging volumes in the Oakland Harbor channels have been in the range of 370,000 cy between 1976 and 1991.[2] Based on the analysis of historical data, the maintenance dredging volumes would increase by approximately 112,000 cy combined for the Inner and Outer Harbor channels, if the proposed improvements are made. This represents an approximately 30 percent increase over the historical volume.

**Wave Conditions.** Waves follow predominant winds from the west-northwest. By themselves, wave conditions are generally not a problem in the entrance to the Oakland Harbor. However, wind and waves, combined with currents at the entrance to the Oakland Harbor, present a navigational challenge for pilots entering either the Inner Harbor or the Outer Harbor. The Entrance Reach and approach reaches to both the Inner Harbor and Outer Harbor were widened as part of the -42 foot project to address this condition.

**Currents.** The currents at the fork of the Outer and Inner Harbor channels run basically perpendicular to both channels. Ebb currents run in a northwest direction, with maximum velocities exceeding 2 knots. They tend to set ships toward the northern

[2] More recent maintenance dredging quantities are not available because new work construction has been on-going since 1992.

bank of the channel. Flood currents run in a southeasterly direction. Both ebb and flood currents are of concern when running strong. Generally, ships must enter the Entrance Channel on the up-current side to avoid being grounded on the down-current bank of the channel.

**Wind.** Winds in the Oakland Harbor are predominantly from the west-southwest through the west-northwest.

**Seismicity.** The San Francisco Bay Area is well known as a seismically-active region. Historically, numerous moderate to strong earthquakes are related to the San Andreas and Hayward fault systems. The Port of Oakland, however, does not lie within an Alquist-Priolo Earthquake Fault Zone, and active or potentially active faults are not known to cross the Port area.

The Bay Area fault system is composed of four major faults: the San Andreas fault, the Northern and Southern segments of the Hayward fault, and the Concord and Calaveras faults. Combined, the probability of an earthquake of magnitude 7 (M7) or greater occurring on one of these faults between 1990 and 2020 has been estimated at 67 percent. The Hayward fault lies approximately 4.5 to 7.0 miles east of the Oakland Harbor. The San Andreas fault, which traverses the San Francisco Peninsula, lies approximately 11.5 to 14.0 miles to the west. The Concord and Calaveras faults, which lie at the foot of the Diablo Range, are located approximately 20 miles to the east. Other, lesser faults are present throughout the region. Because of the low strength of the Bay Mud and comparably steep cut slopes in the existing harbor area it is assumed that local slope failures will occur during moderate to strong earthquakes.

In 1990, the Working Group on California Earthquake Probabilities divided the San Andreas fault into segments (U.S.G.S. Circular 1053, 1990). Those segments near and in the San Francisco Bay Area and their probabilities of producing an M7 or greater earthquake were listed as:

- San Francisco Peninsular Segment: 25 percent chance of an M7 earthquake or greater within the next 30 years.
- North Coast Segment: 2 percent chance of an M8 or greater earthquake within the next 30 years.

In 1988, the Working Group had assigned a 30 percent chance of an M7 or greater earthquake within the next 30 years to the Santa Cruz Mountain segment of the San Andreas fault. The southern portion of this segment produced a M7.1 earthquake in October 1989 (the Loma Prieta earthquake). The northern portion of this segment has been assigned an 18 percent chance of a M6.5 or greater earthquake within the next 30 years.

The Working Group has also assigned earthquake probabilities to the Northern East Bay segment and Southern East Bay Segment of the Hayward fault. The northern segment has been assigned a 23 percent probability of a M7 or greater earthquake over the next 30 years, while the southern segment has been assigned a 28 percent probability of the same magnitude earthquake during the next 30 years. If both segments rupture simultaneously, the event could be as great as a M7.5 earthquake.

The Loma Prieta earthquake imparted ground motions in the Oakland Harbor area that probably exceeded 0.15g peak acceleration. The peak acceleration in the fill at Treasure

Island was measured at 0.16g, while an acceleration of 0.29g was recorded at a 14th Street wharf in the Oakland Outer Harbor. The foundation geology at the wharf is reported to be Bay Mud. Even so, no significant failures of the channel side slopes or unusual quantities of operation and maintenance (O&M) dredged material have been reported. The Port experienced liquefaction-related ground failures at several of its terminal. The ground failure occurred as a result of liquefaction of the hydraulic fills of sand and silt that underlie the container yards.

### 2.2.2 Biological Resources

The underlying sediment within the project area consists of Merritt Sands, which are fine grained and highly compacted. A variable layer of silty mud (Young Bay mud) covers the Merritt Sands in many areas. Much of the sedimentation occurred during the Gold Rush era during the 1840s and 1850s; however, some sedimentation occurs annually during heavy flows from the Delta . When the Harbor is dredged, the overlying fine sediments are removed and the Merritt Sands are re-exposed. As a result, the biological habitat in the area is highly variable due to the alteration of the substrate from silty mud to coarse sand to silty mud as more sedimentation occurs.

The vertical boundaries of the current dredge area are from the high tide line to -44 feet MLLW (-42 feet plus 2 feet overdepth) in the maintained channels. This vertical habitat, with two exceptions, primarily consists of riprap with silts and clays to fine gravel interspersed among the rocks. One exception in the Inner Harbor is the training wall, which consists of large rocks that fit tightly together with minimal crevices for sand or gravel to settle. The other exception, in the Outer Harbor, is the gravel beach located at the western end of the area. The hard substrate (riprap and training wall) provides habitat for sessile organisms such as barnacles and limpets. The crevices between the rock riprap provide habitat for a variety of small crabs and bay mussels. In most areas of both the Outer Harbor and the Inner Harbor, the riprap, which holds the fill that the facilities are built on, continues down to the deep water. Near the bottom, rock habitat becomes altered by the sedimentation covering the rocks. In both the Inner and Outer Harbor, a shallow subtidal zone (0 to 20 feet deep), consisting of muddy/sandy shoal, provides habitat to a large community of macroinvertebrates.

In summary, the affected aquatic environment is characterized by deep-dredged channels bordered by mud/sand shoals and a rocky shoreline. The overall habitat diversity is relatively low, but it has both marine and estuarine characteristics and a large depth range. The evaluation of biological resources is based on biological surveys and literature reviews which are documented in the EIS/R.

**Plankton Community.** Phytoplankton are an important part of the base of the food chain in most water bodies. The classes of phytoplankton present in the study area include diatoms (Bacillariophyceae), coccolithophores (Haptophyta), dinoflagellates (Pyrrophyta,) silicoflagellates (Chrysophyta), cryptomonads (Cryptophyceae), and green algae (Chlorophyceae) (SAIC 1994). Diatoms are often less abundant during certain times of the year when flagellated algae may predominate. These flagellated algae include cryptomonads *Chroomonas* and *Cryptomonas*, and the green algae *Pyramimonas*. Protozoan populations can also be significant and form part of a "microbial loop" that represents an alternative trophic input to the zooplankton.

Copepods can be the most abundant taxonomic group of zooplankton found in the Bay. At times, zooplankton components include a variety of fish larvae such as anchovy, herring, gobies, and silversides, as well as various stages of decapod larvae including

*Crangon* and *Cancer* and an assortment of larval stages of other macroinvertebrates. Besides these meroplanktonic forms (i.e., species that are planktonic for only part of their life cycle), conspicuous zooplankton include temporary invasions or blooms of large gelatinous forms such as various medusae and cetenophores.

**Benthic Community.** Benthic infauna is an important food source for the aquatic community. Many of the bottom dwelling fish such as white croaker feed on polychaetes and other infaunal species. Many of the benthic organisms found in San Francisco Bay are introduced species, presumably brought in with ship ballast, such as the clam *Potamorcorbula amurensis* and the recently introduced sea slug *Philine auriformis* (which were quite abundant in the project area). Many introduced species are well adapted to the dynamic conditions in San Francisco Bay.

The benthic community in a given location is correlated with the grain size of the substrate in the area. The shallow subtidal and deep dredged areas are predominantly soft sediments and the rocky intertidal zones and pilings are hard substrate environments. The shallow subtidal soft substrate community in the Outer Harbor is dominated primarily by crustaceans. Rocky intertidal zones and pilings in the affected area are inhabited by sessile organisms with marine affinities such as the native Bay mussel, many species of algae, bryozoans, sponges, and tunicates. This habitat (particularly the rocky intertidal zone) is quite diverse with 50 to 70 species being observed in a single low tide event.

**Fish and Decapod Crustaceans.** Decapods inhabit an ecotone between the benthic and pelagic (open water) communities. Like the benthic community, the decapods are an important food source for fishes. Crangon shrimp are common food items for many fishes of the Bay and Delta, including striped bass, American shad, green and white sturgeon, and Pacific tomcod.

The summer 1997 species sampling event indicated that the Outer Harbor deep dredged channel had a slightly more diverse selection of crabs than the Inner Harbor. The decapods specific to the Outer Harbor included the blue-spotted shrimp and the hairy rock crab. The decapods abundant in both areas included black shrimp, broken-back shrimp, sand shrimp, Dungeness crab, graceful rock crab, Pacific rock crab, and red rock crab. Black shrimp, sand shrimp, Dungeness crab, and red rock crab were also abundant in the shallow subtidal region of the Outer Harbor.

A wide variety of fish inhabit the affected environment. The Oakland Harbor contains estuarine, marine, and anadromous fishes. Among them are various flatfish, surfperch, gobies, sculpin, silversides, pipefish, sharks, and rays. Common flatfish are English sole, speckled sanddab, starry flounder, and California halibut. Other common bottom fish include bay goby, Pacific staghorn sculpin, white croaker, Pacific tomcod, shiner perch, and plainfin midshipman.

The northern anchovy, a pelagic marine species, occurs year-round. Anchovies serve as an important food source for many fish and bird species such as salmon, halibut, pelicans, terns, and grebes. Pacific herring enter the estuary in the winter and early spring to spawn, particularly in rocky areas, along aquatic vegetative covered substrates, and on pilings. Pacific herring are also an important forage food.

**Aquatic Birds.** A total of 43 bird taxa were sighted during winter surveys, mostly over open water. By far, the greatest numbers were seen over the Outer Harbor shoal, where thousands of diving ducks (especially scaups and scoter) and hundreds of grebes

of various species were counted. The grebes were also abundant in the deep dredged areas. A total species list for all birds sighted in the Inner Harbor and Outer Harbor is provided in the EIS/R.

During the summer 1997 surveys, 27 bird taxa were observed, but only a few hundred individuals were counted. Thus, the total summer bird population was less than 4 percent of the number of individuals seen during the winter surveys. Most of the species and over 30 percent of the total birds were seen in the Inner Harbor channel. Western gulls were the most abundant species overall. The highest counts by site were the western sandpiper (the Inner Harbor channel), double-crested cormorant (the Outer Harbor shoal), and western gull (the Outer Harbor channel).

Threatened and Endangered Species. Five bird species of concern are found in the vicinity of the proposed dredged area. The Double-crested cormorant (Phalacrocorax auritus), a California State Species of Special Concern, and the American peregrine falcon (Falco peregrinus anatum), a state and Federal endangered species, are expected to occasionally forage within the proposed dredge area and vicinity. For the California least tern (Sterna anthillarum browni), the California brown pelican (Pelecanus occidentalis californicus), and the Western snowy plover (Charadrius alexandrunus nivosus), the proposed dredge area is not a likely critical foraging habitat. The nesting area for the California Least Tern is protected in the USFWS controlled refuge on the western side of Former Naval Air Station Alameda. In recent surveys conducted for the Port during the 1997 breeding season, foraging attempts by California Least Terns in the entire dredging area represented less than 7 percent of the of the total foraging dives recorded (4 percent in the Inner Harbor, and 2.5 percent in the Outer Harbor). An additional 5 percent of foraging dives occurred in the Middle Harbor. The results of the survey are documented in the EIS/R.

Chinook salmon of any race are only rarely encountered in the proposed dredge area. Only two fall-run chinook salmon were captured during the habitat evaluation survey. The presence of the fall-run chinook is strongly indicative of the possibility that other runs such as the winter-run chinook salmon (a state and Federal government listed endangered species) might also use this area to a limited extent. The Harbor Seal is both Federally and State listed endangered, and may occasionally be found foraging in the vicinity.

The proposed dredge area also supports one sensitive habitat, eelgrass beds (Zostera marina). Approximately 5,000 square feet of this habitat are present on the eastern side of the entrance to the Middle Harbor. Eelgrass habitat typically provides a refuge area for larval and juvenile fishes and supports foraging activities for birds and other animals.

### 2.2.3 Socio-Economic Conditions

The San Francisco Bay Region is expected to add about 1.5 million new residents between 1990 and 2010. Emerging from the 1990 - 1993 recession, the economy should generate long-term economic activity that will create a demand for about 861,000 new jobs by 2010. New high technology industries will be an important new source of jobs during this period. However, traditional sectors of the economy will continue to grow and provide most of the jobs in the economy. Regionally, more jobs will be added to the service sector during the forecast period than any other job sector. The service sector is estimated to increase by over 465,000 jobs (ABAG, 1994). Countering this expected growth trend is the closure of numerous military facilities and the loss of

associated jobs. Major military facilities in the San Francisco Bay that have closed or will close within the current Federal fiscal year include Naval Station Treasure Island, Naval Air Station Alameda, Mare Island Naval Shipyard, the Presidio, Hamilton Army Airfield, Oakland Army Base, Fleet and Industrial Supply Center Oakland (including its Alameda Annex and Point Molate Fuel Depot), Naval Medical Center Oakland, Public Works Center San Francisco, and DOD Housing Facility Novato.

Government maritime services operating in the Bay Area formerly constituted a significant component of the economy which relies on marine resources. The government provided maritime related services through the U.S. Navy, U.S. Coast Guard, U.S. Army Corps of Engineers, and U.S. Customs Bureau. Of these, the U.S. Navy was one of the most significant maritime employers in the San Francisco Bay/Delta region. Through payroll and operating funds, the service spent nearly $4.0 billion in the area during 1990. Of the eight major U.S. Navy facilities within the Bay Area, five naval sites are being converted to civilian uses. Thus, the government's need for maritime services has declined drastically in the past several years.

Taxable retail sales in the Bay Area are expected to reach $80.4 billion in constant 1995 dollars by 1998. This is equivalent to 8.4 percent real growth between 1990 and 1998. Real taxable sales increased in 1994 after three years of decline. Retail sales are concentrated in the most populous counties, with Santa Clara County accounting for 29 percent of retail sales and Alameda County accounting for almost 21 percent in 1994.

Housing production, especially of units affordable to moderate and lower income households, and high housing prices remain the most serious constraints to the economic health of the region. High housing prices have negatively affected disposable income which in turn has affected taxable sales. The reduction in real growth in taxable sales has affected local governments' tax bases and their ability to finance services and infrastructure.

San Francisco Bay and connected waterways comprise one of the largest natural harbors in the world. Maritime activities supported by San Francisco Bay and the adjoining Sacramento-San Joaquin Delta include deep draft cargo shipping, military facility operations, commercial fishing, ship repair, recreational fishing, water-based transportation (ferries), recreational boating, and tourism.

The ports of the San Francisco Bay and its adjoining delta are a major center for foreign trade. The ports of Oakland, San Francisco, Redwood City, and Richmond are situated on San Francisco Bay; the Sacramento and Stockton ports are located in the Sacramento-San Joaquin River Delta. These maritime trade facilities include approximately 150 piers, wharves, and docks. The region's ports handled foreign trade valued at about $34 billion in 1992 (USACE 1994). The Port of Oakland is the primary container port for the area.

The continental shelf and slope off San Francisco support a range of commercial fisheries. The principal market species in this region include Dungeness crab, market squid, salmon, tuna, flatfishes, a variety of rockfishes, thornyheads, and sablefish. Within the entire San Francisco region (from Point Arena to Point San Pedro, offshore to a distance of 200 nmi) some of the most productive commercial fisheries areas are in the Gulf of the Farallones. The estimated value of all major commercial fisheries within the San Francisco region in 1986 totaled over $23.6 million (US EPA 1993). The San Francisco Bay area commercial fishing fleet consists of approximately 1,100 vessels. The San Francisco Port vicinity is the base for the majority of the commercial and charter

fishing industries in the Bay Area; Oakland and Sausalito provide the majority of berths for the remaining fleet.

In addition to these maritime activities in the Bay Area, a variety of other commercial and recreational uses are dependent on the maintenance of accessibility throughout the Bay and its associated waterways. Recreational boating is available from approximately 65 marinas in the Bay Area. These private marine facilities provide about 19,800 slips throughout the region and generated approximately $168.4 million (1990 dollars) in revenues for the Bay Area (Ogden Beeman & Associates 1990).

Finally, ferry services and/or tourist ships are available from the cities of Alameda, Larkspur, San Francisco, Sausalito, Sonoma, Tiburon, and Vallejo. Cruise ship calls also produce revenues through passenger spending. These two industries provided the region with approximately $60.9 million in revenues in 1990 (Ogden Beeman & Associates 1990).

# 3.0 PROBLEMS AND NEEDS

## 3.1 GENERAL

The condition of deep-draft vessel navigation in the Oakland Harbor and Harbor Entrance channel is the focus of this section, which describes the public concerns and problems and opportunities developed during the study. This section also identifies the Planning Constraints and the Planning Objectives used in plan formulation. This information is required to move into the next major step of the planning process, which is the formulation of specific solutions and plans (Plan Formulation, Chapter 4).

The Federal interest is to alleviate problems by taking advantage of opportunities in ways that contribute to National Economic Development (NED). Contributions to NED are defined as increases in the value of the national output of goods and services. The NED objective must be accomplished without unreasonable environmental effects.

## 3.2 PUBLIC CONCERNS

Public concerns may be expressed directly, such as at a public meeting, or indirectly through Government representatives and agencies, and statutory requirements. Local concern for deep draft navigation at the Port of Oakland is evidenced by the initiation of the Feasibility Study by the Port. A scoping meeting was held at the start of the feasibility phase to identify specific public concerns; the community also had the opportunity to comment on the Draft FS document at the public hearing and during the 30-day public comment period.

The following public concerns have been expressed during this study:

1) The existing navigation channels are inadequate to provide safe and efficient passage for existing deep draft vessels. The existing channel depth cannot accommodate fifth or sixth generation vessels if they are fully loaded. In addition, given present channel depths, widths, and alignments, vessel maneuvering problems are experienced in the channels. These problems are expected to worsen if deeper draft, longer length vessels are brought into Oakland Harbor.

2) Efficient deep draft navigation in San Francisco Bay is a major component of the economic engine of Oakland, Alameda County, and the remainder of the San Francisco Bay Area. The Port of Oakland has lost cargo traffic to other ports because the current channel depths are inadequate to accommodate the new generation of container vessels. Inadequate navigation infrastructure will impede future economic growth and activity in the San Francisco Bay Area.

3) San Francisco Bay and its natural resources are ecologically and economically sensitive. Navigation activities have the potential to impact the natural character and features of the San Francisco Bay. Dredging and deposition of dredged material to enhance natural habitats is beneficial and desirable.

4) The project will enable the Port of Oakland to increase its throughput of container cargo, resulting in increased traffic through the Port. The impacts of the increased traffic, and resulting impacts on air quality and noise levels may fall

disproportionately on the West Oakland community. The West Oakland community is a socially and economically disadvantaged community; thus the construction of the proposed project may raise environmental justice concerns.

5) Limited taking of property is required to enlarge the Inner Harbor turning basin. The affected property owners would prefer an alternate alignment that does not require taking their property.

6) Some of the dredged material is proposed to be reused for construction fill at the former Fleet and Industrial Supply Center Oakland (FISCO). The Navy is currently completing a remedial investigation/feasibility study (RI/FS) program at FISCO, and is concerned about the impact that placement of any material would have on the RI/FS program.

7) Proposed Port maritime development and dredging of the channels will create an opportunity to improve public access to the San Francisco Bay shoreline. Improved and additional public access to the shoreline is greatly desired by the local community.

## 3.3 PROBLEMS AND OPPORTUNITIES

Public concerns addressed within the scope of this investigation are directly related to problems that can be solved through water and related land resources management. While the evaluation of public concerns reflects the range of needs which the public perceives, this section describes the problems and opportunities from a technical perspective. This study has identified problems and opportunities related to commercial shipping, navigational safety, wetland enhancement, estuarine habitat improvement, and public shoreline access improvement. Feasibility level investigations of the Oakland Harbor navigation problems confirmed that the problem was limited to deep draft vessel issues only. While many shallow draft vessels, including barges, tugs, ferries, fishing boats, Coast Guard rescue craft, recreational craft, and commercial fishing vessels share the use of the Oakland Harbor Federal channels with the deep draft vessels, shallow draft operators have not expressed concern about lack of sufficient channel depth.

### 3.3.1 Problem No. 1: Navigational Inefficiencies

Since the introduction of containerized cargo in the 1950s, six generations of container ships have evolved. Channel depths at the Oakland Harbor became marginal when second and third generation container ships with drafts from 33 to 41 feet were brought into use. Fourth generation container ships with drafts of up to 42 feet necessitated the most recent improvements to the Oakland Harbor (deepening the channels to -42 feet MLLW). However, the current channel depth is marginal and constrains access for the fifth generation container ships which have drafts of 42 to 46 feet. Sixth generation vessels are starting to come on line as well; sixth generation vessels have drafts of 46 feet or greater (up to 48 feet at the present time). The evolution of larger container ships is illustrated on Figure 3.1.

The deep draft fifth and sixth generation container ships experience significant tidal delays entering and leaving Oakland, with the result being that many of the shipping lines either bring these ships into Oakland only partially loaded or refuse to bring those ships into Oakland and are considering bypassing Oakland altogether. The deep draft

# Evolution of Container Ships

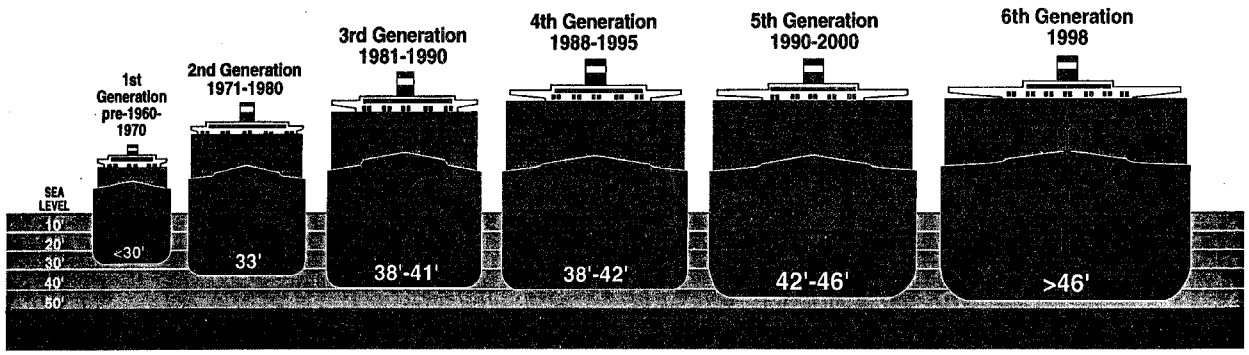



Figure 3.1

vessels can encounter tidal delays of several hours entering Oakland Harbor. More importantly, as a result of delays in unloading, vessels may have to delay their departures a full tidal cycle or more (tidal cycles vary from approximately 10.5 to 14 hours), which is difficult to make up at sea. Because there is only one higher high tide each day, vessels requiring significant tidal water depth may have to wait as much as 20 to 22 hours to enter the harbor.

Vessel lengths and beams have also increased, from 450 feet and 90 feet for the first generation container ships to greater than 1,100 feet and 150 feet for the largest of the sixth generation vessels. Insufficient depth causes expensive delays, and the current size of the turning basins limits the length of vessels operating in the Oakland Harbor. Over 70 percent of the shippers currently using the Oakland Harbor are alliance members, which means that they either have or will have access to sixth generation vessels within the next year. The Port of Oakland has seen greater than a 100 percent increase in the use of large vessels from 1996 to 1997.

The existing Oakland Harbor deep-draft vessel transportation inefficiencies are due to vessel light-loading practices, economies of scale, vessel rerouting, and transportation mode (e.g., truck vs. ship). The existing channel depths do not allow for the efficient movement of deep-draft vessel commerce. The deep-draft vessels that currently call at Oakland have vessel load capacities that are constrained by the existing channel depths. For example, the large, fifth and sixth-generation vessels cannot enter or depart from the Oakland Harbor fully loaded. The depth of the channel limits the operating draft of the vessel which, in turn, limits the vessel load. The various shippers/shipping companies at Oakland Harbor have indicated their concerns with the existing channel depths and how they would change their vessel operations in response to improved channel depths. With a deeper channel, vessels can load to design capacity. A larger load distributes the fixed operating costs for the vessels over a larger volume to reduce the cost per ton of cargo. A deeper channel also reduces the need for vessels to top off at other harbors, allowing the vessel to load fully before sailing to an overseas destination.

In summary, there are two basic problems associated with commercial shipping in Oakland. They are: (1) inefficiencies in commodity transport related to economies of scale, and (2) tidal delays for container ship passages. These problems result directly from the existing depth of the navigation channel and the size of the turning basins.

### 3.3.2 Problem No. 2: Navigational Safety

Deepening of the Oakland Inner and Outer Harbor channels to -42 feet has been completed. That deepening project followed lengthy evaluation, analysis, and subsequent delays due to conflict over proposed disposal of dredged material from that project. The -42 foot project has helped improve navigation safety by widening the approach from the Entrance Channel into the Inner and Outer Harbor channels. Nonetheless, some safety concerns remain and are exacerbated by the fifth and sixth generation of container vessels.

Consistent with the results of the Port's Inner Harbor Hydrodynamic Study, which included model simulation of the hydrodynamic forces between passing vessels and berthed vessels, several San Francisco Bar Pilots expressed concern over the existing Inner Harbor channel width at the westernmost approach as the channel transitions from the Entrance Reach to the Inner Harbor. Strong cross currents and exposure to wind at this location require higher operating speeds, which make entering the channel

a difficult navigational maneuver because it currently changes rapidly from open water to a narrow channel mouth. The Port's Inner Harbor Berth Development project will widen the channel. However, in addition deeper water (-50 feet MLLW) is required to reduce potential lateral forces to acceptable (tolerable) levels. Based on the Hydrodynamic Study conducted for this project (Appendix A.4), a channel depth of -50 feet MLLW represents the minimum required depth at a channel width of 750 feet at the Inner Harbor Channel entrance. Finally, the turning basin will have to be enlarged to accommodate the new generation, larger vessels. Currently, the turning basin requires use of navigational aids to allow safe turning of large vessels.

Based on the results of the studies performed as a part of the -42 foot project as well as applying the results of the Inner Harbor Hydrodynamic Study, it was assumed that the existing channel widths (with the exception of the turning basin) were adequate for the current one-way traffic that currently operates in the Outer Harbor. Any channel widening in the Outer Harbor channel was only considered for the possibility of operating two-way vessel traffic in the Outer Harbor channel. To safely accommodate sixth generation vessels, limited widening is required for the Outer Harbor turning basin.

In addition, the trend in vessel design has been and continues to be toward larger vessels. The larger vessels may be less maneuverable in confined navigation channels due to increases in all key dimensions, including length, draft, and beam. Some of these increases in dimensions are off-set by improved design of rudders and features such as bow and stern thrusters. Maneuverability problems can result from a significant increase in windage and the impact from the vessel hull's mass on the tidal current within the Oakland Inner Harbor, especially when turning or bringing the vessels into berth. San Francisco Bay Bar Pilots find themselves balancing environmental effects (wind and current) with control mechanisms (vessel's main engine, bow thrusters, and escort tugs) to safely transit and maneuver increasingly larger vessels with correspondingly greater mass and momentum.

### 3.3.3 Opportunity No. 1: Growth of Containerized Cargo

Trade along the Pacific Rim is growing at a rapid pace; capturing a greater portion of this trade will benefit the Nation. The Port of Oakland is in a unique position to provide increased capacity for Pacific Rim trade, without subjecting shippers to the congestion currently experienced in the Southern California ports. The Port has planned a significant capacity expansion project (the Vision 2000 Program discussed earlier) to allow for increased growth in container movement through the Port. However, the full benefits of the proposed expansion project can only be realized if the new fifth and sixth generation vessels can be accommodated at Oakland Harbor.

### 3.3.4 Opportunity No. 2: Wetland Enhancement

Several sections of the Water Resources Development Act provide the opportunity for wetland enhancement using dredged materials. This was a successful goal of the Sonoma-Baylands wetlands restoration project which was accomplished with the beneficial reuse of dredged material from the -42 foot project. Beneficial reuse of dredged materials, including wetland and estuarine habitat restoration, was a goal in developing the various disposal options for the proposed navigation improvement project. The disposal options for the proposed project therefore include the proposed Hamilton Wetlands Restoration, Montezuma Wetlands Project, and Middle Harbor Enhancement Area.

### 3.3.5 Opportunity No. 3: Creation of Shallow Water Habitat

Partially as a result of historical dredging activities along the Bay margin, shallow water habitat, including valuable eelgrass habitat, has been adversely impacted. The departure of the Navy from FISCO coupled with the relatively small size of the Middle Harbor area creates an opportunity for restoring the Middle Harbor area to its pre-dredging condition. The proposed Middle Harbor Enhancement Area would use dredged material from the proposed channel deepening project to create highly desirable subtidal shallow water habitat, tidal flats, eelgrass beds, and rocky islands, which will enhance the habitat value in that area.

## 3.4 PLANNING OBJECTIVES

Based on the analysis of the identified problems, needs, and opportunities, and the existing physical, human, and environmental conditions of the study area, planning objectives were identified to direct the formulation and evaluation of alternative plans. The order of the planning objectives listed below does not indicate their level of urgency or their priority.

**Safety:** Improve deep draft navigation safety in the Oakland Harbor and in the Entrance channel.

**Efficiency:** Maximize the efficient use of Oakland Harbor and San Francisco Bay by commercial deep draft vessels. This objective is fundamental to improving the efficiencies of existing and future operations with respect to transportation costs; loading, and unloading; and other costs associated with the movement of waterborne commerce. This objective is consistent with Federal planning guidelines and the primary goal of contributing to the Nation's economic development consistent with applicable environmental laws, regulations, and policy. Specific objectives include reducing tidal delays and increasing economies of scale.

**Environmental:** Maintain and improve environmental resources to the maximum extent practical. This objective concerns compliance with Federal, state and local environmental statutes, regulations, laws, and policies, and is characterized by the following environmental goals:

- Avoid any unacceptable adverse impact on environmental resources.
- Where impacts are not avoidable, provide justifiable mitigation.
- All significant unavoidable impacts must be minimized.
- Improve or restore environmental quality wherever possible without adding undue cost or compromising the primary planning objectives.
- Maximize the beneficial reuse of dredged materials to enhance or create wetland or estuarine areas.
- Maximize the beneficial reuse of dredged material to create shallow water habitat.

## 3.5 PLANNING CONSTRAINTS

Planning constraints are defined as overriding concerns that must be considered in the formulation of a plan. Planning constraints are of such importance that they may not be bartered or exchanged in the planning process. Two potential planning constraints were identified for this study:

(1) The continued existence of the California Least Tern, an endangered species that occasionally feeds in the project area and nests in the project vicinity, cannot be jeopardized by the implementation of the project.

(2) The limiting depth for the harbor channels is set by the San Francisco Bar channel, which currently has a depth of -55 feet MLLW. Tidal conditions and channel depth restrict operating container vessels to a draft of -50 feet MLLW.

# 4.0 PLAN FORMULATION

## 4.1 OVERVIEW

The purpose of this section is to develop a Final Array of Plans from which the recommended plan can be selected. Each plan is comprised of a different combination of components. The "plan components" which must be considered include the following:

1. Entrance channel
2. Outer Harbor channel and turning basin
3. Inner Harbor channel and turning basin
4. Dredged material disposal sites
5. Channel depth

The evaluation of each of these categories of components, with the end result being a combination of components, comprise the Final Array of Plans. The Final Array is then evaluated in terms of the Planning Objectives and required Evaluation Criteria, as specified by the Corps planning guidance, to select a recommended plan.

## 4.2 "WITHOUT PROJECT" PLAN

The Corps planning guidance requires analysis of a "without" project plan as one of the alternatives. Also, to comply with the requirements of the National Environmental Policy Act (NEPA), a "No Action" Plan must be included in the alternative array. The "without project" plan is synonymous with the No Action Plan. The "without project" plan also forms the basis against which all other alternative plans are measured.

The "without project" Plan would retain the existing 42-foot deep navigation channel, with its periodic maintenance dredging program. As larger ships attempt to come into Oakland, the increasing navigation hazard of the relatively shallow water would increase tidal delays for commercial shipping, and would prevent some vessels from using the harbor entirely. The existing depths would therefore limit the size of vessels which could or would utilize the Oakland Harbor. With the global alliances of international shipping carriers and their use of larger container vessels, many of those carriers would be forced into using smaller vessels than they have access to (thus increasing costs by increasing the number of trips required), or to bear the costs of expensive tidal delays or light-loading of cargo.

The "without project" condition includes the Port's new marine terminal development along the Inner Harbor. The development consists of the construction of a tugboat wharf and four new container wharves, and approximately 250 acres of associated container yard space. As part of the new marine terminal development project (the Berths 55 to 58 project), the Port will excavate the northern bank of the Inner Harbor, thereby creating an area of new water between the new Berths 55-58 and the existing 42 foot Federal channel line. This new, wedge-shaped area of water (referred to as the "interconnecting channel") effectively widens the existing channel, and will be deepened to -42 feet MLLW (commensurate with the existing channel depth) as part of the Berth 55-58 project .

## 4.3 CHANNEL COMPONENTS AND TURNING BASIN LOCATION

### 4.3.1 Entrance Channel

The Entrance channel is an integral part of both the Inner and Outer Harbor channels because it is required to provide access to the Harbor channels. The configuration of the Entrance channel is not complex, and only one design was considered. The proposed Entrance channel design includes slight widening of the channel at its entrance to provide more direct access to natural deep water, and to allow vessels to enter the Entrance channel further to the north. This will improve navigation safety by allowing vessels to enter the Outer Harbor channel more directly, thereby avoiding collisions with the wharves.

### 4.3.2 Outer Harbor Channel

Two configurations of the Outer Harbor channel were considered. They differ in the amount of widening performed. Under the first configuration, the channel would be widened to 1,000 feet along its entire length to potentially allow two-way vessel traffic and provide an added margin of safety between moving and berthed vessels. Under the second configuration, only minimal widening of the channel, to accommodate construction of a larger turning basin, would be performed. The two configurations are shown in Figures 4.1 and 4.2. Both configurations were retained for consideration in developing alternative plans. The narrower channel configuration generates less dredged material, resulting in lower costs and somewhat lesser environmental impacts.

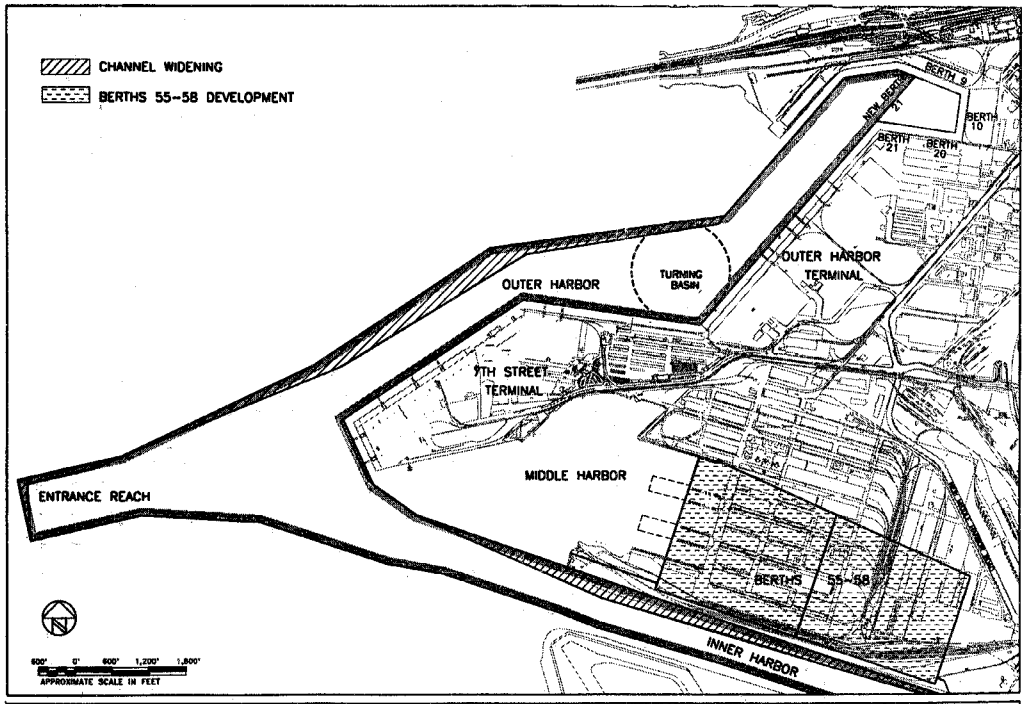
### 4.3.3 Inner Harbor Channel

Only one configuration of the Inner Harbor channel was considered. The Inner Harbor channel must be widened to 750 feet at the western edge of the proposed new berths to safely accommodate the larger sixth generation vessels while also allowing moored vessels to be present at existing berths (APL and Howard terminals) and in the area of the new berths (Figure 4.3).

### 4.3.4 Navigation Considerations

A full ship simulation study has not yet been completed for the proposed project. The design by the Port of Oakland for the channels and turning basins used in this feasibility study is based on long operating experience with the existing project, the insights provided by the computer-aided ship simulation performed for the currently authorized -42 foot project, and input from the San Francisco Bar Pilots. The schedule constraints of the current feasibility study did not permit the completion of a ship simulation study specific to the design vessel anticipated for the recommended project. Therefore, it was not possible to confirm all aspects of the design prior to the completion of the feasibility study. The proposed design is considered adequate, based on the evaluation and confirmation of the highly experienced San Francisco Bar Pilots. The design presented in this document will be confirmed and, if necessary, further refined during the post-authorization design phase by the ship simulation study currently underway which specifically addresses the issues related to additional depth and the revised ship characteristics.

The Port developed the channel configurations and turning basin designs based on two existing studies: the Hydrodynamic Evaluation for Oakland Inner Harbor channel




T:\NEW\PUBLIC\HAND\
SBFT\PLAN3
(ORIG. BASE)

PORT OF OAKLAND
530 WATER STREET OAKLAND, CALIFORNIA

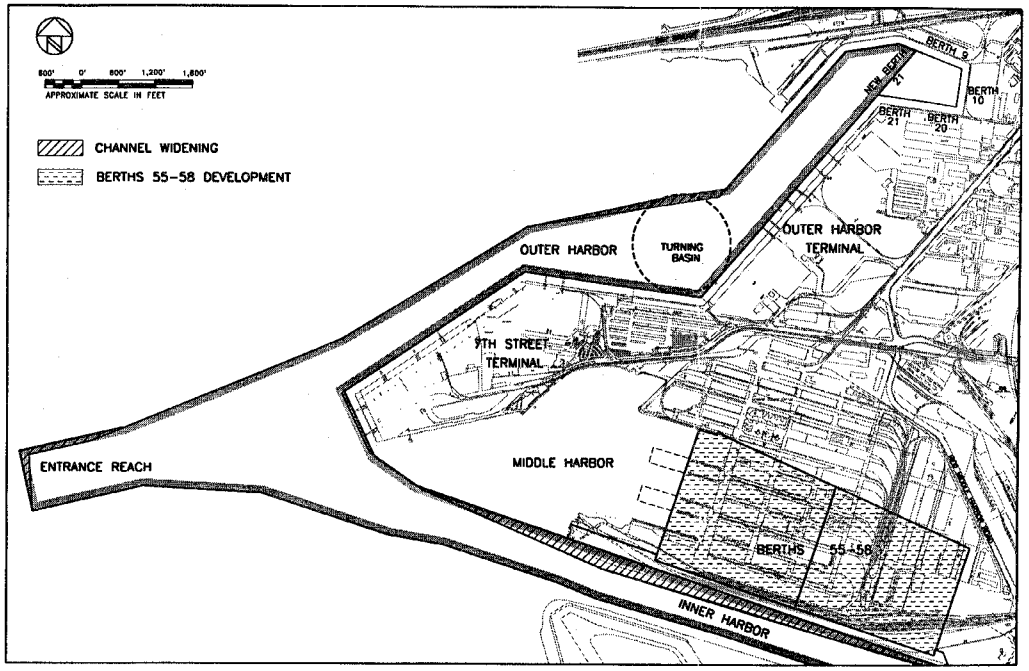
CHIEF ENGINEER
REG. ENGINEER
APPROVED ASST. CHIEF ENGINEER REG. ENGINEER
RECOMMENDED REG. ENGINEER

PRELIMINARY DRAWING
ENGINEERING PROJECT MANAGEMENT DEPT.

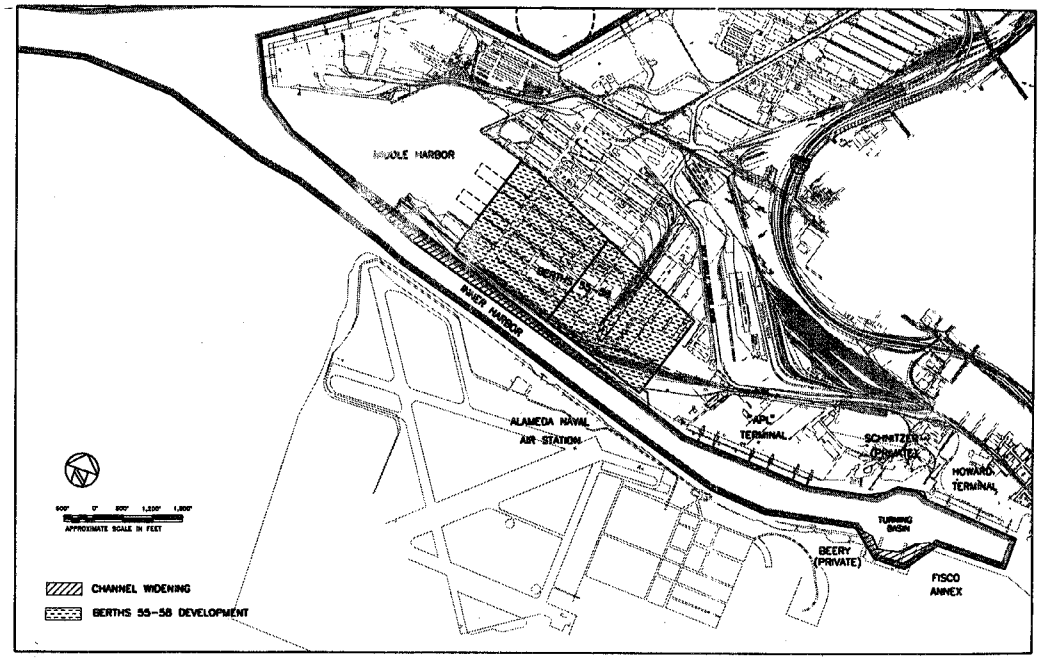
CAKLAND OUTER HARBOR
CONFIGURATION 1

FIGURE 4.1

DATE 1-7-98
SCALE
SHEET 1 OF 1 SHEET
FILE AA-




| | | | | |
|---|---|---|---|---|
| T:\ENG\PUBLIC\HEN\30FT\PLANS4 (OREF: BASE) | PORT OF OAKLAND<br>530 WATER STREET OAKLAND, CALIFORNIA | CHIEF ENGINEER<br>REG. ENGINEER NO.<br>APPROVED: CHIEF ENGINEER REG. ENGINEER NO.<br>RECOMMENDED: REG. ENGINEER NO. | PRELIMINARY DRAWING<br>ENGINEERING PROJECT MANAGEMENT DEPT.<br>OAKLAND OUTER HARBOR CONFIGURATION 2<br>FIGURE 4.2 | DATE 1-7-95<br>SCALE<br>SHEET 1 OF 1 SHEET<br>FILE AA- |




| | | | | |
|---|---|---|---|---|
| T:\ENG\PUBLIC\HAND\SOFT\PLANH (REF: BASE) | PORT OF OAKLAND<br>530 WATER STREET OAKLAND, CALIFORNIA | CHIEF ENGINEER<br>REC. ENGINEER HD<br>APPROVED ASST. CHIEF ENGINEER REC. ENGINEER HZ<br>RECOMMENDED REC. ENGINEER HZ | PRELIMINARY DRAWING<br>ENGINEERING PROJECT MANAGEMENT DEPT.<br>OAKLAND INNER HARBOR<br>FIGURE 4.3 | DATE 1-7-98<br>SCALE<br>SHEET 1 OF 1 SHEET<br>FILE AA- |

(Appendix A.4) and the ship simulation conducted for the turning basin for the -42 foot channel deepening project (Appendix A.6), as well as available information (including input from the San Francisco Bar Pilots) regarding squat[1] requirements (Appendix A.5). The results of the ship simulation for the -42 foot project turning basin are discussed in section 4.3.6, which discusses the Inner Harbor turning basin component.

The Hydrodynamic Study used computer modeling to estimate and graph the relationships among exerted forces (prop wash, vessel wake, and pressure fields), various channel dimensions, and vessel speeds. Pressure fields were the only form of exerted forces determined to have a significant effect.

A range of channel dimensions and vessel speeds were evaluated in the pressure fields model. Channel depths evaluated ranged from -48.4 feet. to -56 feet MLLW. Channel widths used in the assessment ranged from 600 feet to 1,000 feet. Vessel speeds modeled ranged from 4 to 10 knots. To determine the required channel width and depth, the study assumed that presently reported container vessel speeds in the Oakland Inner Harbor would continue to apply. Currently, vessels enter Oakland Entrance channel at approximately 10 knots and the Inner Harbor channel at 8 knots. They then quickly decelerate and are traveling at speeds of 5 to 6 knots when passing the APL terminal. They are thus traveling at approximately 7.5 knots when passing the westernmost berth (Berth 55) planned as part of the Vision 2000 Program.

High speeds are required when entering the Inner Harbor channel to maintain maneuverability and safety when traveling through the currents at the entrance of the Inner Harbor. The Entrance channel leading to the Inner Harbor entrance has a beam set current that creates maneuvering challenges, especially during a maximum flood and ebb currents. For example, a large container ship entering the harbor must maintain a speed of about 10 knots and "crab" counter-clockwise into the flood current. This ship speed is required to allow sufficient capability for abruptly turning the vessel clockwise into the Inner Harbor channel, and to maintain steerage until the ship passes out of the beam set currents and into the constrained Inner Harbor channel.

The study determined that the most substantial reduction in force results from slowing the vessel speed. However, there is no viable means for slowing the vessels while maintaining control at the entrance to the Inner Harbor channel. Tractor tugs alone cannot be used to control the vessels because most of their tug power is consumed just keeping up with a ship at speeds above 7 knots. Dead-slow speed for the large container ships is about 6 knots. Thus tractor tugs cannot be used to maintain control of the large vessels at the high speeds required to enter the channel.

Other conclusions of the Hydrodynamic Study include the following:

- Altered channel width has a more pronounced effect on forces when the vessel speed is high (e.g., approximately 10 knots).
- Deepening the channel effectively reduces the forces on berthed vessels if the passing vessel is moving quickly.
- Force reductions created by deeper channels are less apparent as the channel is widened.

[1] Squat is the term that describes the fact that vessels in motion typically sit deeper in the water than their draft depth would indicate, because the traveling vessel causes the water level around the hull to depress below the still water surface. Squat is also referred to as dynamic sinkage.

The study concludes that the channel must be a minimum of 750 feet wide and 50 feet deep at the westernmost berth of the planned Inner Harbor development, and may narrow to 600 feet wide at the existing APL terminal. With these channel dimensions, berthed vessel motion during passage of an incoming, heavily loaded, Post-Panamax container ship is predicted to reduce loading/unloading efficiency to about 80 percent of normal for a period of about 10 minutes. The Port considers this level of efficiency impact to be acceptable.

### 4.3.5 Outer Harbor Turning Basin

The current Outer Harbor turning basin is located at a bend in the Outer Harbor channel with marine terminals berths adjacent to the south and east of the turning basin and open water to the north and west. It is approximately 1,480 feet in diameter. Using Corps guidance, the " default" design size for the turning basin would be 1,710 feet (1.5 times the length of the design vessel). Given the partially sheltered location of the turning basin, the Port determined that the Outer Harbor Turning basin would need to be enlarged slightly to 1,600 feet. As indicated above, ship simulation modeling will be performed during advanced design studies to refine the need for this widening.

### 4.3.6 Inner Harbor Turning Basin

Extensive analysis and engineering design effort resulted in the current 1,200-foot-diameter Inner Harbor turning basin being located where it is today. Prior to the construction of the new turning basin during the -42' foot project, vessels longer than 750 feet calling at the Inner Harbor turned at a basin constructed by the Port adjacent to Government Island, approximately 4 miles beyond the Port's Howard Terminal. These vessels had to cross two submarine highway tunnels with a limiting depth of -35 feet MLLW. With the construction of the -42 foot project and the new location of the turning basin near the Howard Terminal, this constraint was eliminated; however, concerns over costs and effects on adjacent land-side property owners limited the size of the basin to an approximately 1,200-foot diameter circle. Based on ship simulation studies and extensive work with the San Francisco Bay Bar Pilots, the 1,200-foot diameter basin was determined to be adequate for a 960-foot design vessel.

The new design vessel is approximately 180 feet longer and cannot safely turn in this 1,200-foot basin. Without the enlargement of the turning basin, the design vessel cannot call at the Inner Harbor. Therefore, this study identified the need to enlarge the turning basin. Using the standard Corps criteria the design vessel would require a 1,710-foot turning basin. The Port has determined that given the sheltered location of the turning basin, a 1,500-foot diameter turning basin is likely to be adequate. The proposed 1,500-foot diameter turning basin will provide 50 feet more clearance relative to the design vessel than the current 1,200-foot diameter turning basin provides for the 960-foot design vessel. In addition, senior captain Mr. Kurt B. Braendekilde from Maersk's headquarters in Copenhagen came to the Port in 1996 to evaluate the Inner Harbor turning basin and indicated that he did not foresee any problems turning the design vessel in a 1,500-foot turning basin at the proposed location. The aids to navigation installed as part of the -42 foot channel deepening project would be relocated as part of the turning basin expansion.

Eight potential alignments of the turning basin were considered (Appendix M). The proposed alignment of the 1,500-foot Inner Harbor turning basin was selected based on a screening analysis which considered several factors including cost and environmental

effects. Appendix M.1 provides a detailed description of the turning basin optimization analysis; Appendix M.2 provides geotechnical design information for the selected alignment. With the proposed alignment, three property owners (the City of Alameda, Gateway Properties, and the U.S. Navy) will be affected.

A ship simulation model for the Inner Harbor turning basin will be performed during the design phase and, together with the geotechnical design study, will be used to refine the turning basin design. Extensive debris and material found to be not suitable for unconfined aquatic disposal (NUAD) were removed from the Inner Harbor turning basin widening areas during the -42 foot project. The presence of NUAD sediment in the widening areas has been confirmed by recent sediment sampling, and the Port anticipates that extensive debris will also be encountered during the proposed project.

## 4.4 DREDGED MATERIAL

### 4.4.1 Sediment Quality

The reuse/disposal site options available for dredged sediment are largely dependent on the quality of the sediment, and may also be limited by the economics of the project. The Port has performed sediment sampling and testing for all channel areas considered for deepening and widening. Depending on the channel configuration selected, estimated dredged material volumes range from 12.9 million cubic yards (mcy) to 14.5 mcy. The estimated volumes were divided into five categories based on sediment quality. The Joint Agency Dredged Materials Management Office (DMMO) is responsible for approving the dredged material classifications. DMMO has concurred with the following classifications:

- SUAD (Tier I Exclusion) and Wetland Cover: Approximately 12.2 to 12.7 mcy[2] are suitable for unconfined aquatic disposal (SUAD), based on the Tier I exclusion analysis.

- Wetland Non-Cover: Approximately 0.3 to 1.5 mcy of dredged material are suitable for use as wetland non-cover material (i.e., the material may be used in wetland creation or restoration projects, but may not be used in the top 3 feet). Wetland non-cover quality criteria are set forth in Wolfenden and Carlin, 1992.[3] A portion of this material may meet the criteria for SUAD for in-Bay disposal.

- Construction Fill: The material is not suitable for use in wetland creation/restoration, but may be used in a confined aquatic fill area to create fast land, or may be used as upland fill without any treatment. Up to 300,000 cy of dredged sediment may require upland placement.

- Landfill Material: This material contains elevated levels of chemicals. Up to 100,000 cy of material (primarily debris) are included in this subset of the construction fill category.

---

[2] Ranges, where shown, reflect the potential ranges in quantities associated with the dredging plan selected.

[3] Wolfenden, J.D., and M.P. Carlin. 1992. Interim Sediment Screening Criteria and Testing Requirements for Wetland Creation and Upland Beneficial Reuse. RWQCB, San Francisco Bay Region, Oakland, CA.

Recent supplemental testing has further refined the estimates of the various types of dredged material and is reflected in the volume estimates shown above. The methodology and results of the sediment testing program are discussed in detail in section 3 of EIS/R accompanying this Feasibility Report. Test results are presented in Appendices A.11 and H.

The only dredged material that could not be beneficially reused is material that meets the statutory definition of hazardous waste. The sediment testing results indicated that there is no material within the proposed dredging area that would be classified as state or Federal hazardous waste.

The most restrictive and expensive disposal option that may be required for the proposed project would involve removal of sediments to a regulated landfill. Material that cannot be placed in an aquatic environment but which does not require disposal in a landfill, can be placed in an upland site for either permitted Bay fill or other upland construction uses. The Port's maritime development program includes placing Bay fill and raising existing site elevations at FISCO as part of the development of the new terminals (Berths 55-58). Wetland non-cover material can be placed back into the aquatic environment, but requires a 3-foot cap of cleaner (wetland cover or SUAD) material. Wetland cover material may be reused in wetland reconstruction projects such as Hamilton or Montezuma. Finally, SUAD (Tier I exclusion) material may be used at any reuse location where salinity is not an issue, and can also be disposed of at SFDODS.

Material potentially requiring disposal in a regulated landfill or treatment prior to use as construction fill was only encountered in the Inner Harbor turning basin. The presence of these contaminated sediments and debris is most likely due to the filled-in dry-dock pits that have not been used since the 1940s. Prior to being taken off-site or reused as construction fill, this material will be dried at a rehandling facility located on Port property. It can then be reused or hauled (by truck or rail car) to the appropriate landfill.

Material requiring upland placement (construction fill) was also encountered in the Inner Harbor turning basin. Up to 300,000 cy requiring upland placement may be encountered in the Inner Harbor turning basin. The Port's Vision 2000 development program provides an opportunity for the material to be placed upland by being incorporated into the fill for that project. Wetland non-cover material is found in several locations in the Inner Harbor and Outer Harbor. The majority of this material is fine-grained, soft sediment encountered in the first several feet of deepening. The remainder of the dredged material can be used in any construction or habitat restoration/creation project.

### 4.4.2 Dredged Material Reuse/Disposal Site Options

Twenty sites were initially considered as potential dredged material reuse or disposal locations (Figure 4.4). To determine which sites are suitable for use as part of the proposed project, the EIS/R applied several screening criteria, which included the requirement that the site would be available (infrastructure in place and permitting completed) to receive dredged material by October 2000. Potential reuse/disposal sites that did not meet the screening criteria were not recommended in the EIS/R or in the alternatives development process for this Feasibility Study. However, should any of the sites that were not recommended become available within the required time frame, and

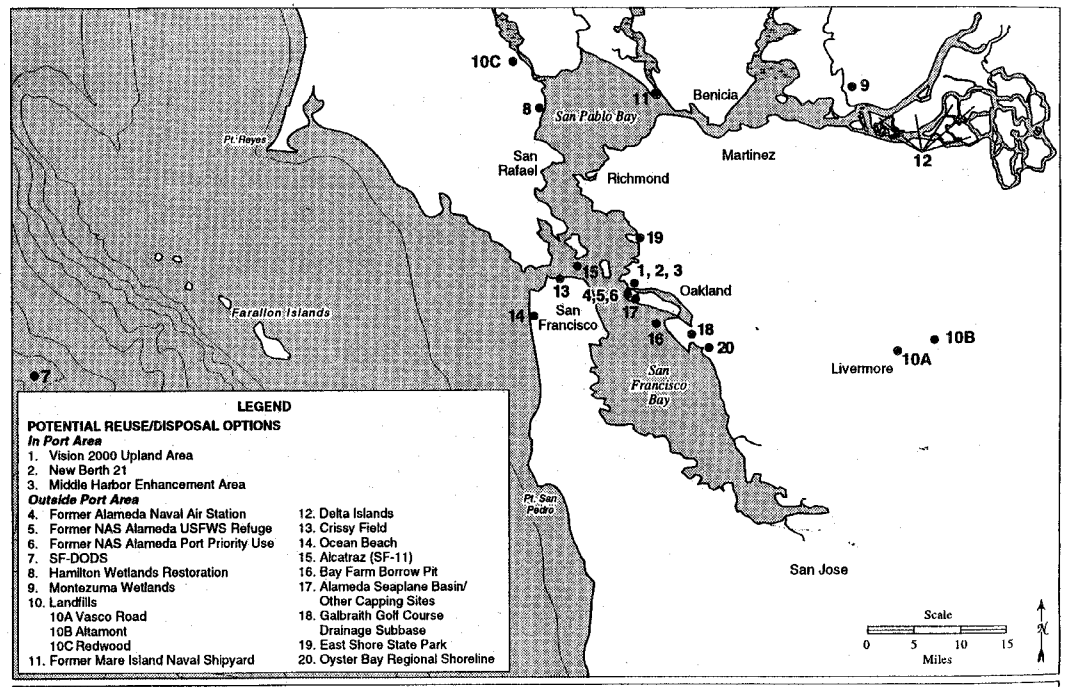



**Figure 4.4**

**POTENTIAL REUSE/DISPOSAL OPTIONS**

logistics and costs permit, they may be used as alternate reuse/disposal sites at the discretion of the Corps, provided they were fully evaluated in the EIS/R. In other words, if technically and economically advisable, the Corps may select fully evaluated dredged material reuse/disposal options other than those selected in this FS.

The following dredged material reuse/disposal site options were considered for the Oakland Harbor Deep Draft Navigation study. Table 4.1 summarizes the disposal sites which were considered.

**San Francisco Deep Ocean Disposal Site (SFDODS).** This is the designated deep ocean disposal site for the San Francisco Bay Area. It is currently operational and available to receive up to 4.8 mcy of material per year. Consistent with its designation process, this site is to be used only when other reuse/disposal sites are unavailable or unable to meet the capacity demands associated with the dredging schedule. This site can accept only SUAD material.

**Former Mare Island Naval Shipyard.** Three potential areas at the former Mare Island Naval Shipyard were considered: the dredge ponds, wetland restoration, and general fill or landfill capping. The Mare Island dredge ponds are currently being maintained; however, a recent feasibility study suggested that the dredge ponds on Mare Island would be too expensive for the City of Vallejo to use. This option was eliminated from further consideration because there is no stable project description for this project, and it appears highly unlikely that the required permits, infrastructure, and environmental documentation will be in place within the required time frame. Also, the Port expects that there would be large tipping fee.

**Delta Islands.** Under this reuse option, dredged material would be used to strengthen and maintain levees on islands located in the western portion of the Delta. A rehandling facility to receive dredged material will be permitted and constructed in the near future. However, the existing environmental documentation does not support the use of sediments from saline environments for this purpose. There are also a considerable number of historic resources on the Delta islands that could be impacted by the placement of dredged materials. Finally, use of the Delta islands to receive dredged materials from a saline environment also conflicts with the State Water Resources Control Board's Non-Degradation Policy. This option was thus removed from further consideration as a reuse/disposal option for the project.

**Vision 2000 Area.** This area comprises 818 acres of upland property that will be redeveloped into marine terminals and a joint intermodal rail yard as part of the Port's Vision 2000 Program. It includes a portion of new land to be created in the area between the former Navy piers at FISCO as part of the Berth 55-58 project. The area between the finger piers will be diked off and filled to create approximately 30 acres of new fastland. Up to 2.5 mcy of dredged material from the proposed project may be used at this area to fill in the newly-diked area to create fast land or to raise grades prior to construction of the new terminals. This option was retained for further consideration.

**New Berth 21.** An area of open water currently comprising the northeastern-most extent of the Outer Harbor channel, bordered by Berths 8 and 9 to the north, Berth 10 to the east, and Berths 20 and 21 to the south (the "dogleg," see Figure 2.4) may be filled in the future as part of the replacement of the Port's Berth 21. The "dogleg" area is approximately 1300 feet long, and is difficult for modern ships to access. It may be completely inaccessible for sixth generation container vessels. The area that may be filled is approximately 27 acres, and roughly square in shape. A portion of the land that

Table 4.1. Summary of Disposal Sites

| Disposal Site(s): | Carried Forward | Reason |
|---|---|---|
| San Francisco Deep Ocean Disposal Site | Yes | Available; large capacity; default disposal location for SUAD material |
| Former Mare Island Naval Shipyard | No | No stable project description; cultural resources concerns; potentially large tipping fee |
| Delta Islands | No | Does not support the use of sediments from saline environment |
| Vision 2000 Upland Area | Yes | Berth 55-58 project will begin before the -50 foot project; permits will be in place |
| New Berth 21 | No | Site may not be available on a timely basis; the Port (local sponsor) does not have control over timing |
| Middle Harbor Enhancement Area | Yes | To create highly desirable shallow water habitat area |
| Crissy Field | No | Project sponsor requested this area be removed from consideration |
| Ocean Beach Nourishment | No | Project sponsor requested this area be removed from consideration |
| Former Alameda NAS-Construction Fill | No | Permitting not complete, volume not defined yet (project in very early pre-design stage) |
| Former Alameda NAS-USFWS Refuge | No | Restoration plans are still uncertain and no project schedule has been developed |
| Former Alameda NAS-Port Priority Use | No | Port Priority Use designation for this area has been removed from Seaport Plan |
| Aquatic Disposal Site-SF-11 (Alcatraz) | No | Designated for use by maintenance dredging projects only |
| Hamilton Wetlands Restoration | Yes | Desirable environmental restoration project |
| Montezuma Wetlands Restoration | Yes | Desirable environmental restoration project |
| Bay Farm Borrow Pit | No | No intent by project sponsor to designate location as a dredged material disposal site |
| Alameda Seaplan Basin and other Capping Sites | No | No interest from potential project sponsor in capping as a remedy |
| Various Landfills | Yes | Adequate landfill space is currently available; landfill disposal may be required for some contaminated sediment/debris |
| East Shore State Park | No | Unlikely that permits and required environmental documentation will be in place in time for -50 project |
| Oyster Bay Regional Shoreline | No | Unlikely that permits and required environmental documentation will be in place in time for -50 project |
| Galbraith Golf Course Drainage Subbase | No | Clean dredged material not likely to be available in time for golf course reconstruction project; material will be supplied by Berth 55-58 project |

may be filled is part of the Oakland Army Base, which is being closed through the Base Realignment and Closure (BRAC) process. While the Port will likely obtain this land,[4] there may be delays in the base closure process. Thus, the Port may not be able to obtain the land and complete the development, planning, and environmental review process on a timely basis. While this reuse/disposal option was retained for consideration in the EIS/R because of the area's designation for maritime use, the degree of uncertainty associated with the timing of this potential reuse/disposal option prevents its selection in the feasibility study. Thus, New Berth 21 was not recommended as a reuse/disposal option for the proposed project. However, should the area become available on a timely basis, it would be very cost-effective to reuse dredged material as fill in this area. Because this reuse/disposal option was fully evaluated in the EIS/R it may be used at the discretion of the Corps, if it becomes available and is cost-effective.

**Middle Harbor Enhancement Area (MHEA).** Due to the closure of FISCO and the Port's plan to create four new berths and a tug wharf along the Inner Harbor, the Middle Harbor area is no longer required for active maritime operations. However, past Navy operations have resulted in the presence of contaminated sediments in this area. The Port proposes to create a shallow water habitat area in the Middle Harbor to enhance the vitality and productivity of local wildlife. This reuse option would create a similar habitat to that which existed in this area prior to Navy dredging operations in the 1940s. In addition, the dredged material would serve as the remediation for the contaminated areas. The proposed project is optimally designed to receive 7 mcy of sediment, and the Bay Conservation and Development Commission (the local agency with jurisdiction over placement of fill into San Francisco Bay) has agreed that the project is consistent with its Management Program and the Bay Plan. The Port has committed to using only material suitable for in-Bay disposal to construct this site. It is expected to be available in time for the proposed project.

**Crissy Field.** Remediation and restoration are required at Crissy Field in the Presidio. However, the project sponsor requested that this area be removed from consideration as a dredged material reuse area. Therefore, this potential reuse location was removed from further consideration.

**Ocean Beach Nourishment.** Replacement of sand removed by natural wave and current actions would help sustain the viability of Ocean Beach. However, the project sponsor requested that this area be removed from consideration as a dredged material reuse area. Therefore, this potential reuse location was removed from further consideration.

**Former NAS Alameda – Construction Fill.** Under this reuse option, the Port would deliver up to 750,000 cubic yards of clean fill to the former NAS Alameda (now called Alameda Point) for use in future projects. This reuse option would represent a very cost-effective source of fill required for the redevelopment of Alameda Point. An appropriate stockpile area is available, and permitting is possible within the required time frame. However, planning of the redevelopment program is still in the preliminary stages, so that exact quantity requirements could not be defined at the time the EIS/R was prepared. Therefore, this reuse option was eliminated from further consideration in the FS.

---

[4] The land has been designated for maritime-related uses in the Community Reuse Plan.

Subsequent to the preparation of the FEIS/R, the Alameda Reuse and Redevelopment Authority (ARRA) commissioned a study on the feasibility of developing a golf course on the site. The study concluded that up to 1.8 million cubic yards of dredged sand might be used at the site. As with the New Berth 21 reuse/disposal option, the EIS/R fully evaluated this option because it met the criteria developed for the EIS/R. Thus, if the ARRA completes the required permitting, the Corps, at its discretion, may choose this reuse/disposal option.

**Former NAS Alameda -- USFWS Refuge.** This reuse option would involve delivering clean dredged material to Alameda Point for use in restoring the wildlife refuge area located in the southwestern portion of the former base. However, restoration plans are still uncertain, and no project schedule has been developed. In addition, the land is currently still under Navy control, and has not been transferred to USFWS. Therefore, this reuse option was removed from further consideration.

**Former NAS Alameda -- Port Priority Use.** A portion of former NAS Alameda was formerly designated as a Port Priority Use area in the Seaport Plan. The Port Priority Use designation has been removed from Alameda Point east to the Inner Harbor submarine tunnel crossings. In addition, Port of Oakland facilities are located north of Alameda, and ground transportation from Alameda Island to the mainland is heavily constrained (limited tunnel and bridge capacity). Thus, there is no local sponsor who is interested in pursuing port use of the former NAS Alameda, and this reuse option has been eliminated from further consideration.

**Aquatic Disposal Site SF-11 (Alcatraz).** This potential disposal location is designated primarily for the disposal of smaller quantities of maintenance dredging material. It is not designated for use by new projects. Therefore, this potential disposal option was removed from further consideration.

**Hamilton Wetlands Restoration (HWR).** This potential reuse option is a wetlands restoration project that is designed to accept SUAD (including wetland cover) dredged material from a variety of dredging projects to assist with the restoration process of former wetlands at the former Hamilton Army Airfield, Antenna Field, and baseball fields. The Hamilton Wetlands Restoration (HWR) project sponsor is very interested in receiving dredged material from the proposed deepening project. The environmental documentation (permitting) for the HWR project has not been completed. It is uncertain whether the required permits and facilities would be in place in time for the proposed project, although it is likely that this reuse option will be available during the later stages of the proposed project. The project represents a beneficial reuse of dredged material and is located relatively close to the Port, and is therefore highly desirable if available on a timely basis. A minimum of approximately 2.5 mcy of dredged material are required to construct a separable component of HWR project. Because this reuse site has high potential environmental benefits, and may be available during a portion of the construction period, this option has been retained for further consideration.

**Montezuma Wetlands Project (MWP).** This potential reuse option is a wetlands restoration project that is designed to accept SUAD (including wetland cover) and wetland non-cover dredged material from a variety of dredging projects to assist with the restoration process. Wetland non-cover material can comprise no more than 33 percent of the total dredged material delivered. As with the HWR project, the environmental documentation for this project has not been completed, and it is uncertain whether the required permits and facilities would be in place in time for the

proposed project. In addition, the project sponsor proposes to charge a tipping fee for accepting dredged material. Nonetheless, because this reuse option represents a positive reuse of dredged material and is therefore desirable if available on a timely basis, it was retained for further consideration. A minimum of 3.0 mcy are required to achieve cost-effective tipping fees at this site.

**Bay Farm Borrow Pit.** Clean dredged materials could be used to refill the Bay Farm Borrow Pit. However, the potential project sponsor, the Corps, has no plans to begin the process of designating this site as a dredged material disposal site. In addition, the City of Alameda has also objected to this site for use as a dredged material disposal site for this or any other Port project. Therefore, this potential reuse option has been eliminated from further consideration.

**Alameda Seaplane Basin and Other Capping Sites.** Clean dredged material could be used to cap contaminated sediments in place. However, the potential project sponsor for the Alameda Seaplane Basin is not interested in capping as a remedy because capping would constrain future use of the area, and no other potential capping sites have been identified. Thus, this reuse/disposal option has been removed from further consideration.

**Various Landfills.** Under this disposal option, up to 800,000 cy of moderately to severely contaminated sediment and debris would be temporarily dried at a rehandling facility at the Port, and then transported to a local or out of state landfill for confined disposal. Adequate landfill space is currently available. This option has been retained for further consideration.

**East Shore State Park.** Under this reuse option, clean dredged material would be used to help construct a new park. Although the project sponsor has expressed interest in receiving the material, it is unlikely that permits and the required environmental documentation would be in place in time for the proposed project. Thus, this site has been eliminated from further consideration.

**Oyster Bay Regional Shoreline.** Under this reuse option, clean dredged material would be used to enhance an existing shoreline that is slated to provide public access. Although the project sponsor has expressed interest in receiving the material, it is unlikely that permits and the required environmental documentation would be in place in time for the proposed project. Thus, this site has been removed from further consideration.

**Galbraith Golf Course Drainage Subbase.** Approximately 2 to 2.5 feet of drainage subbase is required to be placed at the Galbraith Golf Course as part of the reconstruction of the golf course. However, clean dredged material from the proposed project will probably not be available in time for the reconstruction project, and will more likely be delivered from another Port project (e.g., the Berth 55-58 project). Therefore, this potential reuse option has been eliminated from further consideration.

### 4.4.3 Dredged Material Reuse/Disposal Sites Retained for Further Consideration

Based on an evaluation of the sponsor's desire to accept dredged material, and the ability of the sponsor to ensure that the required environmental document, permits, and infrastructure will be in place in the time frame required, six reuse/disposal options were retained for further consideration in the FS. These six reuse/disposal options are:

- SFDODS (capable of receiving SUAD material only),
- Vision 2000 Area (capable of receiving all types of material that may be generated under the proposed project except material requiring landfill disposal),
- Middle Harbor Enhancement Area (capable of receiving SUAD/wetland cover material),
- Hamilton Wetlands Restoration (capable of receiving SUAD/wetland cover material),
- Montezuma Wetlands Project (capable of receiving SUAD/wetland cover material, and limited wetland non-cover material), and
- Various Landfills (capable of receiving all types of material).

The MHEA is considered the first choice because it results in the creation of habitat, is in the center of the dredging area and can accept a large quantity of SUAD dredged material. The Vision 2000 Area ranks second; it is also close to the dredging area and provides beneficial reuse for both SUAD and NUAD dredged material. The Hamilton and Montezuma Wetlands Restoration projects rank third and fourth, respectively; they provide environmental restoration benefits, but require longer transport distances and are significantly more costly. The Montezuma site is located much further away from the project location than Hamilton, which results in higher transportation costs and greater air quality impacts. However, Montezuma is attractive as a reuse site because it is proposed to accept both wetland cover and wetland non-cover quality sediments. Finally, SFDODS and Various Landfills rank fifth, because these options are strictly disposal options, and do not provide for any type of reuse.[5] Because SFDODS is located outside of the local air basin, air quality impacts associated with transporting material to SFDODS are considered less significant than air quality impacts associated with transport to the Montezuma Wetlands Project.

If other nearby beneficial reuse/disposal sites (e.g., New Berth 21 or Former NAS Alameda Construction Fill) become available in time for the construction of the project, they would take precedence over disposal at SFDODS. Use of these alternate reuse/disposal sites would provide a cost savings to the project, as well as environmental benefits through air emission reductions and beneficial reuse of dredged material. Thus, within the constraints of sediment quality, cost, environmental impact, and availability, sediment generated by the proposed project would be reused or disposed of in the order of preference listed.

Despite the fact that ocean disposal is less costly than the Hamilton and Montezuma restoration options, the Hamilton and Montezuma restoration projects are ranked higher than the SFDODS option due to the ecological restoration benefits that these options provide. The Montezuma site may also provided the added benefit of enabling beneficial reuse of wetland non-cover dredged material in an ecological restoration site. The following two subsections describe the potential ecological benefits provided by the Hamilton and Montezuma Wetlands Projects, respectively.

**4.4.3.1 Potential Ecological Benefits of the Hamilton Wetlands Project.** The purpose of the Hamilton Wetlands Project is to restore 990 acres of habitat, including 570 acres of salt marsh habitat using 10.6 million cubic yards of dredged material from the San Francisco Bay Area. Salt marsh is considered especially valuable due to its scarcity, and the additional salt marsh will benefit Federally listed threatened and endangered species

[5] It is possible to reuse some dredged material as daily cover at a landfill, however, this would displace other materials to be placed into the landfill.

that depend on this scarce habitat. Specific benefits associated with the project are discussed below.

The additional salt marsh will provide ideal habitat for the Federally listed endangered salt marsh field mouse. Development of undisturbed grassland, seasonal wetland, and brackish marsh will also substantially increase the area of preferred and undisturbed nesting habitat for the northern harrier, a state-listed species of special concern. These habitat will also substantially increase the area of suitable waterfowl nesting habitat, as well as foraging and resting habitat for migrating and wintering waterfowl.

Intertidal mudflat habitat will develop along the channel margins following excavation and along the margins of levees following introduction of tidal flows to the restoration site. Intertidal mudflats will develop between mean sea level and extreme low water. As sediments are deposited and the site develops, intertidal mudflats will be present in varying amounts. When the wetlands are fully functioning, intertidal mudflats will remain in the form of slough channels and the margins of subtidal channels.

Subtidal channels will provide suitable resting habitat for the brown pelican, double-crested cormorant, San Pablo song sparrow, and salt marsh yellowthroat. If tidal flows into the marsh are sufficient to entrain substantial numbers of fish and other prey items, open water areas will also provide suitable foraging habitat for these species. Tidal mudflats in slough channels and along the margins of subtidal channels will provide foraging and resting habitat areas for shorebirds that migrate through or overwinter in coastal and central California.

Unvegetated shallow water and exposed mud associated with seasonal wetlands and hypersaline ponds that will be restored west of the cross panhandle levee will also provide suitable shorebird foraging habitat. These habitat areas will provide resting areas during periods of extreme tides that inundate tidal habitats used regularly by these species.

Stable, vegetated channels that will become deeper and wider over time may be used as rearing habitat by longfin and delta smelt and other estuarine and marine fish species. The channels may also provide habitat for organisms that provide important food sources for fish. Juvenile chinook salmon and steelhead may temporarily rear in the slough channels during their seaward migration.

**4.4.3.2 Potential Ecological Benefits of the Montezuma Wetlands Project.** The purpose of the Montezuma Wetlands Project is to use approved dredged sediment to restore approximately 1,822 acres of diked former baylands to a tidal wetland ecosystem, which includes some seasonal wetland features. The project will use approximately 14 mcy of sediment dredged from the San Francisco Bay Area to raise diked, subsided areas to elevations suitable for a diversity of habitats including high and low tidal brackish marsh, channels, intertidal ponds, seasonal wetland features, and alkali vernal pools. This will involve converting grasslands and diked seasonal wetlands to tidal marsh, a habitat type that is more rare. This habitat conversion will result in a 4% decrease in the acreage of seasonal wetlands within Suisun Marsh; however, it will increase its tidal wetlands by 17%.

Hundreds of acres of high marsh, also known as pickleweed marsh, will be restored by this project. Pickleweed marsh is habitat for the endangered salt marsh harvest mouse. The present condition of pickleweed habitat at the Montezuma site is relatively poor, mainly because it is subject to drastic year-to-year variation in rainfall and ponding. Of

the total existing pickleweed acreage, 77.2% is of poor quality, 19.1% is of moderate quality, and 3.6% is of high quality. In wet years, essentially the entire salt marsh harvest mouse habitat may be submerged for a period of months. As a result, there may be periodic salt marsh harvest mouse population crashes. To address this concern and make the habitat more predictable and of higher quality for the salt marsh harvest mouse, a 68-acre diked pickleweed marsh with water control features will be constructed. This will ensure that a sufficiently high quality pickleweed habitat is present every year, and that the local salt marsh harvest mouse will not undergo population crashes every few years. This project will thus help support the recovery of this endangered mammal in Suisun Marsh.

The diked site currently supports no fish habitat. The Project will provide over 1,400 acres of low elevation brackish marsh, a shallow tidal habitat with emergent vegetation that will provide breeding habitat for two threatened species of fish, the Delta smelt and the Sacramento splittail. The low marsh will support the growth of zooplankton and macrophytes that these small fish consume and will thus provide an important fish nursery area. "Point bars" (gradually sloped areas along the channel banks) will be created to provide predictable vegetated shallow-water habitat where native Delta fish will find food, cover, and essential spawning and rearing habitat. Winter-run chinook salmon (an endangered species) is expected to benefit from the restored wetlands as well, due to the shallow water habitat that will be available for rearing juveniles. Mason's lilaeopsis, a state-listed rare plant that grows within the "splash zone" of brackish tidal marshes, is also expected to benefit from the conversion of the site to tidal marsh. Mason's lilaeopsis currently occurs on this site only on the outboard slope of the perimeter levee. The restored wetland would also provide habitat for numerous other special status plant species.

As the aquatic vegetation, plankton, and fish become increasingly abundant in the low marsh over time, dabbling ducks and other waterfowl will be attracted to the marsh to feed and breed. Similarly, wading birds such as egrets and herons will find an abundance of food such as fish and invertebrates along the tidal channels. The shallow waters that support tules and cattails will also be important in producing aquatic insects which are important in the diets of many terrestrial and marsh birds.

The project design will also restore the historic connection between tidal marsh wetlands and the wetlands of the fluvial hollows, which carry intermittent streams. This wetland/upland interface will also provide constructed seasonal wetlands and vernal pools, which will be used by migratory birds and shorebirds for resting and foraging. The wetland corridor into the uplands will provide the salt marsh harvest mouse with an escape route from high tides, as well as a foraging area for egrets, herons, and waterfowl.

Besides benefits to listed species (such as the endangered salt marsh harvest mouse and winter-run chinook salmon, and the threatened Delta smelt and Sacramento splittail) many other species will benefit from restoration of their native habitats. These include terrestrial raptors, songbirds, shorebirds, waterfowl, rails, and wading birds. Special status marsh birds that occur on site and would benefit from the tidal marsh conversion include the Suisun song sparrow, salt marsh yellowthroat, tricolored blackbird, black crowned night heron, and American bittern. Other species that could potentially occur if the marsh is restored include white-faced ibis, California black rail, and the endangered California clapper rail. Although there are presently no clapper rails on the site, they historically occurred on pickleweed marsh habitats in Suisun Marsh, which are now relatively rare. The Montezuma Wetlands Project is expected to have widespread benefits for a wide range of species. The conversion of this diked area to tidal wetland

may assist in the recovery of numerous species that are now endangered, threatened, rare, or of special concern due to the loss of habitat or declining populations.

### 4.4.4 Dredging Methods

Several types of dredging equipment may be used to accomplish the proposed project. The three primary types of equipment are described below. The dredges will most likely be electric-powered dredges. No differences in performance characteristics are expected from electric-powered dredges compared to diesel-powered dredges. Electric powered dredges provide significant environmental benefits compared to diesel-powered dredges (i.e., air quality impacts are reduced substantially, the potential for fuel spills is reduced, and electric powered dredges are much less noisy).

**Clamshell Or Excavator Dredge And Barge.** The clamshell dredge removes sediment with a bucket which is dropped through the water and into the sediment. The bucket is raised and dumped into a barge (scow) which is subsequently hauled to the disposal site with a tugboat. Disposal is either accomplished by bottom dumping (in which the scow hinges open with the sediment falling to the bottom), direct pump-out from the scow, or off-loading with another clamshell dredge. An excavator (or dipper) dredge operates in a similar manner except that the bucket is manipulated with hydraulically controlled mechanical arms instead of being suspended by cable. Turbidity occurs as the bucket bites into the sediment, as it travels up through the water, and as it breaks the surface of the water. Consolidated material tends to remain in a mass when disposed, even at high energy sites. Clamshell and excavator dredges can be equipped with a variety of bucket types and sizes for different types of sediment. This type of dredging is preferable for contaminated sediments where turbidity is a concern and where the introduction of slurry water might cause discharge problems at the disposal site. These types of dredges use diesel-electric motors and can easily be converted to fully electric dredges.

**Hydraulic Cutterhead Dredge.** The hydraulic cutterhead dredge is a suction pump-type dredge that utilizes a revolving cutterhead to bite into and loosen the bottom material. This type of dredge is especially suited to dredging consolidated or compacted materials and can be used to remove soft rock deposits. Some of the Merritt Sands are expected to be cemented, thus the power provided by the hydraulic cutterhead dredge is particularly desirable. The dredged material is pumped from the dredge site through floating and/or submerged pipelines and discharged directly into the reuse/disposal site. With the use of the booster pumps, it is possible to pump the material as far as 25,000 feet. Thus, this dredging method can be used to move material from the furthest reaches of the Inner and Outer Harbor channels to the MHEA or other sites within the general Port area. This type of dredge can also be converted to full electrical operation; one such electric cutterhead dredge is currently in operation.

**Hopper Dredge.** Hopper dredges are typically self-propelled ocean-going vessels which suction pump soft unconsolidated materials into a temporary storage hopper built into the hull of the vessel. Once the hopper has been filled, the dredge normally proceeds to the disposal site where the material is bottom dumped. The hopper dredge can be very effective at removing softer unconsolidated material from underlying harder strata. Due to its self-propelled nature, this type of dredge is more difficult to convert to full electric operation. It is not anticipated that hopper dredges will be required for the proposed project.

## 4.5 FORMULATION OF THE PLAN

The five project components described in section 4.3 were combined into six potential project plans, all of which would use a combination of the six reuse/disposal options identified above. These potential plans are evaluated and screened below, and Table 4.2 summarizes this evaluation and screening. Disposal options are formulated in section 4.6, subsequent to the dredging plans.

### 4.5.1 Plan A - "Without Project" Plan

This plan would retain the existing 42-foot deep navigation channel, with its periodic maintenance dredging program. The Outer Harbor turning basin would remain at 1,480 feet, and the Inner Harbor turning basin would remain at 1,200 feet.

### 4.5.2 Plan B - Full Project Plan

This plan of improvement would deepen the Outer Harbor and widen the Outer Harbor to 1,000 feet to improve the safety for moored vessels. During the Reconnaissance phase, it was believed that a 1,000 foot-wide channel would allow for two-way traffic. However, based on discussions with the San Francisco Bar Pilots, the proposed width would still be too narrow, and two-way traffic would still be constrained by the size of the turning basin. The plan also includes deepening and widening the Inner Harbor channel, and enlarging the existing Inner Harbor turning basin.

### 4.5.3 Plan C - Full Inner Harbor Improvements

This plan of improvement would deepen and widen the Inner Harbor channel and enlarge the Inner Harbor turning basin, with no improvements for the Outer Harbor channel. Partners within the global shipping alliances are located in both the Inner and the Outer Harbors. The presence of alliance partners in both the Inner and the Outer Harbors necessitates treating the Inner and Outer Harbor channels as a single functioning harbor. Construction of only the Inner Harbor would hamper the realization of benefits from the project because the shipping alliances make decisions on vessel fleet utilization based on the depths of both channels. The costs to dredge the Inner Harbor and the Outer Harbor are similar, and the economic analysis indicates that there are substantial benefits to deepening both harbors. Therefore, Plan C was dropped from further consideration.

### 4.5.4 Plan D - Full Outer Harbor Improvements

This plan of improvement would deepen and slightly widen the Outer Harbor channel and slightly enlarge the Outer Harbor turning basin, with no improvements for the Inner Harbor. As described for Plan C, above, the presence of alliance partners in both the Inner Harbor and the Outer Harbor necessitates treating the Inner and Outer Harbor channels as a single functioning harbor. Construction of only the Outer Harbor would hamper the realization of benefits from the project because the shipping alliances make decisions on vessel fleet utilization based on the depths of both channels. Again, costs to dredge the Inner Harbor and the Outer Harbor are similar, and the economic analysis indicates that there are substantial benefits to deepening both harbors. Therefore, Plan D was dropped from further consideration.

Table 4.2. Summary of Evaluation and Sceening of Channel Design Options Considered

| Plan Option | Description | Carried Forward | Reason |
|---|---|---|---|
| A | No Action Plan | Yes | Required by NEPA and Corps Planning Guidelines |
| B | Deepen Outer Harbor and widen Outer Harbor to 1,000 feet, deepen and widen Inner Harbor, enlarge existing Inner Harbor turning basin | No | Two way traffic cannot be accomplished with a 1,000-foot wide channel; requires additional dredging of an estimated 2.5 mcy |
| C | Deepen and widen the Inner Harbor channel and enlarge Inner Harbor turning basin | No | Does not address Outer Harbor -- fails to satisfy all plan objectives |
| D | Deepen and slightly widen Outer Harbor channel and slightly enlarge Outer Harbor turning basin | No | Does not address Inner Harbor-- fails to satisfy all plan objectives |
| | Deepen and widen Outer Harbor channel, enlarge Outer Harbor turning basin, deepen Inner Harbor channel | No | Does not provide sufficient width in the Inner Harbor for safe passage of vessels; relic of the planning process |
| F | Deepen Outer Harbor channel, slightly enlarge Outer Harbor turning basin, deepen and widen Inner Harbor channel, enlarge Inner Harbor turning basin | Yes | Based on economic value of deepening the Inner and Outer Harbors; includes all five project components; satisfies all plan objectives |

### 4.5.5 Plan E - Full Outer Harbor Improvements and Specific Inner Harbor Improvements

This plan of improvement would deepen and widen the Outer Harbor channel, enlarge the Outer Harbor turning basin, deepen the Inner Harbor, and enlarge the Inner Harbor turning basin. No widening of the Inner Harbor channel would be included in this plan.

This plan is a relic of the planning process; it was created before the Port initiated the development of its new marine terminals development along the Inner Harbor. The proposed widening of the Inner Harbor channel under the other action plans is limited to deepening of a narrow strip of newly submerged land (the interconnecting channel) created as a result of the Port maritime development program. Widening of the Inner Harbor is required to allow vessels to pass moored vessels at the new berths. Thus, Plan E was eliminated from further consideration.

### 4.5.6 Plan F - Specific Outer Harbor Improvements and Full Inner Harbor Improvements

This plan of improvement would deepen the Outer Harbor channel, slightly enlarge the Outer Harbor turning basin, deepen the Inner Harbor channel, and enlarge the Inner Harbor turning basin. Only very limited channel widening in the Outer Harbor would be included in this plan.

Based on the economic value of deepening both the Inner and Outer Harbors, only plans addressing both the Inner and Outer Harbors (Plans B and F) were retained for further consideration in this study. The potential benefits are large, and deepening only a portion of the channels fails to satisfy all the plan objectives (i.e., safety and efficiency gains would be limited to the portions of the channels that were deepened), and is not acceptable to the shippers in alliances (greater than 70 percent of the shippers calling on the Port are part of alliances). The plan of action thus includes all five project components. Plan B offers only minimal benefits (limited safety improvements only, two-way vessel traffic is not feasible with a 1,000-foot wide channel) when compared to Plan F, and requires the dredging of an estimated additional 2.5 mcy of material. Because further evaluation during the feasibility study phase showed that two-way traffic in the Outer Harbor could not be accomplished with a 1,000-foot wide channel, Plan B was also eliminated from further consideration. Plan F is the selected plan of improvement carried forward for analysis in this document.

The following section evaluates a range of potential reuse/disposal options combinations.

## 4.6 DREDGED MATERIAL REUSE/DISPOSAL SCENARIOS

As indicated in section 4.4, six dredged material reuse/disposal locations were retained for the study. As part of the FS, various combinations of these reuse/disposal locations were evaluated to arrive at a range of scenarios that would be cost effective and would provide environmental restorations benefits and maximize reuse, where possible. All reuse/disposal options were also evaluated for cost-effectiveness. The most cost-effective reuse/disposal option is the MHEA, followed by the Vision 2000 Area. Both sites are in close proximity to the dredging area, thereby minimizing transportation costs. SFDODS ranks third for cost-effectiveness. The Hamilton Wetlands Restoration Project and the Montezuma Wetlands Project rank fourth and fifth, respectively.

Finally, of the six reuse/disposal alternatives retained for consideration in plan formulation, landfill disposal is the least cost-effective.

Table 4.3 provides a summary of the reuse/disposal scenarios considered. All seven scenarios include the Vision 2000 Area for reuse of approximately 300,000 cy of construction fill quality material, and the landfill disposal option for disposal of approximately 100,000 cy of sediment and debris requiring landfill disposal. These two options are required to address material that is not suitable for reuse in an aquatic environment. The discussion of the seven scenarios, below, focuses on the disposition of the remaining 12.5 mcy.

#### 4.6.1 Scenario I: Habitat Reuse and Ocean Disposal

This scenario was designed to create the most cost-effective plan. In addition to Vision 2000 reuse and landfill disposal, Scenario I consists of partial habitat reuse (7.0 mcy would be delivered to the MHEA) and partial ocean disposal (5.2 mcy would be disposed of at SFDODS). An additional 0.3 mcy of wetland non-cover quality material, that could not be disposed of at the MHEA or SFDODS, would also be reused at the Vision 2000 Area, bringing the total for that location to 0.7 mcy. Aside from being the most cost-effective combination of reuse/disposal locations, Scenario I also provides flexibility, in that SFDODS is already permitted, and is currently available for use. Thus, Scenario I was retained for further evaluation in the Final Array of Candidate Plans.

#### 4.6.2 Scenario II: Maximum Habitat Reuse

In addition to Vision 2000 reuse and landfill disposal, Scenario II consists of a combination of the three disposal options that result in beneficial reuse. Under this scenario, approximately 2.5 mcy of dredged material would be transported to HWR, 3.0 mcy would be transported to MWP, and the MHEA would receive 7.0 mcy. This approach provides maximum flexibility (by including the greatest possible number of habitat reuse locations), maximizes diversity of the habitat created (by including both the MHEA shallow water habitat and the HWR and MWP salt, brackish, and fresh-water wetland habitats), and provides the optimum amount of dredged material to the cost-effective MHEA reuse location. This scenario was retained for further evaluation in the Final Array of Candidate Plans.

#### 4.6.3 Scenario III: Habitat Reuse using the Hamilton Wetlands Restoration Project

In addition to Vision 2000 reuse and landfill disposal, Scenario III consists of habitat reuse at the MHEA (7.0 mcy) and habitat reuse at HWR (5.2 mcy). As with Scenario I, an additional 0.3 mcy of wetland non-cover quality material that could not be disposed of at the MHEA or HWR, would also be reused at the Vision 2000 Area, bringing the total for that location to 0.7 mcy. Scenario III was not carried forward because it is a more limited version of Scenario II that does not provide any other benefits. While Scenario III also maximizes beneficial reuse of dredged material, it consists of a smaller number of reuse locations, thereby reducing dredged material management flexibility in the event of problems at one location. Wetland habitat creation would consist primarily of brackish (estuarine) wetlands.

#### 4.6.4 Scenario IV: Habitat Reuse using the Montezuma Wetlands Project

Scenario IV is similar to Scenario III, except that 5.5 mcy of material (including all 0.3 mcy of Wetland Non-cover (WNC) quality material) would be disposed of at the MWP. This scenario was rejected for the same reason as Scenario III; in addition, it

Table 4.3

DREDGED MATERIAL REUSE/DISPOSAL COMBINATIONS CONSIDERED

| **Disposal/Reuse Location** | Scenario I | Scenario II | Scenario III | Scenario IV | Scenario V | Scenario VI | Scenario VII |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| MHEA | X | X | X | X | | | |
| Vision 2000 Upland | X | X | X | X | X | X | X |
| SF-DODS | | X | | | X | | X |
| Hamilton Wetlands Restoration Project | X | | X | | | X | X |
| Montezuma Wetlands Project | X | | | X | | X | |
| Landfill Disposal | X | X | X | X | X | X | X |
| Retained for Final Array of Alternative Plans? | Yes | Yes | No | No | Yes | No | No |

would be somewhat more expensive and incur greater air quality concerns than Scenario III, because the MWP location is almost twice as far from the Port area as the HWR project location.

#### 4.6.5 Scenario V: Ocean Disposal

While current indications are favorable (i.e., BCDC recently agreed with the Corps' determination that that Scenarios I and II are consistent with BCDC's Management Program and the Bay Plan), Scenario V provides an alternative to the various partial or complete habitat reuse scenarios in case habitat reuse is ultimately not permitted by the local agencies. In addition to Vision 2000 reuse and landfill disposal, Scenario V diposes of 12.2 mcy of dredged sediment at SFDODS. An additional 0.3 mcy of wetland non-cover quality material, that could not be disposed of at SFDODS, would be reused at the Vision 2000 Area, bringing the total for that location to 0.7 mcy. This scenario was retained for further evaluation in the Final Array of Candidate Plan because it provides a currently-permitted alternative to the other possible scenarios.

#### 4.6.6 Scenario VI: Wetland Reuse

Scenario VI was developed as an alternative to Scenario II. It also provides maximum habitat reuse; however, only wetland projects are included in this scenario. In addition to Vision 2000 reuse and landfill disposal, Scenario VI includes disposal of 6.2 mcy at the HWR and 6.3 mcy at the MWP. Scenario VI was not retained for further evaluation because it is cost prohibitive (because the MHEA is not included in this scenario), it results in the creation of a more limited range of habitats (i.e., does not yield any additional habitat benefits when compared to Scenario II), and has more significant adverse air quality impacts.

#### 4.6.7 Scenario VII: Wetland Reuse and Ocean Disposal

In addition to Vision 2000 Area reuse and landfill disposal, Scenario VII consists of disposal of 7.0 mcy of dredged sediment at HWR, and 5.2 mcy of dredged material at SFDODS. Because HWR and SFDODS cannot accept wetland non-cover quality material, 0.3 mcy of wetland non-cover quality sediment would be disposed of at the Vision 2000 Area, bringing the total for that site to 0.7 mcy. Scenario VII is an alternative to Scenario I in that is provides a combination of disposal and reuse; however, it uses the HWR site instead of the MHEA. Scenario VII was conceived as an alternative to Scenario II; however, it does not generate any additional environmental benefits, and results in greater air quality impacts and higher costs. Thus, Scenario VII was eliminated from further consideration.

#### 4.6.8 Summary

In summary, Scenarios I (the most cost-effective reuse/disposal scenario), II (the most cost effective maximum habitat reuse scenario), and V (the all ocean disposal scenario) were retained for further evaluation in the Final Array of Candidate Plans. Section 4.7, below, evaluates the Final Array of Alternative Plans, which consists of the action plan (Plan F) discussed in Section 4.5 above, using the three different scenarios for dredge material reuse/disposal retained, and the No Action Plan. The No Action Plan is included in the Final Array because its inclusion is required by NEPA and by Corps planning guidelines.

## 4.7 FINAL ARRAY OF ALTERNATIVE PLANS

The Final Array of Alternative Plans includes three action alternatives consisting of dredging Plan F and disposal/reuse scenarios I, II, and V (identified as Action Plans F-I, F-II, and F-V respectively), and the No Action alternative. The dredging configuration of Action Plan F is shown in Figure 4.5 (the various reuse/disposal locations are not shown in this figure). In addition to the channel and turning basin widening and deepening described above, the figure shows related project activities that will be completed by the Port of Oakland. The Port will deepen the berths along the Inner and Outer Harbor channels, and will create new terminal facilities (Berths 55 - 58) as part of its Vision 2000 Program.

Action Plan F-I includes reuse of dredged material at the MHEA (7.0 mcy) and the Vision 2000 Area (0.7 mcy), and disposal at SFDODS (5.2 mcy) and at a landfill (up to 0.1 mcy). The proposed reuse/disposal strategy for Action Plan F-I is the most cost-effective approach and includes a significant habitat reuse component.

Action Plan F-II includes reuse of dredged material at the MHEA (7.0 mcy), the Vision 2000 Area (0.3 mcy), the HWR site (2.5 mcy), and the MWP site (3.0 mcy) and disposal of up to 100,000 cy at a landfill. The proposed reuse/disposal strategy for Action Plan F-II maximizes the environmental reuse (all wetland non-cover or better material is reused for environmental restoration or habitat creation) and overall reuse (construction fill quality material is reused at the Vision 2000 Area). Use of the HWR and MWP locations assumes that the sites are available and construction costs are feasible for the Port and the Federal Government. If the HWR and/or MWP sites are not available, the material currently slated for these sites combined could be reused entirely at one site, or could be disposed of at SFDODS.

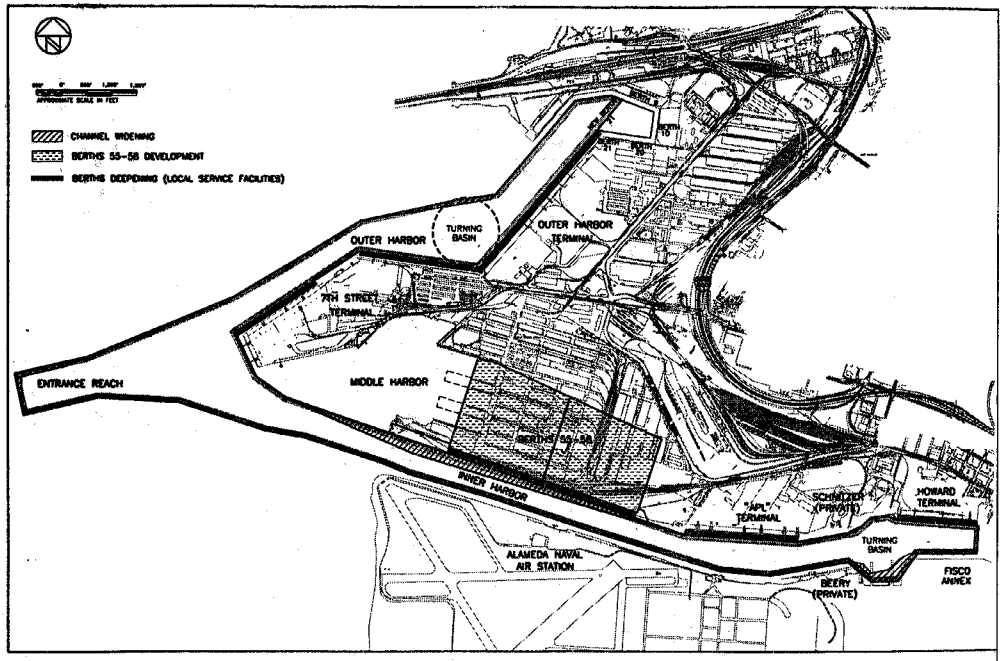
Action Plan F-V consists of reuse of dredged material at the Vision 2000 Area (0.6), and disposal at SFDODS (12.2 mcy) and at a landfill (up to 0.1 mcy). This plan includes only reuse/disposal locations where required environmental documentation has been completed and/or is readily obtainable.

Effectiveness, economic, and environmental considerations were the primary factors in identifying the Final Array of alternative plans. Permitting feasibility considerations led to the inclusion of Action Plan F-V. Prior to analyzing the Final Array of plans against the evaluation criteria and calculating a benefit to cost ratio for the selected plan, the optimum project depth must be identified.

## 4.8 CHANNEL DEPTH DETERMINATION AND SENSITIVITY ANALYSIS

The current channel depth in the Entrance, Inner, and Outer Harbor channels is -42 feet MLLW. The project evaluated consistent depths for all three channels, with a maximum depth of -50 feet MLLW. Channel depths greater than -50 feet MLLW were not considered in the evaluation for several reasons:

- The San Francisco Bar channel is currently maintained at -55 feet MLLW; this depth limits total container vessel draft to 50 feet (i.e., is consistent with a -50 foot MLLW Inner and Outer Harbor channel depth);




T:\ENG\PUBLIC\MND\SEPT\PLANS
GREY- BASED

# PORT OF OAKLAND

530 WATER STREET OAKLAND, CALIFORNIA

CHIEF ENGINEER

APPROVED ASS'T CHIEF ENGINEER REG. ENGINEER NO.

RECOMMENDED REG. ENGINEER NO.

PRELIMINARY DRAWING
ENGINEERING PROJECT MANAGEMENT DEPT.

ACTION PLAN F

FIGURE 4.5

DATE 1-22-88

SCALE

SHEET 1 OF 1 SHEET

FILE AA-

- The maximum channel depth in the Outer Harbor is also constrained by the presence of the Bay Area Rapid Transit (BART) transbay submarine rail tunnel (known locally as the BART Transbay Tube). The top of the armor rock is at -53 feet MLLW in the project area and BART requires a minimum one-foot clearance between the top of the armor rock and any dredging activity; and

- Current projections of future vessel designs by the shipping companies using the Port of Oakland indicate that while vessel capacity may continue to increase, the anticipated maximum draft will remain in the 48-foot range.

Thus, operational constraints and future design trends both led to the decision to limit the evaluation of proposed channel depths to -50 feet MLLW.

### 4.8.1 Channel Depth Optimization

To optimize channel depths, a 1-foot incremental analysis was performed using a model described in Appendix A.7 (Economic Analysis). The model focused on the benefits derived from navigation efficiencies and performed an optimization of the channel depths ranging from -45 to -50 feet MLLW. The analysis showed that the optimum channel depth (i.e., the channel depth which provides the maximum annual net benefits) depends on the vessel mix assumptions. Action Plans F-I (the NED Plan) and F-V optimize at -50 feet MLLW. Action Plan F-II optimizes at -49 feet MLLW. The relatively flat optimization curve for all three Action Plans is due to the assumptions inherent in the vessel mix. The vessel mix assumes that shippers will use the identical vessel mix with channel depths of -49 and -50 feet. Thus, the incremental benefit derived from the -50 foot MLLW channel depth is limited to a reduction in tidal delays. Tidal delays savings are small compared to savings from economies of scale.

Tables 4.4-1 through 4.4-3 show the net benefit determination for the channel depth optimization. The corresponding optimization curves are shown in Figures 4.6 through 4.8. As shown by the optimization analysis, Action Plan F-I at the -50 foot depth is the NED Plan. Action Plan F-II at -50 feet MLLW is the locally preferred plan (LPP) because it more fully meets the Port's objectives, and provides greater habitat benefits than the NED Plan. It is fully supported by the sensitivity analysis.

### 4.8.2 Sensitivity Analysis

To further frame the channel depth optimization process, a sensitivity analysis was conducted to assess the impact of the estimated growth rate and vessel mix on channel depth optimization. The sensitivity analysis was conducted in part because historic assumptions regarding shipper behavior have generally underestimated the benefits realized from a given project, full shore-side cost savings (e.g., lower inventory costs due to shorter delivery cycles) are not quantified in the model for seaport economic benefits, and the Port has seen a rapid increase in the number of large (44-foot draft or larger) vessels in the recent past. The benefits calculations for the sensitivity analysis are provided in Appendix A.7. Two scenarios were analyzed: (1) a lower growth rate (2.1 percent) using the same vessel mix, and (2) a slightly different vessel mix with the 3.9 percent growth rate. Reducing the growth rate from the estimated 3.9 percent per year to 2.1 percent only affects the optimization for the NED Plan (the NED Plan optimizes at -49 feet MLLW with the lower growth rate). However, even with the current Asian crisis the Port's growth rate for Fiscal Year 1998 (July 1997 through June 1998) was 7.25 percent. Thus it is unlikely that the average annual growth rate for the benefit period would be as low as 2.1 percent. The slightly different vessel mix (using

## TABLE 4.4-1. ANNUAL NET BENEFITS
## Action Plan F-I -- Habitat Reuse and Ocean Disposal

| Dredging Depth | Total Average Annual Cost | Annual Benefit | Annual Net Benefit | Benefit/Cost Ratio |
|---|---|---|---|---|
| -45 | $12,130,000 | — | — | — |
| -46 | — | $149,030,000 | — | — |
| -47 | — | $161,680,000 | — | — |
| -48 | $15,660,000 | $166,890,000 | $151,230,000 | 10.66 |
| -49 | $16,370,000 | $185,840,000 | $169,470,000 | 11.35 |
| **-50** | **$17,190,000** | **$187,870,000** | **$170,680,000** | **10.93** |

Note:
(a) Estimated first cost plus interest during construction (interest calculated at 6.875% per year)
(b) Cost Recovery Factor (6.875% and 50 years) = 0.07132

## TABLE 4.4-2. ANNUAL NET BENEFITS
## Action Plan F-II -- Maximum Habitat Reuse

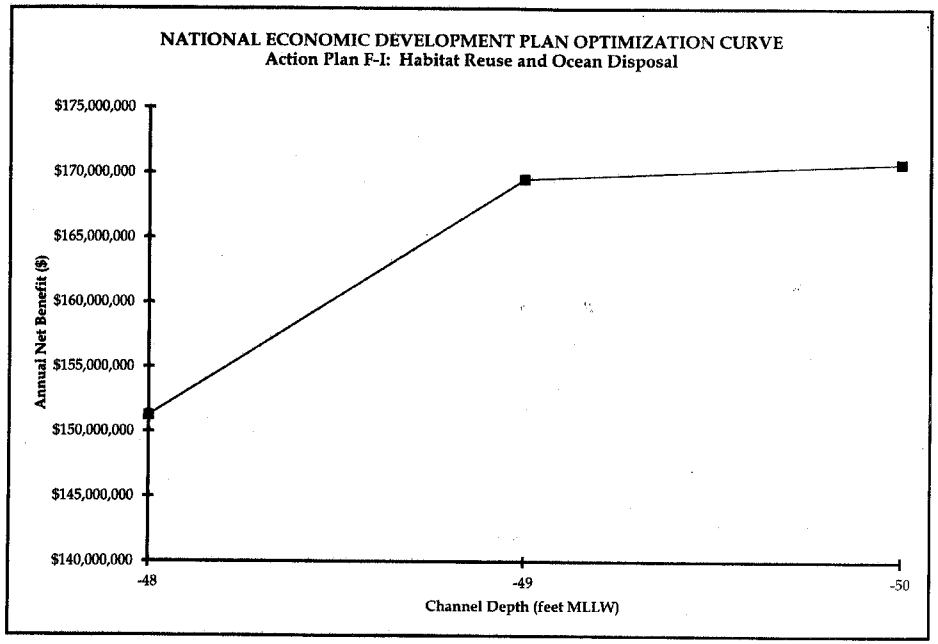
| Dredging Depth | Total Average Annual Cost | Annual Benefit | Annual Net Benefit | Benefit/Cost Ratio |
|---|---|---|---|---|
| -45 | $13,030,000 | — | — | — |
| -46 | — | $149,030,000 | — | — |
| -47 | — | $161,680,000 | — | — |
| -48 | $20,010,000 | $166,890,000 | $146,880,000 | 8.34 |
| **-49** | **$21,070,000** | **$185,840,000** | **$164,770,000** | **8.82** |
| -50 | $23,290,000 | $187,870,000 | $164,580,000 | 8.07 |

Note:
(a) Estimated first cost plus interest during construction (interest calculated at 6.875% per year)
(b) Cost Recovery Factor (6.875% and 50 years) = 0.07132

## TABLE 4.4-3. ANNUAL NET BENEFITS
## Action Plan F-V -- Ocean Disposal

| Dredging Depth | Total Average Annual Cost | Annual Benefit | Annual Net Benefit | Benefit/Cost Ratio |
|---|---|---|---|---|
| -45 | $14,810,000 | — | — | — |
| -46 | — | $149,030,000 | — | — |
| -47 | — | $161,680,000 | — | — |
| -48 | $19,050,000 | $166,890,000 | $147,840,000 | 8.76 |
| -49 | $20,320,000 | $185,840,000 | $165,520,000 | 9.15 |
| **-50** | **$21,680,000** | **$187,870,000** | **$166,190,000** | **8.67** |

Note:
(a) Estimated first cost plus interest during construction (interest calculated at 6.875% per year)
(b) Cost Recovery Factor (6.875% and 50 years) = 0.07132


NATIONAL ECONOMIC DEVELOPMENT PLAN OPTIMIZATION CURVE
Action Plan F-I: Habitat Reuse and Ocean Disposal
$175,000,000
$170,000,000
$165,000,000
$160,000,000
$155,000,000
$150,000,000
$145,000,000
$140,000,000
Annual Net Benefit ($)
-48
-49
-50
Channel Depth (feet MLLW)

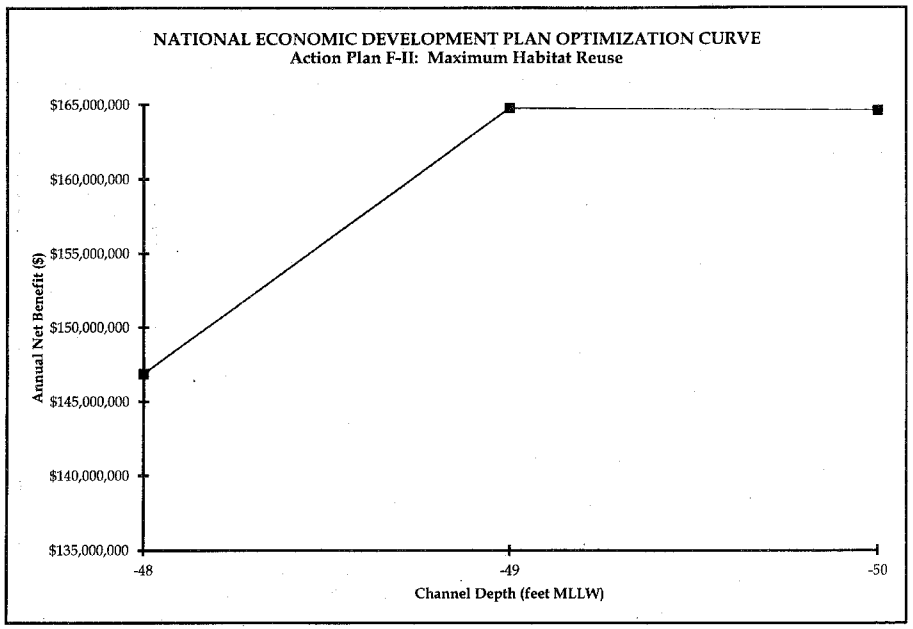

NATIONAL ECONOMIC DEVELOPMENT PLAN OPTIMIZATION CURVE
Action Plan F-II: Maximum Habitat Reuse
$165,000,000
$160,000,000
$155,000,000
$150,000,000
$145,000,000
$140,000,000
$135,000,000
Annual Net Benefit ($)
-48
-49
-50
Channel Depth (feet MLLW)

Figure 4.7

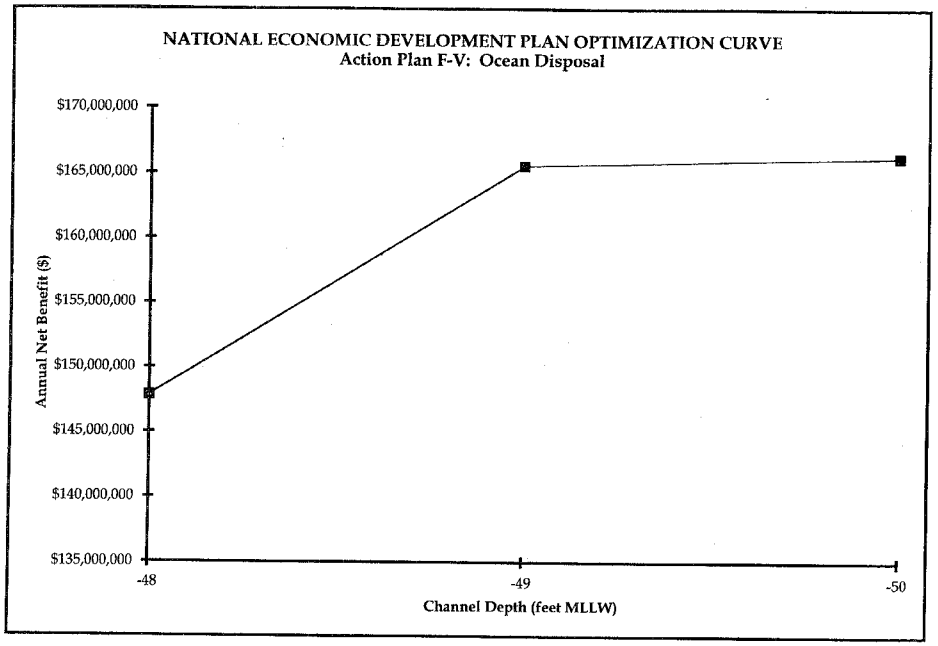

NATIONAL ECONOMIC DEVELOPMENT PLAN OPTIMIZATION CURVE
Action Plan F-V: Ocean Disposal
$170,000,000
$165,000,000
$160,000,000
$155,000,000
$150,000,000
$145,000,000
$140,000,000
$135,000,000
Annual Net Benefit ($)
-48
-49
-50
Channel Depth (feet MLLW)

Figure 4.8

the 3.9% growth assumptions, but assuming that shippers will bring large vessels on line more quickly and that shippers will bring in a slightly different vessel mix at -49 feet MLLW than at -50 feet MLLW) optimizes at -50 feet MLLW (or greater[6]) for all three Action Plans. Appendix B.6 provides the supporting calculations for the sensitivity analysis.

### 4.8.3 Selected Channel Depth

Based on the results of the channel optimization and the sensitivity analysis, the selected channel depth for the NED and Locally Preferred Plans is -50 feet MLLW. The selected channel depth is supported by the following factors:

- The NED Plan optimizes at -50 feet MLLW;
- The difference in net benefits between the -50 foot MLLW depth and the -49 foot MLLW depth is 1% or less for the Selected Plan;
- A different vessel mix (that assumes that shippers will send a slightly different vessel mix at -49 feet MLLW) than at -50 feet MLLW results in all three Action Plans optimizing at -50 feet MLLW; and
- The Selected Plan provides optimum habitat benefits at -50 feet MLLW (i.e., more dredged material is available for wetlands restoration).

## 4.9 PLAN EVALUATION

Action Plans F-I, F-II, and F-V, and the No Action Plan were tested against specific evaluation criteria which are set forth in the Corps' Principles and Guidelines for planning (ER 1105-2-100). The following subsections summarize this evaluation.

The criteria presented below are used to evaluate project plans under Federal guidelines. These criteria are also used to narrow the alternatives to a recommended plan. The four evaluation criteria used in plan formulation are effectiveness, efficiency, completeness, and acceptability. A description of the criteria and the plan evaluation by criterion is provided below.

### 4.9.1 Effectiveness

Effectiveness is the extent to which an alternative plan alleviates the specified problems and achieves the specified opportunities (efficient fleet operations and navigation safety). Effectiveness is a measure of a plan's ability to achieve the desired output and can be evaluated as follows:

1. Plans must represent sound, safe, acceptable engineering solutions to the problems and needs.
2. Plans must be technically achievable and cannot contain obstructions which prevent accomplishment of the desired output.

---

[6] Deeper depths were not analyzed because of the physical constraints (depth of the San Francisco Bar channel and elevation of BART Transbay Tube armor rock) in the project area.

3. Plans must be realistic and state-of-the art. However, they must not rely on future research and development of key components.

The action plans meet the effectiveness criterion, whereas the No Action Plan does not achieve the desired output. The Action Plans address the problems identified in the planning process. The LPP provides the greatest habitat benefit and fully meets the Port's objectives, and thus receives the highest rating under this criterion. Action Plan F-V does not provide any habitat benefit, and thus ranks below Action Plans F-I and F-II.

### 4.9.2 Efficiency

Efficiency is the extent to which an alternative plan is the most cost effective means of alleviating the specified problems and realizing the specified opportunities.

1. Plans must be economically efficient and justified. That is, when costs and benefits are accounted for, the benefits must exceed the costs. The plan which creates the greatest net benefits, or contributes the most to National Economic Development, is considered the most efficient.

2. Plans must be efficient in other resource areas also. They must represent near optimal use of all resources including land, water, transportation, infrastructure, and energy resources.

All action plans rank above the No Action Plan under this criterion, since no action does not provide increased benefits and adds nothing to National Economic Development. Action Plan F-I at -50 feet MLLW is the NED Plan, and is therefore considered the most efficient plan. Action Plan F-I minimizes impacts to the environment by minimizing the amount of land required to construct the project, and by minimizing the amount of energy required to dispose of the dredged material. Action Plan F-II provides maximum habitat restoration, but is not the most cost-effective, thus Action Plan F-II is ranked second under this criterion. Action Plan F-V has slightly lower costs than Action Plan F-II, but provides no environmental benefit; thus Action Plan F-V is ranked third.

### 4.9.3 Completeness

Completeness is the extent to which a given alternative plan provides and accounts for all necessary investments or other actions to ensure the realization of the planned effects. This may require relating the plan to other types of public or private plans if the other plans are crucial to realization of the contributions to the objective. This criterion assures that all measures required to achieve the desired outputs, structural or non-structural, are included in the plan or are at least addressed.

Based on this criterion, the action plans and the No Action Plan are all complete. Required permitting, real estate, and related issues have been addressed in this FS. All plans are ranked equally under this criterion.

### 4.9.4 Acceptability

Acceptability is the workability and viability of the alternative plans with respect to acceptance by state and local entities, as well as the public, and compatibility with existing laws, regulations, and public policies.

The local (West Oakland) community is concerned about potential increases in truck traffic and the potential for degradation in air quality. The City of Alameda has

expressed concerns over potential impacts to ferry operations during the dredging program. In addition, both the City of Alameda and a private property owner have expressed concerns regarding the proposed alignment of the Inner Harbor turning basin.

The general public and most agencies with an interest in navigation improvements prefer Action Plan F-II because it accomplishes the full objectives of the project and provides maximum habitat reuse. Local public interest groups support the construction of the MHEA, which is dependent on dredged material from the proposed project (i.e., it requires large volumes of clean or relatively clean fill that would be prohibitively expensive to obtain in any other way). In addition, local public interest groups also strongly favor the construction of the Hamilton Wetlands Restoration project. Action Plan F-II at -50 feet MLLW would generate sufficient dredged material so that the MHEA, the HWR project (if available on a timely basis), and the MWP (if available on a timely basis) could all be supported by the proposed project.

## 4.10 PLAN EVALUATION BY RESOURCE ACCOUNT

The Corps' Principles and Guidelines for the planning process have established four specific categories or "accounts" which are used to facilitate evaluation and display the effects of alternative plans. These accounts are: national economic development (NED), environmental quality (EQ), regional economic development (RED), and other social effects (OSE). These four accounts encompass all significant effects of a plan on the human environment as required by the National Environmental Policy Act of 1969 (NEPA). They also encompass social well-being as required by section 122 of the Flood Control Act of 1970. The EQ account shows effects on ecological, cultural, and aesthetic attributes of significant natural and cultural resources that cannot be measured in monetary terms. The OSE account shows urban and community impacts and effects on life, health, and safety. The NED account shows effects on the national economy. The RED account shows the regional incidence of NED effects, income transfers, and employment effects (ER 1105-2-100, Chapter 5, section 1, Principles and Guidelines, paragraph 5-8). Each of these resource accounts, and the results of the evaluation are described below.

### 4.10.1 National Economic Development (NED) Account

The NED account identifies beneficial and adverse effects on the nation's economy. Beneficial effects in the NED account are increases in the economic value of the national output of goods and services from a plan. Adverse effects in the NED account are the opportunity costs of resources used in implementing a plan. The NED Plan is the plan that maximizes the economic benefits to the Nation.

Action Plan F-I at -50 feet MLLW is the NED Plan. Action Plan F-I maximizes the net annual economic benefits that can be achieved by constructing the project but does not provide the same habitat benefits that Action Plan F-II provides. A detailed analysis of project costs and benefits is provided in Chapter 5. Action Plans F-II and F-V optimize at a depth of -49 feet MLLW. The No Action Plan provides no added economic benefits..

### 4.10.2 Environmental Quality (EQ) Account

The EQ account is a means of displaying the effects of alternative plans on the "human environment" as defined by NEPA. This is essential to a reasoned choice among

alternative plans. Beneficial effects in the EQ account are favorable changes in the ecological, aesthetic, and cultural attributes of natural and cultural resources. Adverse effects in the EQ account are unfavorable changes in the ecological, aesthetic, and cultural attributes of these same resources.

The environmental impacts of the three reuse/disposal scenarios associated with dredging Action Plan F and the No Action Plan are presented in detail in the accompanying EIS/R. Dredging the channel may result in the loss of a small area of eelgrass habitat and other shallow water habitat. The only potentially unavoidable significant impacts identified by the EIR/S are noise during construction, and air quality during the project's construction phase. These impacts would occur with any of the Action Plans. The creation of the MHEA (under Action Plans F-I or F-II) will result in the creation of eelgrass beds and other shallow habitat of equal or greater area to that lost to construction. The USFWS and National Marine Fisheries Service have determined that the construction of the MHEA will provide adequate mitigation for both short-term and long-term impacts of the project.

The Port is working with the local community to develop a mitigation plan for air quality that would address potential air quality impacts from the cumulative effect of several related projects. The potential noise impacts are associated with night-time dredging. These potential noise impacts, as well as air quality impacts during construction will be minimized by the proposed use of electric dredges. Concerns have also been expressed about the potential impacts of the project if it results in the introduction of exotic organisms to the Bay through vessel discharge of ballast water. The EIS/R concludes that it cannot be determined what, if any, adverse impact Action Plan F might have on the introduction of exotic organisms. However, the newer vessels, although larger, typically carry less ballast water and/or have the capability for internal ballast water transfer. For the related non-Federal berths 55-58 development project, the Port of Oakland has proposed a Port ordinance that would require vessels berthing at the Port to exchange or discharge ballast water at sea. This mitigation is appropriate under the Berth 55-58 development program since is an operational mitigation that is not currently regulated by Federal law. Thus, they are anticipated to discharge less ballast water per vessel than current generation vessels. The remaining mitigation efforts consist of monitoring during and after construction, and including appropriate specifications in the bid documents.

Action Plan F-II presents the opportunity for maximum wetland and shallow water habitat restoration through the creation of the MHEA project and potentially significant contributions to the HWR project and the MWP. Wetland restoration at both the HWR and MWP sites will provide significant benefits to both state and Federally listed endangered and threatened species. The potential contributions to environmental restoration make Action Plan F-II the optimal plan for habitat creation. Action Plan F-I (the NED) provides a lesser amount of habitat benefit, as it would only result in the construction of the MHEA, and would not support any wetlands creation.

#### 4.10.3 Regional Economic Development (RED) Account

The RED account registers changes in the distribution of regional economic activity that results from each alternative plan. Two measures of the effects of the plan on regional economies are used in this account, regional income and regional employment. The positive effects of regional income and employment include the sum of the NED benefits that accrue to that region, plus transfers of income and employment to the region from areas outside the region, considering transfers of economic activity, indirect effects, and induced effects. The regional economic impact of the Port of Oakland is

estimated to stretch from Oakland north to the Oregon border, and south to Bakersfield.

The economic analysis developed by the Corps assumes that economic growth in the region will be constant, regardless of the channel depth (i.e., is the same for the No Action Plan and Action Plans F-I, F-II, and F-V). The increased seaport activity is expected to create new jobs and economic opportunities for maritime businesses such as terminal operators, shipping lines, freight forwarders, warehouses, container repair and leasing, government, railroads, and trucking that will compensate for some of the losses in maritime activities due to the departure of the U.S. Navy and U.S. Army from Bay Area bases. The action plans may help the Port of Oakland capture an increased portion of the Pacific Rim trade growth and prevent US-bound cargo from entering through foreign ports, thereby helping the Bay Area and the Nation to maintain their competitiveness in the international arena.

#### 4.10.4 Other Social Effects (OSE) Account

The OSE account is a means of displaying information on alternative plan effects from perspectives that are not reflected in the other three accounts. These include:

1. Harbor and community impacts including income distribution, employment distribution, population distribution and composition; fiscal condition of governments; quality of community life; and transportation, utility, and other infrastructure systems.

2. Life, health, and safety effects; reflects the risks associated with loss of life, injury to citizens, and catastrophic damages to property and essential public services.

3. Displacement effects; the displacement of people, businesses, and other activities.

Economic growth in the region has been assumed to be constant regardless of channel depth. Action Plans F-I, F-II, and F-V increase the safety in the Oakland Harbor and Entrance channels.

There is an on-going public debate about how local residents, especially in neighboring West Oakland, would actually benefit from jobs and new business from Port expansion activities that would be facilitated by the deeper channels. West Oakland has absorbed numerous urban renewal and infrastructure projects, such as the East Bay Municipal Utilities District wastewater treatment plant, U.S. Regional Post Office, West Oakland BART station, and the Cypress Freeway. These projects have increased pollution and reduced the quality of life in West Oakland without providing much direct economic benefit for residents. West Oakland activists want to ensure that the Port takes measures to balance the needs and concerns of the community with the requirements of the project and ensure that West Oakland receives its fair share of the anticipated benefits of the project.

West Oakland is primarily an African-American community, and, in addition to environmental problems, many residents deal with economic hardships from low-income jobs and high unemployment (up to 40 percent for African-American males in West Oakland). Air pollution, dust, noise, and truck traffic associated with the Port's Vision 2000 Program, as well as the upcoming conversion of Oakland Army Base and East Bay Bridge reconstruction, are expected to have adverse effects on West Oakland residents. These effects would be greatest during construction activities, but could also

be permanent due to the increased ship, train, truck, and car traffic that these projects would allow in the area.

Another social effect is associated with the disruption to existing properties that will be associated with the widening of the Inner Harbor turning basin. The proposed alignment minimizes the overall social and economic impact of the disruptions (see analysis in Appendix M.1); however, limited disruptions are unavoidable. Two of the three affected property owners, the City of Alameda and a private property owner, have expressed concerns over the proposed effect on property on the south side of the turning basin. The Port is working with the affected business to evaluate whether contemplated design modifications could minimize potential business disruptions. The U.S. Navy also owns property that may be affected, however, it has not expressed any concerns. Thus, each Action Plan has both positive (increased safety for vessels) and negative impacts. The No Action Plan and Action Plans F-I, F-II, and F-V were rated equally for this account.

# 5.0 SELECTED PLAN

## 5.1 CONSIDERATIONS IN PLAN SELECTION

Based on the evaluation of the action plans by the criteria specified in section 4.9 and resource accounts (section 4.10), Action Plan F-II has the highest ranking overall. It has been designated the locally preferred plan (LPP) and is the Selected Plan. Action Plan F-I has the greatest net economic benefit. As a result, it has been designated the National Economic Development (NED) Plan. Action Plan F-V is the least preferred of all the action plans, however, it would become the NED Plan if Action Plan F-I cannot be permitted. It has been designated the Alternate NED Plan. All action plans are ranked superior to the No Action Plan. This chapter presents the NED Plan, Selected Plan, and Alternate NED Plan in detail, including the specifics of design, costs, benefits, and other related unique elements.

Final selection of the Selected Plan included a detailed impact analysis and evaluation of the action plans and the No Action Plan. The detailed environmental impact analysis of the various plans is presented in the EIS/R. A summary of the impacts of the four plan alternatives by system of accounts is presented in Table 5.1. A discussion of the trade-off analysis of how each of these plans rate in terms of planning objectives and other specified evaluation criteria follows.

Action Plan F-I with a channel depth of -50 feet MLLW maximizes NED benefits. Benefits are provided from the reduction in vessel light loading practices and reduction in vessel trips required to transport the same amount of cargo. The Selected Plan/LPP (Action Plan F-II) has slightly lower net annual benefits, but provides substantially greater environmental benefits through added wetlands restoration. The Alternate NED Plan (Action Plan F-V), which optimizes NED benefits at a channel depth of -49 feet MLLW, provides transportation benefits but no environmental benefits. No transportation benefits would be provided under the No Action Plan. Costs and related issues are discussed in detail in section 5.6.

The NED, Selected Plan/LPP, and Alternate NED Plans result in environmental impacts which would not occur under the No Action Plan. These impacts are discussed in detail in the accompanying EIS/R. Primary impacts include short-term impacts on water quality and air quality during construction, impacts on air quality during operation, noise impacts during construction, temporary loss of benthic habitat due to construction, and a change in benthic habitat from shallow water habitat (i.e., -20 feet MLLW or less) to deep water habitat (i.e., greater than -20 feet MLLW) for a small area. Action plans F-I and F-II would provide environmental benefits through the creation of the Middle Harbor Enhancement Area, and, for Action Plan F-II, also with beneficial reuse of the material for wetland restoration at the HWR and MWP sites.

From the perspective of community and social well being, all action plans would provide benefits as compared to the current situation, i.e., the No Action Plan. The project-related improvements would help keep the Port of Oakland competitive in the maritime industry, which in turn would benefit the local economy.

The navigation improvements would minimize navigation safety issues for deep draft vessels using Oakland Harbor and Entrance channels, thus providing safer conditions for all users. The action plans would also provide benefits from a regional development

**Table 5.1. Summary of Impacts by System of Accounts**
**Action Plans F-I, F-II, F-V, and No Action Plan**

| Resource Category | No Action | Action Plan F-I | Action Plan F-II | Action Plan F-V |
|---|---|---|---|---|
| NATIONAL ECONOMIC DEVELOPMENT | No national economic development benefits | National economic benefits in the form of efficiencies of scale in transportation. | National economic benefits in the form of efficiencies of scale in transportation. | National economic benefits in the form of efficiencies of scale in transportation. |
| | | | | |
| ENVIRONMENTAL QUALITY | | | | |
| Air Quality | No change from existing condition. | Temporary impacts during construction and on-going operational impacts as a result of growth. | Temporary impacts during construction and on-going operational impacts as a result of growth. | Temporary impacts during construction and on-going operational impacts as a result of growth. |
| Biological Resources | No change from existing condition. | During construction: Temporary turbidity during construction and limited loss of eelgrass habitat. After construction: Extensive new shallow water habitat with greater biological value and diversity than current conditions created at MHEA. | During construction: Temporary turbidity during construction and limited loss of eelgrass habitat. After construction: Extensive new shallow water habitat with greater biological value and diversity than current conditions created at MHEA. Potential for significant wetland habitat restoration project support at Hamilton and Montezuma. | During construction: Temporary turbidity during construction and limited loss of eelgrass habitat. |
| Contaminated Waste | No change from existing condition. | Removal of up to 373,000 cy of contaminated sediment from the aquatic environment. | Removal of up to 373,000 cy of contaminated sediment from the aquatic environment. | Removal of up to 373,000 cy of contaminated sediment from the aquatic environment. |
| Cultural Resources | No change from existing condition. | Potential impact from Inner Harbor turning basin on NRHP-eligible former Todd Shipyard. | Potential impact from Inner Harbor turning basin on NRHP-eligible former Todd Shipyard. | Potential impact from Inner Harbor turning basin on NRHP-eligible former Todd Shipyard. |

**Table 5.1. Summary of Impacts by System of Accounts**
**Action Plans F-I, F-II, F-V, and No Action Plan**

| Resource Category | No Action | Action Plan F-I | Action Plan F-II | Action Plan F-V |
|---|---|---|---|---|
| Geology/Soils/ Groundwater | No change from existing condition. | No change from existing condition. | No change from existing condition. | Potential exceedances of applicable noise ordinances during construction. |
| Noise | No change from existing condition. | Potential exceedances of applicable noise ordinances during construction. | Potential exceedances of applicable noise ordinances during construction. | Potential exceedances of applicable noise ordinances during construction. |
| Recreation and Public Access | No change from existing condition. | Fishing, views, and park access will benefit from the MHEA. | Fishing and views, will benefit from the MHEA, HWR, and MWP. The MHEA will also enhance park access. | No change from existing condition. |
| Seismicity | No change from existing condition. | No change from existing condition. | No change from existing condition. | No change from existing condition. |
| Surface Water Resources | No change from existing condition. | Fisheries, bird utilization, benthic habitat, and water quality will improve with the construction of the MHEA. | Fisheries, bird utilization, benthic habitat, and water quality will improve with the construction of the MHEA, HWR, and MWP. | No change from existing condition. |
| Ground Traffic | No change from existing condition. | Increase in truck traffic, requiring mitigation at several intersections. | Increase in truck traffic, requiring mitigation at several intersections. | Increase in truck traffic, requiring mitigation at several intersections. |
| Vessel Traffic | Increase in number vessels with growth, leading to potential congestion. | Reduced increase in vessels due to larger capacity vessels able to utilize Oakland Harbor. | Reduced increase in vessels due to larger capacity vessels able to utilize Oakland Harbor. | Reduced increase in vessels due to larger capacity vessels able to utilize Oakland Harbor. |
| Visual Resources | No change from existing condition. | Greatly improved views at the MHEA due to eelgrass meadows, clear shallow water, tidal wetlands, shallow sand flats, and attraction of many shore birds. | Greatly improved views at the MHEA, HWR and MWP due to eelgrass meadows, clear shallow water, tidal and seasonal wetlands, shallow sand flats, and attraction of many shore birds. | No change from existing condition. |

**Table 5.1. Summary of Impacts by System of Accounts**
**Action Plans F-I, F-II, F-V, and No Action Plan**

| Resource Category | No Action | Action Plan F-I | Action Plan F-II | Action Plan F-V |
|---|---|---|---|---|
| Water Quality | No change from existing condition. | Temporary turbidity effects during construction. Long-term benefits due to improved circulation and water clarity in the MHEA. Water quality improved by removal of up to 373,000 cy of impacted sediments. | Temporary turbidity effects during construction. Long-term benefits due to improved circulation and water clarity in the MHEA, MWP, and HWR. Water quality improved by removal of up to 373,000 cy of impacted sediments. | Temporary turbidity effects during construction. Water quality improvements by removing 373,000 cy of impacted sediments. |
| **REGIONAL ECONOMIC DEVELOPMENT** | | | | |
| Employment/Labor Force | Stagnant maritime-related employment. | Slight increase in local employment during construction. Project will enable current employment levels to be maintained. | Slight increase in local employment during construction. Project will enable current employment levels to be maintained. | Slight increase in local employment during construction. Project will enable current employment levels to be maintained. |
| Business and Industrial Activity | Stagnant maritime-related commerce. Growth will be limited to any growth attainable from local economic growth. | Slight increase in maritime-related business activity. | Slight increase in maritime-related business activity. | Slight increase in maritime-related business activity. |
| Local Government Finance | No change from existing condition. | No change from existing condition. | No change from existing condition. | No change from existing condition. |
| **OTHER SOCIAL EFFECTS** | | | | |
| Public Facilities/Services | No change from existing condition. | Relocation of BART anode cables and US Navy sewer line required. | Relocation of BART anode cables and US Navy sewer line required. | Relocation of BART anode cables and US Navy sewer line required. |
| Natural Resources | No change from existing condition. | Increased shallow water habitat at MHEA. | Increased shallow water habitat at MHEA. Support for increased wetlands areas if Hamilton and Montezuma projects are available. | No change from existing condition. |

standpoint. The maritime industry would be strengthened for the entire region making it more attractive to maritime-related industries, and fostering further connections with the Pacific Rim. The -50 foot MLLW depth provided by the Selected Plan is the most effective in meeting the overall project objectives. Thus, based on the analysis conducted, the Selected Plan is Action Plan F-II at -50 feet MLLW.

## 5.2 DESCRIPTION OF THE PLANS

### 5.2.1 General Design Considerations

The Selected and NED Plans include deepening and selective widening of the Entrance channel, Inner and Outer Harbor channel, and Inner and Outer Harbor turning basins. Figures 5.1a through 5.1e show the general navigation features of the plans.

The design of general navigation features (GNF) was accomplished in accordance with Corps criteria, procedures, and standards to accommodate the actual and projected vessels calling at Oakland Harbor. The information on the vessels and their operations in the navigation channels was obtained from the vessel sponsors, shippers, and pilots.

### 5.2.2 Channel Design

The navigation improvements were designed using standard Corps criteria for one-way vessel traffic including:

1. EM 1110-2-1607, "Tidal Hydraulics."
2. EM 1110-2-1613, "Hydraulic Design of Deep Draft Navigation Channels."
3. ER 1110-2-144, "Deep Draft Navigation Project Design."

The channel designs also considered information obtained on actual operations in the Oakland Harbor, in addition to a hydrodynamic study (Appendix A.4), standard vessel squat criteria provided by the San Francisco Bar Pilots (see Appendix A.5), and the ship simulation for the design of the -42 foot Project (Appendix A.6).

### 5.2.3 Design Vessel

Vessels operating in Oakland Harbor vary from pleasure craft (kayaks and row, power, and sail boats) to large container ships. The channel design is based on providing safe passage for the largest, least maneuverable ships expected to call at Oakland Harbor in the foreseeable future. The main vessel characteristics considered for deep draft channel design are beam, draft, and length. Other important characteristics are maneuverability (including whether or not vessels are equipped with bow and stern thrusters), operating speeds, side surface area (sensitivity to cross winds), yaw, wave generation (wake), squat, and trim. Lesser characteristics related to this project are heave, pitch, roll, sway, and surge.

The design and dimensions of the project channels and turning basins are based on the largest deep draft vessel expected to be using the channels. This vessel is referred to as the "design vessel" and is defined as the most cost efficient vessel (or vessels) expected to call at Oakland on a predictable and economic basis. Existing shipping operations in Oakland Harbor were evaluated and the largest vessel for each type of operation was identified. This included identification by shippers of the largest vessels they anticipated using with improved channels.

| POINT # | NORTHING | EASTING |
|---|---|---|
| 1-A | 480747.0400 | 1467828.2800 |
| 2-A | 482689.1200 | 1470778.8300 |
| 3-A | 482283.8000 | 1473668.4800 |
| 4-A | 485564.8500 | 1476515.9500 |
| 5-A | 486278.3400 | 1477135.1500 |
| 6-A | 486384.9700 | 1476858.4400 |
| 7-A | 486256.3400 | 1475990.6100 |
| 8-A | 484040.1873 | 1474068.0371 |
| 9-A | 483921.2200 | 1473182.5000 |
| 10-A | 483421.5200 | 1470818.1500 |
| 11-A | 481599.4200 | 1467785.5800 |
| 12-A | 480144.8267 | 1464231.5154 |
| 13-A | 479762.4512 | 1462533.8221 |
| 14-A | 478786.8900 | 1462753.5500 |
| 15-A | 479193.7700 | 1464560.0400 |
| 16-A | 480105.7937 | 1466479.0318 |

CHANNEL WIDENING

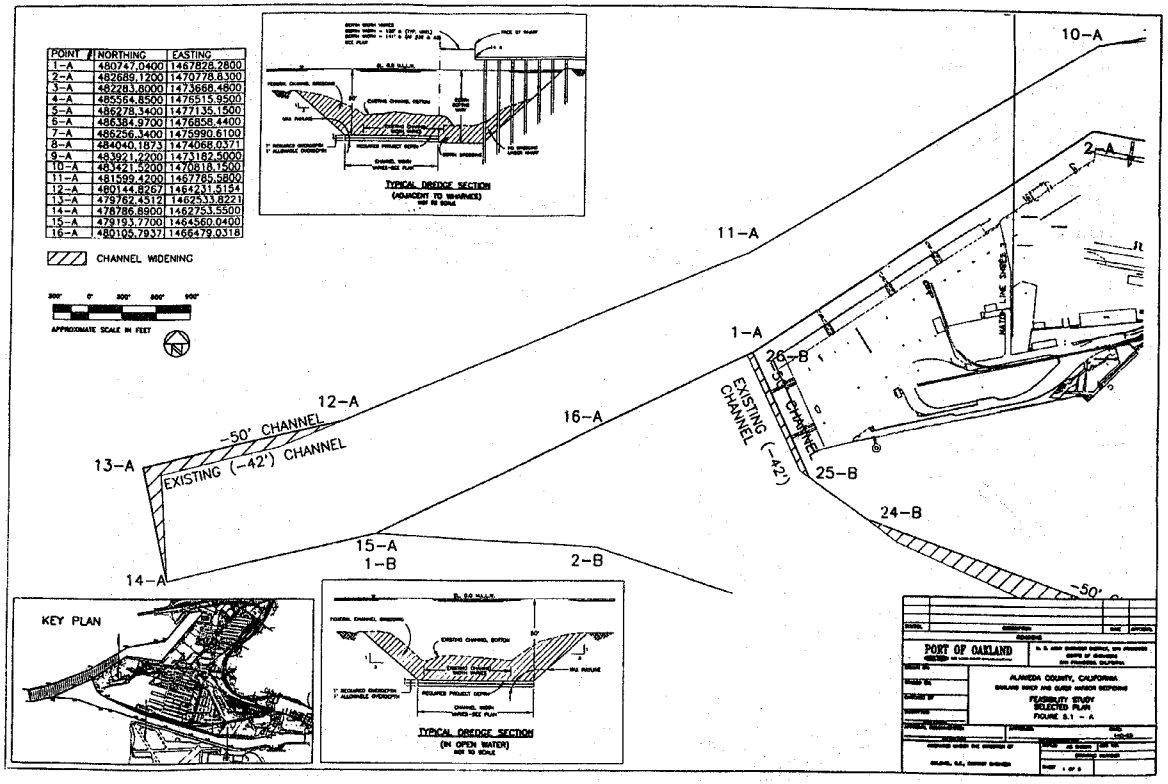
APPROXIMATE SCALE IN FEET

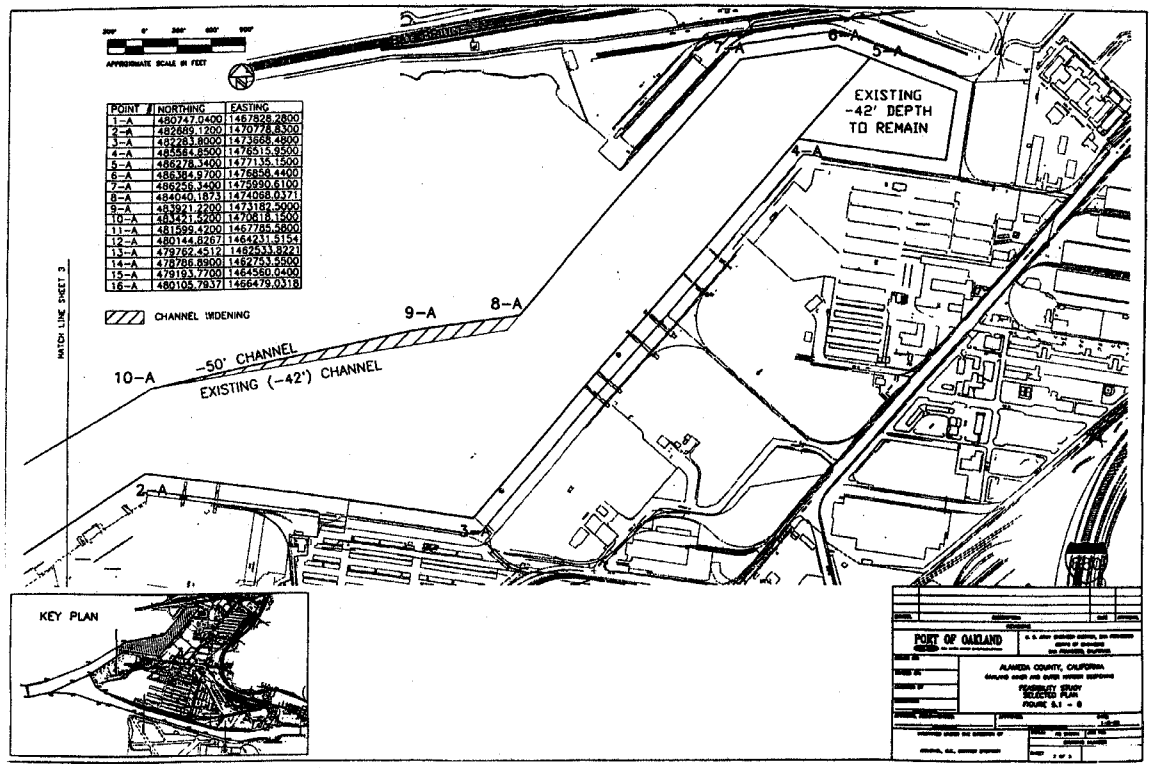


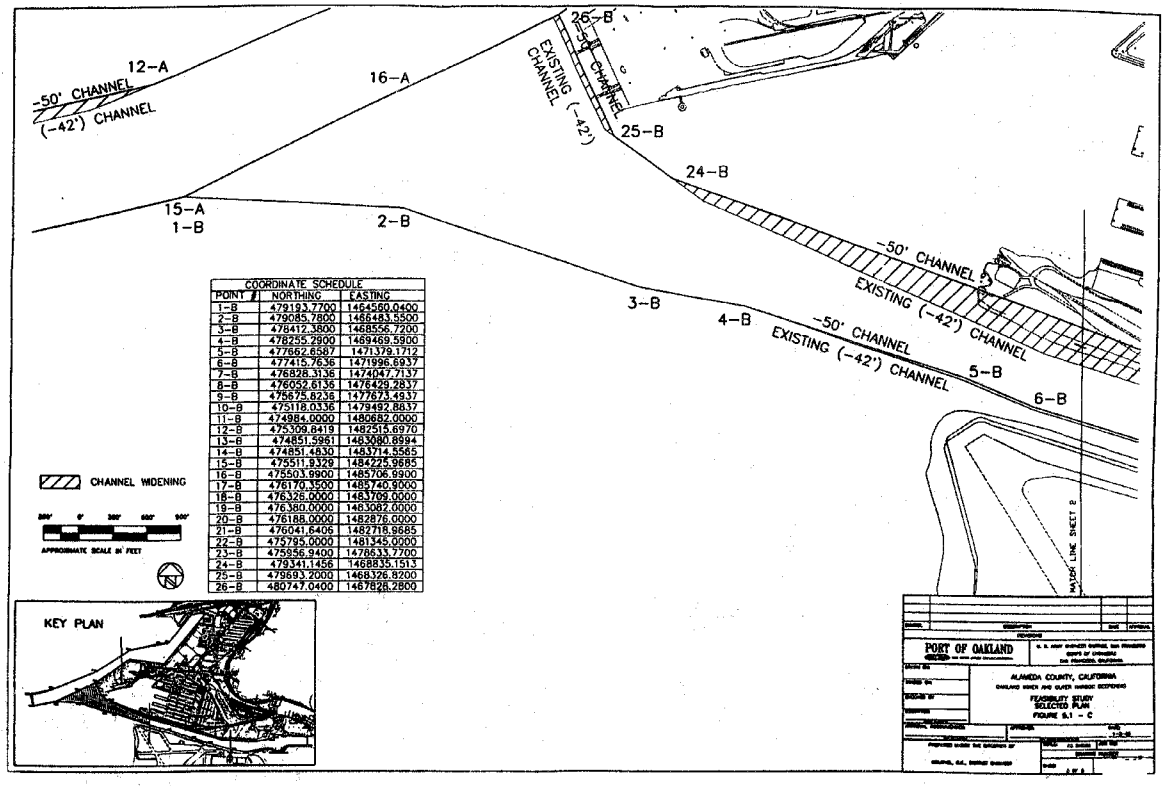




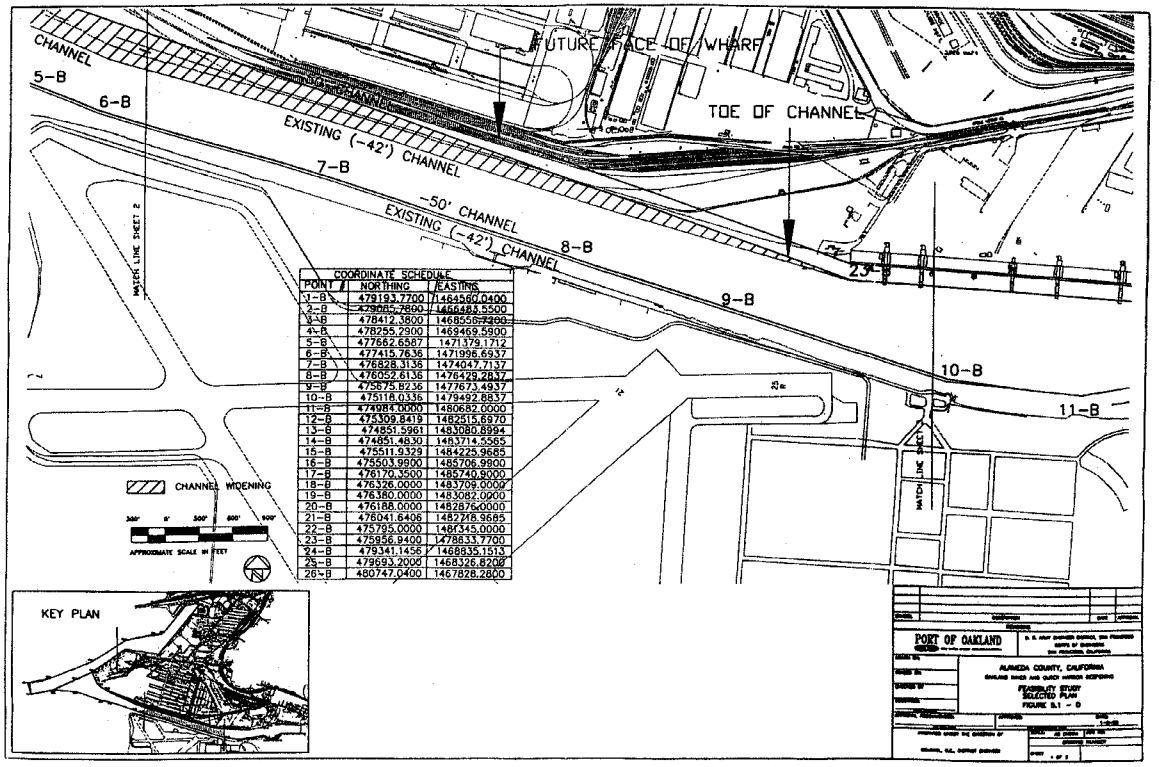


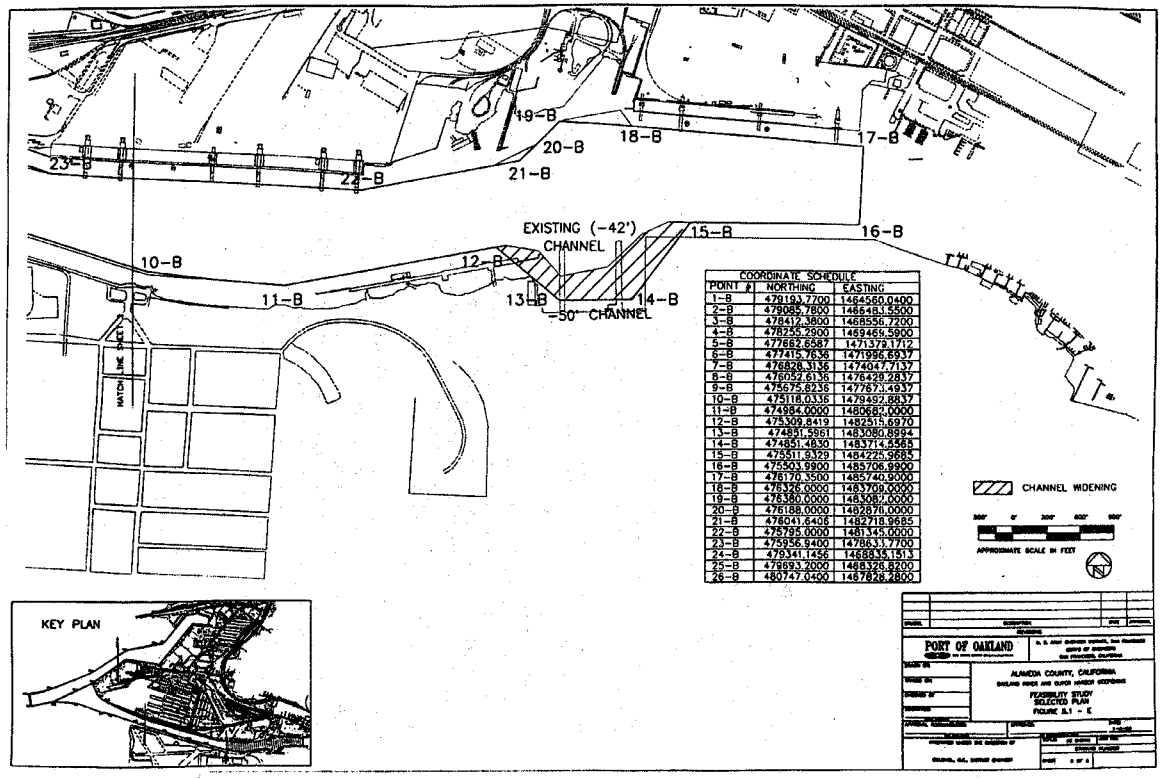

APPROXIMATE SCALE IN FEET
EXISTING -42' DEPTH TO REMAIN
CHANNEL WIDENING
-50' CHANNEL
EXISTING (-42') CHANNEL
MATCH LINE SHEET 3
KEY PLAN
POINT # | NORTHING | EASTING
1-A | 480747.0400 | 1467828.2800
2-A | 482686.1200 | 1470778.8300
3-A | 482283.8000 | 1473668.4800
4-A | 485584.8500 | 1476515.9500
5-A | 486278.3400 | 1477135.1500
6-A | 486384.9700 | 1476856.4400
7-A | 486235.3400 | 1475930.6100
8-A | 484040.1873 | 1474068.0371
9-A | 483921.2200 | 1473182.5000
10-A | 481421.5200 | 1470618.1500
11-A | 481599.4200 | 1467785.5800
12-A | 480144.6267 | 1464231.5154
13-A | 479762.4512 | 1462533.8221
14-A | 478788.8900 | 1462753.3500
15-A | 479193.7700 | 1464560.0400
16-A | 480105.7937 | 1466479.0318
PORT OF OAKLAND
ALAMEDA COUNTY, CALIFORNIA
FEASIBILITY STUDY
BEGINNING PLAN
FIGURE 5.1 - B




| COORDINATE SCHEDULE | | |
|---|---|---|
| POINT # | NORTHING | EASTING |
| 1-B | 479193.7700 | 1464560.0400 |
| 2-B | 479085.7800 | 1466483.5500 |
| 3-B | 478412.3800 | 1468556.7200 |
| 4-B | 478255.2900 | 1469469.5900 |
| 5-B | 477662.6587 | 1471379.1712 |
| 6-B | 477415.7636 | 1471996.8937 |
| 7-B | 476828.3136 | 1474047.7137 |
| 8-B | 476052.6136 | 1476429.2837 |
| 9-B | 475675.8236 | 1477673.4937 |
| 10-B | 475118.0336 | 1479492.8837 |
| 11-B | 474984.0000 | 1480682.0000 |
| 12-B | 475309.8419 | 1482515.6970 |
| 13-B | 474851.5961 | 1483080.8994 |
| 14-B | 474851.4830 | 1483714.5585 |
| 15-B | 475511.9329 | 1484225.9685 |
| 16-B | 475503.9900 | 1485706.9900 |
| 17-B | 476170.3500 | 1485740.9000 |
| 18-B | 476326.0000 | 1483709.0000 |
| 19-B | 476380.0000 | 1483082.0000 |
| 20-B | 476188.0000 | 1482876.0000 |
| 21-B | 476041.6406 | 1482718.9685 |
| 22-B | 475795.0000 | 1481345.0000 |
| 23-B | 475856.9400 | 1478633.7700 |
| 24-B | 479341.1458 | 1468835.1513 |
| 25-B | 479693.2000 | 1468326.8200 |
| 26-B | 480747.0400 | 1467828.2800 |




| COORDINATE SCHEDULE | | |
|---|---|---|
| POINT # | NORTHING | EASTING |
| 1-B | 479193.7700 | 1464560.0400 |
| 2-B | 479085.7600 | 1466483.5500 |
| 3-B | 478412.3800 | 1468556.7200 |
| 4-B | 478255.2900 | 1469469.5800 |
| 5-B | 477662.6587 | 1471379.1712 |
| 6-B | 477415.7636 | 1471996.6937 |
| 7-B | 476828.3135 | 1474047.7137 |
| 8-B | 476052.6136 | 1476429.2837 |
| 9-B | 475675.8236 | 1477673.4937 |
| 10-B | 475118.0336 | 1479492.8837 |
| 11-B | 474984.0000 | 1480682.0000 |
| 12-B | 475309.8419 | 1482515.6970 |
| 13-B | 474851.5961 | 1483080.8994 |
| 14-B | 474851.4830 | 1483714.5565 |
| 15-B | 475511.9329 | 1484225.9685 |
| 16-B | 475503.9900 | 1485706.9900 |
| 17-B | 476170.3500 | 1485740.9000 |
| 18-B | 476326.0000 | 1483709.0000 |
| 19-B | 476380.0000 | 1483082.0000 |
| 20-B | 476188.0000 | 1482876.0000 |
| 21-B | 476041.6406 | 1482768.9685 |
| 22-B | 475795.0000 | 1481345.0000 |
| 23-B | 475956.9400 | 1478833.7700 |
| 24-B | 479341.1456 | 1468835.1513 |
| 25-B | 479693.2000 | 1468326.8200 |
| 26-B | 480747.0400 | 1467828.2800 |




COORDINATE SCHEDULE

| POINT # | NORTHING | EASTING |
|---|---|---|
| 1-B | 479193.7700 | 1464560.0400 |
| 2-B | 479085.7800 | 1466483.5500 |
| 3-B | 478412.3800 | 1468556.7200 |
| 4-B | 478255.2900 | 1469465.5900 |
| 5-B | 477662.6587 | 1471372.1712 |
| 6-B | 477415.7636 | 1471996.6937 |
| 7-B | 476828.3136 | 1474047.7137 |
| 8-B | 476052.6136 | 1476429.2837 |
| 9-B | 475675.6236 | 1477673.4937 |
| 10-B | 475116.0336 | 1479497.8837 |
| 11-B | 474984.0000 | 1480687.0000 |
| 12-B | 475309.8419 | 1482515.6970 |
| 13-B | 474851.5861 | 1483080.8894 |
| 14-B | 474851.4830 | 1483714.5585 |
| 15-B | 475511.8329 | 1484725.9685 |
| 16-B | 475503.9900 | 1485706.9900 |
| 17-B | 476170.3500 | 1485740.9000 |
| 18-B | 476326.0000 | 1483709.0000 |
| 19-B | 476380.0000 | 1483087.0000 |
| 20-B | 476188.0000 | 1482978.0000 |
| 21-B | 476041.6406 | 1482718.9685 |
| 22-B | 475795.0000 | 1481345.0000 |
| 23-B | 475956.9400 | 1478631.7700 |
| 24-B | 479341.1456 | 1468835.1513 |
| 25-B | 479693.2000 | 1468326.8200 |
| 26-B | 480747.0400 | 1467828.2800 |

Other factors considered included identification of the largest vessels currently used in comparable trades at the deeper draft ports on the west coast, and identification of the largest existing vessel used for handling the commodities currently transported in and out of the Oakland Harbor. As stated previously, the majority (greater than 95 percent) of the vessels calling at Oakland are container vessels.

Based on this analysis, the design vessel is the new "extended K-Class" (also referred to as S-Class) container ship, which is designed to carry in excess of 6,500 TEU.[1] Extended K-Class vessels have a 48-foot draft. Dimensions of the extended K-Class design vessel are: Length 1,139 feet, and Beam 140 feet.

### 5.2.4 Navigation Considerations for Channel Design

Channel depth is based on the economic optimization with required vessel underkeel clearances. Vessel bottom clearance factors considered for the semi-protected conditions of the Oakland Harbor include vessel squat, trim, and maneuverability.

Squat (also referred to as "dynamic sinkage") is the term for the hydraulic phenomenon associated with the lowering of the water surface immediately surrounding a vessel under way, thus causing the vessel to "sit" lower in the water than while the vessel is at rest. Based on criteria for the semi-protected channels considered in this study and the current vessel operating speeds, an allowance of 2 feet was selected for vessel squat. Squat is strongly dependent on vessel speed; the squat used in this analysis may understate the amount of squat experienced by some of the vessels entering the Oakland Harbor. As shown in Appendix A.5, at 10 knots (the speed at which vessels enter the Entrance Channel) a vessel with a block coefficient of 0.7 (the average block coefficient used in the Hydrodynamic Study) may experience as much as 4.6 feet of squat. The large container vessels enter the Inner Harbor channel at a speed of approximately 8 knots; at 8 knots, the squat requirement is still 2.9 feet.

No precise information on the effect of shallow water on steering was available, but it is generally recognized that a vessel becomes difficult to handle and requires large rudder angles when speed is reduced in shallow water. Winds, waves, and cross-currents are important factors included in vessel maneuverability concerns through the entrance to the Oakland Inner and Outer Harbors. Based on pilot recommendations and the safety requirements imposed by most shipping lines using the Oakland Harbor, an allowance of 2 feet has been made for maneuverability, pitching, and rolling of a vessel navigating the channels. This allowance is referred to as "underkeel clearance." The combined 4-foot requirement for squat and underkeel clearance is also recommended by the San Francisco Bar Pilots (Appendix A.5).

Trim recognizes the fact that to improve vessel handling, shippers are likely to load their vessels so that the stern sits slightly lower in the water than the bow. An additional clearance of 1 foot has been allowed for trim. The overall clearance allowed for the design vessel between the ship keel at design draft and the channel bottom in the semi-protected portion of the project is 5 feet, consisting of 2 feet of squat, 2 feet of underkeel clearance for safety and maneuverability, and 1 foot of trim. For ease of reference in the remainder of this document, this 5-foot requirement is referred to as "required depth in addition to design draft."

---

[1] TEUs (which stands for twenty-foot equivalent units) are a measure of a vessel's capacity, and refer to the number of 20-foot equivalent units that a vessel could carry. Typical containers range in length from 20 feet to over 45 feet.

### 5.2.5 Channel Side Slopes

The current channel side slopes are roughly 1-vertical to 3-horizontal, and were developed in part by allowing natural sloughing of the banks after dredging. These slopes will have an acceptably high safety factor and are expected to perform well both statically and during strong seismic shaking. The stability of the side slopes is largely controlled by the presence of the Young Bay Mud, a fat and compressible, structurally weak clay. In general, the proposed channel limits are set back far enough from the existing shoreline to accommodate the same 1-vertical to 3-horizontal slopes with the widening and deepening of the channels.

The geotechnical investigation has concluded that the shoreline slopes from Alameda Point to the Ferry Landing on the south side of the channel currently are marginally stable and are expected to perform poorly during a major earthquake. Significant impacts associated with the deepening and these marginally stable slope areas can be avoided by relocating the channel limit approximately 25 feet to the north. To maintain the desired 750-foot channel width, the Port's Berth 55-58 project is proposed to be located to accommodate this channel line relocation.

The existing shoreline along the portion of the Inner Harbor turning basin is also expected to perform poorly during a major seismic event. The proposed deepening of the turning basin would require significant excavation in order to provide more stable 3:1 sideslopes. Bulkhead walls could be used to reduce the amount of excavation required and would improve the stability of this section of shoreline.

In all other areas of the project the proposed new slopes are expected to perform well, under both static and seismic loading. The new bank along the Port's Berth 55-58 project will be designed and constructed in accordance with Port of Oakland seismic design criteria.

### 5.2.6 Design Of Channels

The following are the feasibility level design features of the Selected Plan:

(1) The Entrance channel would be deepened to -50 feet MLLW plus overdepth, with widening on the north side of the channel beginning at the west end of the channel to the east end of the entrance channel (maximum width of 1, 000 feet, tapering to the existing width of 900 feet at the eastern end).

(2) The Outer Harbor channel would be deepened to -50 feet MLLW plus overdepth along its entire length. Limited widening is planned for the Outer Harbor channel to accommodate the wider turning basin.

(3) The Outer Harbor turning basin would be deepened to -50 feet MLLW plus overdepth, and enlarged to a diameter of 1,600 feet to accommodate the design vessel.

(4) The Inner Harbor channel would be deepened to -50 feet MLLW plus overdepth along its entire length, with widening along the northern boundary, from approximately mile 40+00 (the center of the mouth of the Middle Harbor) to mile 135+00 (the western boundary of the APL terminal). Widening would straighten the channel alignment from the entrance to the Inner Harbor to the western end of the APL terminal. This would provide a channel width of 750 feet at the western end of

the Port's planned new Inner Harbor marine terminals. No widening is planned for the Inner Harbor channel east of the APL terminal.

(5) The Inner Harbor turning basin would be deepened to -50 feet MLLW plus overdepth and widened from 1,200 feet to 1,500 feet. The recommended widening would occur on the southern end of the existing turning basin to minimize the taking of land and economic impact on business operations adjacent to the turning basin. The other options evaluated (see Appendix M) create significantly greater negative economic effects and in all cases but one also involve substantially more dredging and excavation with associated higher construction costs.

The proposed channel depth is consistent with both the maximum draft allowed by the San Francisco Bar Channel, and the limitations imposed by the presence of the BART submarine tunnel, which is located in the project area.[2]

### 5.2.7 Local Service Facilities

In addition to providing commensurate depths at the Port berths, significant work will have to be done to the berths in order to maintain their structural performance after berth deepening. All the berths within the project area, with the exception of Berths 20, 21, 34, 38, and 40 (none of which are expected to have large vessels calling there), are planned for deepening. Berths 20 and 21 are being used by Sealand, which currently utilizes a variety of vessel sizes at their facility in the Oakland Outer Harbor. Their smaller vessels can call at Berths 20 and 21, while the deep draft vessels can call at their Berth 22, which will be deepened. Berth 38 is located at the end of the 7th Street peninsula. It is currently too short and too exposed for large container vessel use, and therefore will not require deepening. Berth 40 is a tug boat wharf located in the proposed MHEA area and will be removed as part of this project.

### 5.2.8 Reuse/Disposal Sites

The estimated volume of dredged material to be removed under the NED and Selected Plans is 12.9 mcy. As explained in section 4.4.1, the sediment to be dredged was divided into five categories. The classifications were determined based on the chemical concentrations detected in the sediment and the leachability potential for materials with elevated levels of chemicals. The sediment testing is discussed in detail in the EIS/R (see section 3) and Appendices A.11 and H. The locations of the potential reuse/disposal areas are shown in Figure 4.4.

As explained in section 4.6, three reuse/disposal scenarios were retained for consideration in the Final Array of Candidate Plans. All plans require limited landfill disposal (up to 0.1 mcy) for contaminated sediment and debris, as well as upland reuse (0.4 to 0.7 mcy) of sediment that is not suitable for reuse in an aquatic environment. The Selected Plan/LPP (Action Plan F-II) utilizes reuse/disposal Scenario II. Scenario II provides the maximum habitat reuse, and is cost-effective as a result of the inclusion of the MHEA in the disposal scenario. The NED plan uses a combination of ocean disposal and the MHEA; this is the most cost effective disposal scenario, but provides less habitat benefit than Scenario II. Finally, the Alternate NED Plan uses ocean disposal and limited upland reuse and disposal. The disposal sites are described briefly below.

---

[2] In a comment letter on the FS and EIS/R BART recommended a minimum 1-foot clearance over the top of the armor rock. The top of the armor rock is at -53 feet MLLW (shown as -56 feet NGVD on the BART plans in Appendix A.1), which is consistent with the planned one foot of overdepth and one foot of tolerance allowed in addition to the proposed -50 foot MLLW channel depth.

**Middle Harbor Enhancement Area.** The Middle Harbor Enhancement Area (MHEA) can accept SUAD and wetland cover material. At the request of local environmental organizations, the small quantity of wetland non-cover material expected to be generated by the project (approximately 0.3 mcy) will be excluded from the MHEA. This decision does not measurably affect the cost of the project. The optimum design capacity of the MHEA is 7.0 mcy.

**Vision 2000 Area.** The Vision 2000 Area can accept SUAD, wetland cover, and wetland non-cover material, and construction fill (untreated or treated fill). The material would first be dried to a minimum of 50 percent solids, and then placed by conventional earthmoving equipment. If necessary (i.e., if required as part of a regulatory agency permit), the dried material may be treated with lime or a similar material to reduce the solubility of leachable compounds.

The estimated capacity of the Vision 2000 Area is 2.5 mcy. Construction fill (currently estimated at 0.3 mcy) will be reused in its entirety at the Vision 2000 Area. Under Action Plans F-I and F-V, up to 0.3 mcy of wetland non-cover material may also be placed at the Vision 2000 Area. The remaining capacity of the site would be used to accommodate material from the bank cut completed as part of the Berth 55-58 project, which is separate from the channel deepening project.

**Hamilton Wetlands Restoration Site.** The HWR site is slated to receive SUAD material only, including wetland cover material. Under the Selected Plan, up to 2.5 mcy of SUAD material from the proposed project would be hauled to the HWR site, if the site is available during construction. The HWR site would not receive any material under the NED Plan or Alternate NED Plan.

**Montezuma Wetlands Project Site.** The MWP site is slated to receive SUAD material and small amounts (less than 33 percent) wetland non-cover material. Under the Selected Plan, up to 2.7 mcy of SUAD material and up to 0.3 mcy of wetland non-cover material from the proposed project would be hauled to the MWP site, if the site is available during construction, costs for the site remain generally competitive with the HWR site, and potential air quality concerns can be resolved. The MWP site would not receive any material under the NED Plan or Alternate NED Plan.

**San Francisco Deep Ocean Disposal Site.** Excess SUAD material would be hauled to the SFDODS. The suitability of the material for disposal in the ocean was determined based on sediment sampling and testing which was performed in 1997 and 1998. Under the Selected Plan, dredged sediment would only be hauled to SFDODS if the HWR or MWP projects are not available on a timely basis. Under the NED Plan, 5.2 mcy of dredged material would have to be disposed of at SFDODS. Under the Alternate NED Plan, that quantity increases to 10.8 mcy. SFDODS does not provide beneficial reuse of dredged material.

**Various Landfills.** Sediment not suitable for use as construction fill and debris that cannot be recycled would be sent to a landfill. Based on the sediment sampling and analytical testing performed to date, the total quantity of material likely to be transported to a landfill is not expected to exceed 100,000 cy, including debris (the debris is expected to be encountered during the construction of the Inner Harbor turning basin).

## 5.3 DREDGING PLAN

As a part of the related Port maritime development project (the Vision 2000 Program), the northern bank of the Inner Harbor channel will be excavated and dredged to widen the channel. The new berths are designed to accommodate berth depths as deep as -55 feet MLLW, but will initially be dredged to a depth of -44 feet (plus 2 feet overdepth), consistent with the berthing needs required by the current -42 feet MLLW channel depth (i.e., and additional 2 feet of depths so that vessels can ride extreme tides at berth). The area between the new berths and the existing channel, known as the interconnecting channel, will be excavated to a depth of -42 feet (plus 2 feet overdepth). The Selected Plan and NED Plans will relocate the Federal channel line to include this area. As part of the navigation project, the new berths will be deepened commensurate with the Selected Plan. The material from the bank excavation will be reused in the maritime development program as fill for the Port's Berths 55-58 project. This creates the opportunity for construction fill quality (contaminated) sediments (e.g., from the Inner Harbor turning basin) to be contained within a portion of the Berth 55-58 construction fill.

The Berth 55-58 project is proposed to begin construction in mid-1999; therefore, the first item of work for the proposed channel deepening project would be the construction of the Inner Harbor turning basin. An electric clamshell or excavator-type dredge would be used to construct the basin. Following demolition of the obstructing wharves and construction of the necessary bulkheads, the turning basin would be dredged and excavated. The dredged material will be transported via scow to the Port's Vision 2000 construction site or currently-permitted Berth 10 Rehandling Facility and off-loaded there with a second clamshell rig.

The second item would consist of the first phase of dredging of the channels, using an electrically-powered clamshell or excavator dredge to remove the softer Young Bay Muds (YBM) which have been determined to be suitable for placement as wetland non-cover (WNC). Under the Selected Plan, the WNC material would be transported via scow to the MWP and pumped out using facilities supplied by that project. Both pump-out of the WNC and material management on-site at the MWP are included in the tipping fee.

The construction of the MHEA would proceed concurrently with items 1 and 2. An armored dike would be constructed along the edge of the new channel at the mouth of the Middle Harbor. It would likely be constructed by bottom dumping and/or using a flat barge and pushing off with a bulldozer to deliver the material for the structure. Because portions of the structure will be constructed to elevations above mean sea level, the final phase of construction would require a crane-mounted barge to place the top surface of rock.

Upon completion of the dredging of the WNC material, the clamshell dredge will remove the remainder of the soft muds. Up to two clamshells could operate simultaneously at this phase. The soft muds would be transported to the MWP site.

An electric cutterhead dredge would be utilized to dredge the deeper depths of the channels, starting with the Inner Harbor. The cutterhead dredge would discharge directly into the MHEA; the pipeline would be moved periodically to create appropriate subbottom contours to support the MHEA creation (including internal containment structures). A detailed plan for placement will be developed to provide the correct contours to accomplish the design of the MHEA. Careful spreading of the sands could include either moving the discharge from a hydraulic dredge (with a diffuser to spread

the material and facilitate low energy settling of the slurry) around the site or the careful placement of the sands from bottom-dump scows (i.e., in thin passes). If there is insufficient volume of material to be dredged from the Inner Harbor to complete the MHEA, a portion of the sediments from the Outer Harbor channel would also be dredged and placed in this manner.

The balance of the channel dredging would be done with electric clamshell or excavator dredges placing the material into scows for transport to the HWR and MWP sites. Off-loading at Hamilton or Montezuma would be accomplished with the use of unloading pump operations similar to the operation used at the Sonoma-Baylands site. Disposal at SFDODS would be done by bottom dumping. Two electric production clamshell dredges (if available) could operate simultaneously, with the air quality impacts associated with tug transport of the scows being the limiting factor in the number of dredges operating. A fleet of 3 scows per dredge is considered efficient for this type of operation.

A small quantity of material from the berths to be dredged was found to be not suitable for unconfined aquatic disposal and would have to be contained together with the turning basin material in the Port's Vision 2000 site. The remainder of the berth dredging would utilize electric clamshell or excavator dredges with placement at either Hamilton, Montezuma or SFDODS, as indicated above.

The preferred method for deepening and widening the Oakland Harbor and Entrance channels is dredging by electric clamshell dredge or by electric hydraulic cutterhead dredge. The Entrance and Inner and Outer Harbor channels are all located in relatively protected areas that allow the use of fixed plant operations. Fixed plant operations facilitate the use of electric dredges, which will be required by the project to avoid significant air quality impacts. Electric dredges will also benefit the project by reducing construction-related noise.

The electric clamshell dredge(s) would be used initially for the softer Young Bay Muds, both to reduce the volume of water diluting the clayey material, and to minimize potential water quality impacts due to dispersion of sediments at the reuse/disposal site. The Young Bay Muds typically contain the highest concentrations of contaminants and, as such, the control afforded by the clamshell dredge is highly desirable. A smaller electric clamshell dredge would be used for the Inner Harbor turning basin, Inner and Outer Harbor berths, and shallow widening areas. In addition, any material to be transported to off-Port reuse/disposal sites would be excavated using an electric production clamshell dredge. Using a three-shift operation, daily production rates per clamshell are estimated at 1,000 to 5,000 cy.

The electric hydraulic cutterhead dredge would be used for the bulk of the dredging operations. The cutterhead dredge evolved from mining (tunneling) equipment and, as such, is especially well suited to the cemented Merritt Sands that proved difficult to dredge during the -42 foot Project. The hydraulic cutterhead dredge has an integral pumping system/pipeline that can be used to deliver dredged material directly to a local reuse/disposal site, thereby reducing air quality impacts and costs. The density of the sands and the depth of dredging require a cutterhead dredge with a minimum pipeline size of 26 inches. The pipeline would be sunk to the bottom of the channel to avoid interfering with vessel traffic. If necessary, a narrow trench could be dug to below -42 feet MLLW for the pipeline. Using a 3-shift operation, estimated production rates are up to 32,000 cy per day.

## 5.4 OPERATION AND MAINTENANCE REQUIREMENTS

Maintenance dredging of the Federal channels is generally the responsibility of the Federal government. However, pursuant to Section 101(b) of WRDA 86 the additional cost to perform maintenance dredging below a depth of -45 feet MLLW is shared equally with the non-Federal sponsor (i.e., the Port). The process used to estimate the O&M dredging quantities and determine cost-sharing responsibilities is outlined below and described in detail in Appendix B.1. Other maintenance requirements include initial operation and monitoring of the MHEA.

### 5.4.1 Estimated Operations and Maintenance Dredging Quantities

The historical records of maintenance dredging for the Federally authorized channel at Oakland Harbor were analyzed to determine if previous changes in the dimensions and depths or the channel have caused changes in the rate of shoaling. There is an extensive period of record showing the quantities of maintenance dredging material removed from the Federally authorized channel at Oakland Harbor. The complete period of record is from 1931 to 1997. In this time frame, there have been three occasions when there was a significant change in the Federally authorized channel. One was in 1931, one in 1942, and one in 1974-1975.

There has also been a significant change beginning in 1991. Since 1991, the preponderance of dredging at Oakland has been the result of new work. Only one year of data exists for maintenance dredging requirements for the Outer Harbor since 1991. This consists of recent volume calculations of the -42 foot Outer Harbor project resulting from a year of shoaling. Results of condition surveys conducted in March 1998 indicate that only 210,000 cy (including advance maintenance and overdepth) are required to be dredged.

The period of record was broken down into three segments. Each segment represents a period following an event of significant change. During each period, there was no recorded change in the depth or width of the authorized project until the next event of significant change. The three periods are 1932 to 1941, referred to as "Period A," 1943 to 1973 referred to as "Period B," and 1976 to 1991 referred to as "Period C." The years between segments are years in which new work construction occurred.

During Period A, the average dredging quantity was 304,758 cy and during Period C it was 373,134 cy. However, during Period B the average annual dredging was 700,116 cy. The greater depth -35 feet (MLLW) in the Outer Harbor compared to the Inner Harbor (-30 feet MLLW), could have resulted in a sediment trap situation in the Outer Harbor. Under the recommended project plan both the Inner and Outer Harbor will be at the same depth, and the sediment trap situation will not exist. Therefore, the post-project condition will more closely approximate Period A or Period C than Period B.

The analysis suggests that the recommended -50 foot deepening of both the Inner and Outer Harbor together will result in a modest increase in the shoaling rate. The analysis suggests that the shoaling rate for the authorized Oakland Harbor project as a whole is relatively constant when the Inner and Outer Harbors are maintained at the same depth. However, when the Outer Harbor is deeper than the Inner Harbor, the shoaling rate greatly increases. Alternatively, some of the higher volumes in Period B may have been associated with dredging to support war-time efforts and/or the practice of side-casting dredged material.

Based on the preceding analysis, the future maintenance dredging required for the recommended plan to deepen the Inner and Outer Harbors was estimated by comparing Period A (1932 through 1941) with Period C (1976 through 1991). During Period A, the Inner and Outer Harbors were both maintained at a depth of -30 feet MLLW. During Period C both the Inner and Outer Harbors were maintained at a depth of -35 feet MLLW. The average annual maintenance dredging increased by approximately 70,000 cubic yards when the depth increased by 5 feet. Therefore there was an average increase of 14,000 cubic yards per foot of increased depth.

The alternatives for the proposed channel deepening project were evaluated for optimization of costs and benefits and cost sharing based on an increase in maintenance dredging of 14,000 cubic yards per foot of added depth. Thus, it is estimated that the annual increase in maintenance dredging for the NED Plan with a depth of -50 feet MLLW would be approximately 112,000 cy. The cost to move this material to an in-Bay disposal site that is designated for disposal of O&M material (SF-11, or "Alcatraz") is estimated to be $3.06 per cubic yard. The annual incremental dredging cost would be $411,000 (including a 20 percent contingency). The portion of this total that would require cost sharing with the local sponsor would be 5 feet (i.e., from -45 to -50 feet), or 70,000 cy per year (consequently, including the contingency, approximately $257,000 of the total annual dredging cost would represent shared costs).

The Port has also estimated the projected increase in average annual maintenance dredging in based on the increase in berth acreage and depth. The Port projects an increase in average annual maintenance dredging of 62,000 cubic yards for the berths. The Port's estimated cost to move this material to an in-Bay disposal site designated for disposal of O&M material is estimated to be $7.45 per cubic yard. The annual incremental dredging cost would be $554,000 (including a 20 percent contingency).

Similar calculations were performed for all the alternative dredging depths, and the results are used in the optimization analysis that follows. It must be clarified that these volumes are only estimates, and that actual shoaling rates are expected to vary significantly from year to year, depending on rainfall. In addition, the average shoaling rates may vary significantly from these projections.

### 5.4.2 Capacity of Sites for Operations and Maintenance Dredging Material

The total average annual quantity of O&M dredging from the improved Oakland project is estimated to be 485,000 cy. Alcatraz, the current designated in-Bay disposal site for O&M material has ample annual capacity to accept this quantity. Alcatraz is the least cost permitted site and will be used as long as it is available. Other locations that could accept O&M material include the HWR and MWP sites. The HWR site is estimated to have a total capacity of 10.6 mcy; thus, it will have a residual capacity of 8.1 mcy after the delivery of 2.5 mcy (under the Selected Plan). Similarly, the MWP site will have a residual capacity of 11 mcy after the delivery of 3.0 mcy by the proposed Oakland project.

### 5.4.3 Operations and Maintenance During Construction

During the 4 to 5 year construction period for the proposed project, it is anticipated that shoaling will occur in the channels being dredged. This same situation led to substantial construction claims during the construction of the -42 foot project. Therefore, the operations and maintenance program for the Oakland Inner and Outer Harbor channels should be closely coordinated with the deepening project.

### 5.4.4. Operation and Maintenance of Disposal/Reuse Sites

Under the Selected Plan, dredged materials will be delivered to the MHEA, and the HWR and the MWP sites. Costs for monitoring the MHEA (for a 10-year period) have been included in the project costs. Project costs also reflect project costs associated with planting and other initial habitat management efforts. Monitoring of the MHEA is required to confirm hydrodynamic modeling, and track consolidation and subsidence curves to predict final site elevations. Water quality, bathymetry, current velocities, and tidal range data, as well as biological colonization of the created habitat areas would be used to verify modeling and direct any necessary minor adjustments in the final designs to maximize potential success in the habitat design.

The distribution and site management costs associated with placement of dredged materials at HWR have been included in the project cost estimate; that is, to ensure that the proposed project is adequately funded, costs associated with mobilizing and operating an off-loader, site management (dredged material distribution), and monitoring have been included in the estimate. Similarly, a proportional percentage (i.e., 25 percent) of the site preparation costs (including construction of levees and weirs) has been added to the estimate for the HWR costs. While the costs of site preparation, site management, and monitoring may ultimately be funded as part of separate authorization for the Hamilton project, constructing the estimate this way ensures that adequate funds are available to construct the Oakland project.

Several differing assumptions between the Port and HWR cost estimates resulted in different unit cost estimates for dredging at the Oakland project and off-loading at the Hamilton project. Appendix B.7 provides a summary of the different assumptions and the resulting disparities in the unit cost estimates.

The distribution and site management costs associated with placement of dredged materials at MWP will be borne by the operator at that site.

## 5.5 PROJECT ECONOMICS

The following section describes the derivation of the costs and benefits used in the analysis leading to determination of the optimized National Economic Development (NED) Plan and the Selected Plan. The section also presents the rationale for and determination of the required cost sharing between the Federal Government and the Port of Oakland.

The NED Plan is defined as the plan which makes the greatest net contribution to National Economic Development. The NED account used in the evaluation of alternatives addresses that part of NEPA, as defined in 40 CFR 1508.4, that identifies beneficial and adverse effects to the economy. The NED Plan is the plan which maximizes the net economic benefits (average annual benefit less the average annual costs) of an alternative.

In this study, the NED Plan has been determined to be the plan which dredges the selected layout for channels and turning basins to a depth of -50 feet MLLW and uses reuse/disposal Scenario I (Action Plan F-I). The Selected Plan/LPP is the plan which uses reuse/disposal Scenario II (Action Plan F-II) and provides a channel depth of -50 feet MLLW. An Alternate NED plan (Action Plan F-V at -49 feet MLLW) was also determined, in case permitting of the most cost-effective reuse option (the MHEA) becomes infeasible.

### 5.5.1 Cost Estimate Assumptions

Cost estimates for the alternative plans considered are based on October 1998 price levels. The costs were developed by the Corps of Engineers San Francisco District, utilizing the Micro Computer Assisted Cost Estimating System (MCACES), and based in part on recent information on contractor bids and audits for other construction projects conducted by the Corps. The cost estimates include contingencies for each cost item based on an analysis of the accuracy of information used for the design and costs. Contingencies assigned to the various cost items ranged from 0 percent to 25 percent. The cost estimate includes the estimated cost for engineering and design as well as supervision and administration of construction.

The cost estimate includes all channel components shown in section 5.2.6 and required reuse/disposal sites described in section 5.2.8. No dredging or other work at the San Francisco Bar Channel is required for or proposed under this project.

The cost estimate assumes that the Contractor will be working 24 hours a day in 3 8-hour shifts, 7 days a week. It is anticipated that dredging would be performed by a combination of electric clamshell dredges and an electric hydraulic cutterhead dredge. For dredged material designated for construction of the MHEA, dredged material would be placed either directly by pumping through a pipeline from the face of the cutterhead dredge, or by bottom dumping material from scows filled by the clamshell dredges. The estimate assumes that approximately 25 percent of the material delivered to the MHEA would be placed by scows.

For dredged material designated for upland disposal at the Vision 2000 Area, the dredged material would be placed in scows by an electric clamshell dredge, transported as close to the upland area as possible, and then placed directly by another clamshell dredge. Material would be delivered at a minimum of 50 percent solids, and can therefore be dried in place. For dredged material designated for any off-Port habitat restoration or creation project (e.g., HWR or MWP), barges would transport the material to designated off-loading point for that facility. For material designated for ocean disposal, barges would transport the dredged material to SFDODS, then bottom dump the material. Finally, for contaminated sediment to be disposed of at local landfills, the material would be dredged by clamshell and delivered via scows to a lined rehandling facility located on the Vision 2000 Area or at Berth 10. The material would be off-loaded using a second clamshell dredge, and would be dried to approximately 70 percent solids using conventional earth-moving equipment. Decant water and any stormwater run-off would be captured in an adjacent settling basin, and discharged under permit. Once the sediment has dried sufficiently, it would be loaded onto trucks or rail cars for transport to the designated landfill(s).

Mobilization and demobilization is based on the preparation, transfer, set-up, and removal of required plant and equipment. The estimate assumed that mobilization of the cutterhead dredge would require approximately 14 days. The pipeline associated with the hydraulic cutterhead dredge would be placed in a trench dug below the existing channel bottom, to protect it from passing vessels. In addition to the creation of a trench, the pipeline requires delivery, setup, and removal.

Clamshell dredges and scows are readily available. The estimated mobilization/ demobilization time for clamshell dredges is 14 days. Up to two electric production clamshell dredges (if available), and a smaller electric clamshell dredge may be used simultaneously on this project. An additional 2 days of mobilization/ demobilization

time will be required to prepare and set up the dredge. The estimated mobilization/demobilization time for scows is up to 10 days (i.e., they are all expected to be mobilized from the West Coast). The estimate assumes that 6 scows will be required, and that scows used for hauling outside of the immediate Oakland harbor area will have a capacity of 5,000 cy. The necessary trucks or rail cars to transport dredged material to landfills can be mobilized within 7 days. The dredging will have to be completed with electric dredges. The time required to retrofit the equipment may extend the mobilization period significantly.

The electric hydraulic cutterhead dredging plant consists of a 27-inch diameter cutterhead dredge and pipeline. The hydraulic cutterhead dredge has a total combined rating of 10,000 horsepower to operate the cutterhead, ladder pump, and, if required, booster pump (depending on the distance that sediment will be pumped). A standard 21-cy clamshell dredge has a 2,200 hp power plant. Both the hydraulic cutterhead dredge and the clamshell dredge(s) will be accompanied by a survey boat and tender tugs, as needed. Both the survey boat and the tender boat will be conventionally powered (diesel). The survey vessel is assumed to be equipped with 340 horsepower and all necessary hydro-surveying equipment.

Aids to navigation work would involve moving the aids to navigation installed at the Inner Harbor turning basin as part of the -42 foot project and the light that will be removed as part of the MHEA levee construction. The Port and Corps currently do not anticipate that further aids to navigation will be required. The proposed Inner Harbor turning basin widening will result in a turning basin that is larger relative to the design vessel than the Inner Harbor turning basin designed for the -42 foot project. Nonetheless, ship simulation studies will determine whether further aids to navigation are required.

The potential costs associated with the use of electric dredges are reflected in the use of a higher contingency factor (25 percent compared to the standard 20 percent) for Navigation, Ports, and Harbors costs calculated in the MCACES. The cost differential associated with this increase in contingency ranges from approximately $3.5 million for the NED Plan to $5.3 million for the Selected Plan.

Delivery times to the various reuse/disposal sites will depend on the distance and equipment used to transport material to the site. SFDODS is located approximately 50 nautical miles west of the Golden Gate Bridge in over 8,000 feet of water. The distance from the project site to SFDODS is 58 nautical miles. The MHEA is located within the project area. Much of the material to be reused at MHEA would be placed directly by the hydraulic cutterhead dredge; barge travel time to the MHEA is expected to be minimal. The MHEA is approximately 190 acres in size, and would be used to develop shallow water habitat. Materials placed in this area could have a dual purpose: they will serve to create the shallow water area, and could also serve as the remediation for contaminated sediments associated with former Navy operations.

Delivery to Hamilton or Montezuma, or any other habitat restoration or creation project outside of the Port area, is currently expected to be similar to the use of any other multi-user site: i.e., the material would be delivered to a designated location, and the local project sponsor for the habitat restoration/creation project would determine where on the facility the material would be placed. The Hamilton site is located 15 miles north of the project area, and the Montezuma site is located 27 miles northeast of the project area. (As noted earlier, the Hamilton cost estimate includes sufficient funds to cover the costs associated with the placement of Project material at the Hamilton site even if the Hamilton project has not been funded at the time of construction).

The Vision 2000 Area is located within the project area. Barge travel time to the Vision 2000 Area is expected to be minimal. The Vision 2000 Area upland reuse site would utilize the newly diked fill area or existing upland areas to receive construction fill which is not suitable for open water disposal. A rehandling facility for contaminated material to be transported to local landfills may also be constructed at the Vision 2000 Area, or at other areas at the former FISCO. The rehandling facility would require construction of the appropriate containment cells, a weir structure to control decant water and stormwater, and earthmoving equipment to help move the sediment to dry it more quickly. A liner may also be required when the more contaminated sediments are being handled.

As indicated earlier, up to 100,000 cy of contaminated sediment and debris may be transported to a landfill. The material would first be dried at a rehandling facility located on the Vision 2000 Area or Berth 10. Once dried (to approximately 70 percent solids for sediment), the material would be loaded onto trucks or rail cars using conventional earthmoving equipment. Depending on the degree of contamination encountered, the material may be disposed in any of several local (Bay Area) landfills.

Other assumptions used in the cost estimate include:

| | |
|---|---|
| • Dredged Material (by Convention): | 50% sand/silty sand<br>50% clay |
| • Dredge Depth Required Overdepth: | 1 foot |
| • Dredge Depth Tolerance: | 1 foot |
| • Dredge Rate: (Clamshell) | 1,000 to 5,000 cy/day (sand) |
| (Clamshell) | 5,000 to 12,000 cy/day (mud) |
| (Hydraulic Cutterhead) | 30,000 to 34,000 cy/day |
| • Travel Time to SFDODS (round trip): | 20 hours |
| • Available Hours Per Dredging Day: | 24 hours/day |
| • Effective Time: | 65% |
| • Monthly Ownership: | 12 mo/yr[3] |
| • Contingencies: | 0% to 25%, as appropriate |
| • Mobilization/Demobilization (Total) | $variable |
| • Preconstruction Engineering and Design | $3,250,000 |
| • Construction Supervision/Administration | $variable |

Project costs to be borne by the local sponsor include relocation of up to four BART tube anode cables (estimated cost: $1,620,000). The costs of relocating these facilities would be shared 50 - 50 between the Port as NFS and the owner of the facilities assuming they are deep draft public utilities at the time they are required to be moved. The estimate assumes that the sewer line will be owned by the U.S. Navy at the time that it is relocated; in that case, it is cost shared as a general navigation feature of the project. In addition, the Port would bear the costs of deepening and other necessary modifications to the berths in the Inner and Outer Harbors (i.e., local service facilities, LSFs), as described in section 5.2.7. Berth deepening is included in the cost estimate for LSFs, and includes both the newly constructed berths (which will be at -46 feet MLLW), and the currently existing berths.

Project cost estimates for various dredging depths are provided in Appendix B.4 (MCACES Summaries) and are summarized in Tables 5.2-1 through 5.2-3.

[3] Note that this assumption (65 percent utilization for 12 mo/yr) is consistent with the Corps Equipment Manual EP 1110-1-8, which assumes a 9 mo/yr continuous (100 percent) utilization.

**TABLE 5.2-1. Summary of Dredging Volumes and First Costs**
**Action Plan F-I: Habitat Reuse and Ocean Disposal**

| Dredging Depth | -45 feet (e) | -48 feet | -49 feet | -50 feet |
|---|---|---|---|---|
| Total Dredging Volume (cubic yards) (a) | 5,703,000 | 9,931,000 | 11,397,000 | 12,864,000 |
| Total GNF | $115,370,000 | $123,770,000 | $132,290,000 | $142,470,000 |
| Total LERR | $14,950,000 | $14,950,000 | $14,950,000 | $14,950,000 |
| Total Local Service Facilities (b) | $12,390,000 | $42,150,000 | $42,330,000 | $42,460,000 |
| Other Costs (c) | $980,000 | $1,730,000 | $1,980,000 | $2,220,000 |
| Total Project First Costs (d) | $143,690,000 | $182,600,000 | $191,550,000 | $202,100,000 |

Note:

(a) Total dredging volume includes material from Inner Harbor turning basin that requires confined disposal, and one foot required overdepth and one foot of tolerance.

(b) Most Port berths are already dredged to -46 feet MLLW. Only Port Berths 32 and 33 will require retrofit if the channel is deepened to -45 feet MLLW.

(c) Ocean Monitoring Costs

(d) Before escalation to mid-point of construction

(e) Using -45 foot MLLW MCACES costs

**TABLE 5.2-2. Summary of Dredging Volumes and First Costs**
**Action Plan F-II: Maximum Habitat Reuse**

| Dredging Depth | -45 feet (e) | -48 feet | -49 feet | -50 feet |
|---|---|---|---|---|
| Total Dredging Volume (cubic yards) (a) | 5,703,000 | 9,931,000 | 11,397,000 | 12,864,000 |
| Total GNF | $120,980,000 | $160,030,000 | $171,010,000 | $195,060,000 |
| Total LERR | $14,950,000 | $14,950,000 | $14,950,000 | $14,950,000 |
| Total Local Service Facilities (b) | $12,100,000 | $42,010,000 | $42,170,000 | $42,290,000 |
| Other Costs (c) | $0 | $0 | $0 | $0 |
| Total Project First Costs (d) | $148,030,000 | $216,990,000 | $228,130,000 | $252,290,000 |

Note:

(a) Total dredging volume includes material from Inner Harbor turning basin that requires confined disposal, and one foot required overdepth and one foot of tolerance.

(b) Most Port berths are already dredged to -46 feet MLLW. Only Port Berths 32 and 33 will require retrofit if the channel is deepened to -45 feet MLLW.

(c) Ocean Monitoring Costs (the Selected Plan does not require ocean monitoring)

(d) Before escalation to mid-point of construction

(e) Using -45 foot MLLW MCACES costs

## TABLE 5.2-3. Summary of Dredging Volumes and First Costs
## Action Plan F-V: Ocean Disposal

| Dredging Depth | -45 feet (e) | -48 feet | -49 feet | -50 feet |
|---|---|---|---|---|
| Total Dredging Volume (cubic yards) (a) | 5,703,000 | 9,931,000 | 11,397,000 | 12,864,000 |
| Total GNF | $140,350,000 | $154,710,000 | $168,160,000 | $182,550,000 |
| Total LERR | $14,950,000 | $14,950,000 | $14,950,000 | $14,950,000 |
| Total Local Service Facilities (b) | $9,950,000 | $43,190,000 | $44,370,000 | $46,430,000 |
| Other Costs (c) | $3,620,000 | $3,950,000 | $4,560,000 | $5,410,000 |
| Total Project First Costs (d) | $168,870,000 | $216,800,000 | $232,040,000 | $249,340,000 |

Note:

(a) Total dredging volume includes material from Inner Harbor turning basin that requires confined disposal, and one foot required overdepth and one foot of tolerance.

(b) Most Port berths are already dredged to -46 feet MLLW. Only Port Berths 32 and 33 will require retrofit if the channel is deepened to -45 feet MLLW.

(c) Ocean Monitoring Costs

(d) Before escalation to mid-point of construction

(e) Using -45 foot MLLW MCACES costs

### 5.5.2 Description of the NED and the Selected Plan

The Selected Plan consists of deepening Oakland Harbor and the Entrance channel to a depth -50 feet MLLW, with 2 feet combined of overdepth and tolerance. An estimated 12.9 mcy would be dredged. As stated earlier, approximately 7.0 mcy would be deposited at the MHEA, 0.3 mcy would be reused upland at the Vision 2000 Area, up to 3.0 mcy would be transported to the MWP location, up to 2.5 mcy could be used for wetland restoration at the HWR site, and up to 100,000 cy would be taken off-site to a landfill. Under the NED Plan, the Vision 2000 site would receive 0.6 mcy, the MHEA would receive 7.0 mcy, up to 5.2 mcy would be disposed of at SFDODS, and 100,000 cy would be taken off-site to a landfill. Finally, under the Alternate NED Plan, up to 10.8 mcy would be disposed of at SFDODS, 0.5 mcy be reused at the Vision 2000 Area, and up to 100,000 cy could be hauled to a landfill.

The scheduled construction start date for the Selected Plan is February 2000. The construction midpoint date is April 2002. Construction of the Selected Plan would require approximately 54 months, including mobilization and demobilization.

The scheduled construction start date for the NED Plan is February 2000. The construction midpoint date is August 2001. Dredging for the NED Plan would require approximately 36 months, including mobilization and demobilization.

The scheduled construction start date for the Alternate NED Plan is February 2000. The construction midpoint date is February 2002. Dredging for the Alternate NED Plan would require approximately 48 months, including mobilization and demobilization.

### 5.5.3 Project Costs for the -45 Foot Plan

The rate of cost sharing for GNF changes at -45 feet. Above -45 feet the rate is 75 percent Federal, 25 percent non-Federal; below -45 feet the standard rate for cost-sharing is 50 percent Federal, 50 percent non-Federal, down to the depth of the NED Plan. A quantity and cost estimate for dredging to a depth of -45 feet MLLW for each of the three Action Plans is presented in Tables 5.2-1 through 5.2-3. The information in Tables 5.2-1 through 5.2-3 is based on the MCACES developed for constructable plans at -45 feet MLLW. However, a lower cost was used in the calculation of cost sharing between the Federal Government and the Port of Oakland (see Tables 5.6-1 through 5.6-3).

The Port's approach uses a true "incremental" approach -- that is, the estimated cost at -45 feet MLLW is developed from the MCACES for the plan at the full depth. The full-depth plan costs were adjusted to reflect reduced volumes, shorter project durations, and similar variables that differ between the -45 foot MLLW increment of the plan and the full plan. Unit costs for dredging and disposal were also modified to reflect the economies of scale achievable at the full plan depth.

The Port's approach results in a truly incremental cost for the -45-foot MLLW plan, is more favorable to the Federal Government than the "constructable" -45 foot MLLW plan costs presented in the MCACES (i.e., the Port a greater share of the total costs).. Appendix B.9 presents a detailed rationale for this approach and Port-modified -45 foot MLLW plan cost.

It should be noted that the draft House of Representatives language for WRDA 98 extended the -45 foot depth to -53 feet MLLW. The actual cost sharing for the proposed project is dependent on any such Congressional action.

### 5.5.4 Project Economic Benefits

Appendix A.7 to this Feasibility Report presents the economic analysis used to estimate the benefits resulting from deepening the Oakland Harbor and Entrance channels. The benefits consist primarily of the transportation savings and the reduction in shoreside operating costs associated with tidal delays. Additional impacts such as the reduction of risk of vessel grounding are recognized, but were not quantified for this analysis. The benefits are based on a comparison of the differences in estimated costs for vessel operations under "with" and "without" project conditions.

For the benefit and optimization analysis, the benefits resulting from alternative depths of dredging must be compared under the same projections of future conditions. All projections of future conditions are to some extent uncertain and dependent upon factors including the opinions of those making the projections. The benefit projections are summarized in Table 5.3. The benefits are calculated at the discount rate of 6 7/8 %, which is the statutorily correct rate for calculations in Federal fiscal year 1999.

The benefits were computed within the context of a multiport analysis. The existing and projected future "with" and "without" project operations of the vessels that use Oakland Harbor were examined and incorporated into the analysis. The economic analysis assumed that there will not be a significant shift to competing ports under the No Action Plan, because most of the cargo brought to Oakland is locally produced or consumed. Another important issue considered in the analysis is whether carriers would consider servicing Bay Area customers by rail or truck from another West Coast Port. This concern is prompted by carriers that have sailing rotations that "straddle" the Bay Area, i.e., that call at Southern California and Pacific Northwest ports. However, given the lack of sufficient land-side transportation resources, and the large Bay Area population, it is unlikely that carriers would reroute cargo entirely.[4] Nonetheless, the Port's operating experience leads it to believe that shippers will modify their fleet mixes based on the depth of the channels.

Two benefit categories were developed for the Oakland Harbor economic analysis: Economies of Scale and Tidal Delay Reduction. Economies of scale reflect the reduced cost of transporting more containers per vessel, with a resulting reduction in the number of trips required. Tidal delay reductions reflect the costs associated with keeping a vessel at sea or at berth while waiting for sufficient water depth for safe passage. Beam width delays were determined not to be significant; therefore, potential reductions in beam width delays were not computed for this analysis.

In consideration of the recent economic slow-down in Asia, the economic analysis also evaluated the most recent revised activity projections for the Port prepared by Booz-Allen for the Port's upcoming bond sale. The projections show an average expected annual growth rate of 4.8 percent to 4.9 percent, which is 1 percent greater than that assumed in the economic model. In addition, the Port's cargo volume has continued to grow in the most recent six quarters, which have included significant impacts to activity at other West Coast ports. The growth rate for the Port's Fiscal Year 1998 (July 1997 through June 1998) was 7.25 percent.

---

[4] Nonetheless, as shown in the letters from carriers also provided in Appendix A.7, this assumption contradicts the position of certain carriers, who are unwilling to bring the sixth generation vessels into Oakland unless the channel is deepened to -50' MLLW. Thus, assuming that the percentage of large vessels brought into Oakland correlates linearly with channel depth likely overstates the benefits from large vessels achievable at shallower depths.

## TABLE 5.3
## AVERAGE ANNUAL BENEFITS

| Dredging Depth | Average Annual Benefit |
|---|---|
| -45 | — |
| -46 | $149,030,000 |
| -47 | $161,680,000 |
| -48 | $166,890,000 |
| -49 | $185,840,000 |
| -50 | $187,870,000 |

It should be noted that the economic model for calculating benefits from seaport dredging projects currently does not adequately capture savings associated with reductions in inventory costs due to a more efficient transportation system, whereas the benefit model for inland water projects does include consideration of inventory cost savings. Thus, the economic model for seaport projects likely underestimates the overall benefits.

### 5.5.5 Calculation of Average Annual Costs

The determination of the NED Plan is based on a comparison of average annual benefits and average annual costs. The average annual costs are computed for a project life of 50 years and an interest rate determined by statute. The interest rate currently applicable for Federal Fiscal Year 1999 is 6 7/8 percent. The interest rate is used to calculate the cost of interest during construction, to reflect the cost of the money used for construction. The calculations are based on a 4.0-year mobilization/construction period for the NED Plan, a 5.0 year mobilization/construction period for the Alternate NED Plan, and a 5.5 year mobilization/construction period for the Selected Plan. The construction duration is governed by a combination of dredge production rates and air emissions limits (i.e., transport of material to locations outside of the Port area is constrained by the need to maintain emissions below the conformity threshold). The payment distributions are shown in Appendix B.5.

Costs were assumed to be distributed equally over the year. Corps policy suggests that for feasibility-level studies interest be calculated using a one-year compounding period.[5] In accordance with Corps policy the interest for the yearly average expenditure was calculated assuming the yearly cost is expended at mid-year. The present worth of the interest during construction costs is determined and added to the total estimated first cost of construction. This cost is used to calculate an average annual cost, or annualized first cost. Estimated costs for operation and maintenance of the completed project (calculated in the manner discussed previously) are added to the annualized first costs, for a total average annual cost for each alternative depth of dredging for the selected layout of channels and turning basins. The calculation of total average annual costs is shown in Tables 5.4-1 through 5.4-3.

### 5.5.6 Calculation of Net Benefits and Benefit to Cost Ratios

The calculation of net benefits (average annual benefits in excess of average annual costs) and benefit to cost ratios (average annual benefits divided by average annual costs) are provided below and summarized in Table 5.5-1 through 5.5-3.

The benefit/cost (B/C) ratio for the Selected Plan with a -50 foot MLLW channel depth is 8.07 to 1. This B/C ratio is the ratio of the annual benefits, $187,870,000 (rounded), to the annualized cost (including interest during construction) of $23,290,000 (rounded). Net Annual Benefits are $164,580,000 (rounded).

The B/C ratio for the NED Plan with a -50 foot MLLW channel depth is 10.93 to 1. This B/C ratio is the ratio of the annual benefits, $187,870,000 (rounded), to the annualized cost (including interest during construction) of $17,190,000 (rounded). Net Annual Benefits are $170,780,000 (rounded).

For comparison, the B/C ratio for the Alternate NED Plan with a -50 foot MLLW channel depth is 8.67 to 1. This B/C ratio is the ratio of the annual benefits, $187,870,000

[5] SPDPD-E letter dated 4 February 1981.

## TABLE 5.4-1. AVERAGE ANNUAL COSTS
## Action Plan F-I -- Habitat Reuse and Ocean Disposal

| Dredging Depth | Estimated First Costs (a) | Interest During Construction (b) | Total Investment Cost | Annualized Investment Cost (c) | Annual O&M (d) | Total Average Annual Costs |
|---|---|---|---|---|---|---|
| -45 | $143,690,000 | $16,310,000 | $160,000,000 | $11,410,000 | $620,000 | $12,030,000 |
| -46 | — | — | — | — | — | — |
| -47 | — | — | — | — | — | — |
| -48 | $182,600,000 | $25,310,000 | $207,910,000 | $14,830,000 | $830,000 | $15,660,000 |
| -49 | $191,550,000 | $25,380,000 | $216,930,000 | $15,470,000 | $900,000 | $16,370,000 |
| -50 | $202,100,000 | $25,380,000 | $227,480,000 | $16,220,000 | $970,000 | $17,190,000 |

Notes:
(a) -45 foot MLLW depth cost based on MCACES for -45 foot MLLW Plan
(b) Interest Rate = 6 7/8%
(c) Cost Recovery Factor (6 7/8% and 50 years) = 0.07132
(d) Based on Alcatraz placement costs of $3.06/cy for material dredged from the channel (plus 20% contingency) and a $7.45/cy for material dredged from the berths (plus 20% contingency)

## TABLE 5.4-2. AVERAGE ANNUAL COSTS
## Action Plan F-II -- Maximum Habitat Reuse

| Dredging Depth | Estimated First Costs (a) | Interest During Construction (b) | Total Investment Cost | Annualized Investment Cost (c) | Annual O&M (d) | Total Average Annual Costs |
|---|---|---|---|---|---|---|
| -45 | $148,030,000 | $25,970,000 | $174,000,000 | $12,410,000 | $620,000 | $13,030,000 |
| -46 | — | — | — | — | — | — |
| -47 | — | — | — | — | — | — |
| -48 | $216,990,000 | $51,950,000 | $268,940,000 | $19,180,000 | $830,000 | $20,010,000 |
| -49 | $228,130,000 | $54,640,000 | $282,770,000 | $20,170,000 | $900,000 | $21,070,000 |
| -50 | $252,290,000 | $60,620,000 | $312,910,000 | $22,320,000 | $970,000 | $23,290,000 |

Notes:

(a) -45 foot MLLW depth cost based on MCACES for -45 foot MLLW Plan
(b) Interest Rate = 6 7/8%
(c) Cost Recovery Factor (6 7/8% and 50 years) = 0.07132
(d) Based on Alcatraz placement costs of $3.06/cy for material dredged from the channel (plus 20% contingency) and a $7.45/cy for material dredged from the berths (plus 20% contingency)

## TABLE 5.4-3. AVERAGE ANNUAL COSTS
## Action Plan F-V -- Ocean Disposal

| Dredging Depth | Estimated First Costs (a) | Interest During Construction (b) | Total Investment Cost | Annualized Investment Cost (c) | Annual O&M (d) | Total Average Annual Costs |
|---|---|---|---|---|---|---|
| -45 | $168,870,000 | $30,070,000 | $198,940,000 | $14,190,000 | $620,000 | $14,810,000 |
| -46 | — | — | — | — | — | — |
| -47 | — | — | — | — | — | — |
| -48 | $216,810,000 | $38,720,000 | $255,530,000 | $18,220,000 | $830,000 | $19,050,000 |
| -49 | $232,040,000 | $40,270,000 | $272,310,000 | $19,420,000 | $900,000 | $20,320,000 |
| -50 | $249,340,000 | $41,060,000 | $290,400,000 | $20,710,000 | $970,000 | $21,680,000 |

Notes:
(a) -45 foot MLLW depth cost based on MCACES for -45 foot MLLW Plan
(b) Interest Rate = 6 7/8%
(c) Cost Recovery Factor (6 7/8% and 50 years) = 0.07132
(d) Based on Alcatraz placement costs of $3.06/cy for material dredged from the channel (plus 20% contingency) and a $7.45/cy for material dredged from the berths (plus 20% contingency)

## TABLE 5.5-1. ANNUAL NET BENEFITS
## Action Plan F-I -- Habitat Reuse and Ocean Disposal

| Dredging Depth | Total Average Annual Cost (a) | Annual Benefit | Annual Net Benefit | Benefit/Cost Ratio |
|---|---|---|---|---|
| -45 | $12,130,000 | — | — | — |
| -46 | — | $149,030,000 | — | — |
| -47 | — | $161,680,000 | — | — |
| -48 | $15,660,000 | $166,890,000 | $151,230,000 | 10.66 |
| -49 | $16,370,000 | $185,840,000 | $169,470,000 | 11.35 |
| **-50** | **$17,190,000** | **$187,870,000** | **$170,680,000** | **10.93** |

Note:
(a) -45 foot MLLW depth cost based on MCACES for -45 foot MLLW Plan

## TABLE 5.5-2. ANNUAL NET BENEFITS
## Action Plan F-II -- Maximum Habitat Reuse

| Dredging Depth | Total Average Annual Cost (a) | Annual Benefit | Annual Net Benefit | Benefit/Cost Ratio |
|---|---|---|---|---|
| -45 | $13,030,000 | — | — | — |
| -46 | — | $149,030,000 | — | — |
| -47 | — | $161,680,000 | — | — |
| -48 | $20,010,000 | $166,890,000 | $146,880,000 | 8.34 |
| **-49** | **$21,070,000** | **$185,840,000** | **$164,770,000** | **8.82** |
| -50 | $23,290,000 | $187,870,000 | $164,580,000 | 8.07 |

Note:
(a) -45 foot MLLW depth cost based on MCACES for -45 foot MLLW Plan

## TABLE 5.5-3. ANNUAL NET BENEFITS
## Action Plan F-V -- Ocean Disposal

| Dredging Depth | Total Average Annual Cost (a) | Annual Benefit | Annual Net Benefit | Benefit/Cost Ratio |
|---|---|---|---|---|
| -45 | $14,810,000 | — | — | — |
| -46 | — | $149,030,000 | — | — |
| -47 | — | $161,680,000 | — | — |
| -48 | $19,050,000 | $166,890,000 | $147,840,000 | 8.76 |
| -49 | $20,320,000 | $185,840,000 | $165,520,000 | 9.15 |
| **-50** | **$21,680,000** | **$187,870,000** | **$166,190,000** | **8.67** |

Note:
(a) -45 foot MLLW depth cost based on MCACES for -45 foot MLLW Plan

rounded), to the annualized cost (including interest during construction) of $21,680,000 (rounded). Net Annual Benefits are $166,190,000 (rounded).

### 5.5.7 Determination of the NED Plans and Optimization of the Selected Plan

The NED Plan is defined as the plan which makes the greatest net contribution to National Economic Development. The NED Plan is the plan which maximizes the net benefits of an alternative. The average annual benefits less the average annual costs are greatest for the NED Plan. Table 5.5-1 shows that the NED Plan is the -50 foot MLLW dredging depth alternative of Action Plan F-I. Without the MHEA site, the NED Plan is the -49 foot MLLW dredging depth alternative of Action Plan F-V. The Selected Plan also optimizes at -49 feet MLLW. However, as described earlier, the optimization results depend strongly on the vessel mix assumptions, and, all three plans optimize at -50 feet MLLW using the alternative vessel fleet mix as shown in the sensitivity analysis. As is also shown on Tables 5.5-1 through 5.5-3, the difference in annual net benefits between the -50 foot MLLW depth NED plan, and the Selected Plan is only $6.1 million, or 4.0 percent of the annual benefits of the NED Plan (at -50 feet MLLW). However, this incremental annual cost results in significant additional habitat benefit through the wetlands restoration at HWR and MWP described in section 4.4.3. Finally, as described in section 5.5.4, the seaport economic model does not currently reflect inventory cost savings, and thus likely understates the total economic benefit. Choosing the Selected Plan at the -50 foot MLLW depth is fully justified by the project economics.

### 5.5.8 Cost Apportionment

The proposed apportionment of first costs between the Federal Government and the Port of Oakland for the recommended plan is in accordance with Section 101 of WRDA 86 and follows the principles laid out in Section 204 of WRDA 92, which requires non-Federal interests to provide the following:

(1) 25 percent of the cost of construction of the general navigation features portion of the project which has a depth in excess of 20 feet, but not in excess of 45 feet (which includes the construction of land-based and aquatic dredged material disposal facilities that are necessary for the disposal of the dredged material required for project construction, operation, or maintenance and for which a contract for the facility's construction or improvement was not awarded on or before October 12, 1996); plus

(2) 50 percent of the cost of construction of the general navigation features portion of the project which has a depth in excess of 45 feet.

(3) An additional 10 percent of the cost of construction general navigation features of the project in cash over a period not to exceed 30 years, at an interest rate determined pursuant to Section 106 of the Water Resources Development Act of 1986. The value of lands, easements, rights-of-way, relocations, and dredged material disposal areas provided may be credited toward this payment, except that for deep draft harbors (deeper than -45 feet MLLW), there is a limitation to one-half of the costs for utility relocations.

(4) Share in the costs of operation and maintenance (O&M) of the project for deep draft harbors in an amount equal to 50 percent of the excess of the cost of the O&M of such project over that which would be incurred for O&M if such project had a depth of 45 feet.

(5) The NFS is required to provide all lands, easements rights-of-way, and utility relocations (LERRs) for cost-shared projects for which they shall receive credit. This is in accordance with the provisions of Water Resources Development Act of 1986, as amended, and will be included as an obligation of the NFS in the Project Cooperation Agreement.

(6) 25 percent of the cost of construction of the general navigation features of the project which provide environmental/habitat restoration benefits. Costs for construction must be limited solely to construction costs which are in excess of those costs necessary to carry out the dredging for construction, operation, or maintenance of the authorized navigation project in the most cost effective way, consistent with economic, engineering, and environmental criteria.

As discussed further in Appendix B.8, there may be a number of alternatives available for consideration and adoption regarding the allocation of costs of construction for the project to the extent that aquatic habitats are protected, restored, or created. These alternatives range from a standard cost share applicable to any navigation project (Federal/NFS cost share 75 percent/25 percent down to -45 feet MLLW and 50 percent/50 percent for depth greater than -45 feet MLLW, as described above), to a combination of cost-sharing on a general navigation benefits basis plus cost sharing for the Hamilton and/or Montezuma options on the 65 percent Federal/35 non-Federal basis, to various other possible cost sharing arrangements which will depend on the application of various Federal statutes and ultimate determinations and decisions by the Secretary of the Army Civil Works [ASA (CW)] and Congress.

As explained in detail in Appendix B.8, the Port believes that an appropriate cost share allocation for this project would be:

(1) For general navigation features associated with the NED Plan: 75 percent Federal/25 percent non-Federal to the -45 foot MLLW depth, 50 percent/50 percent for depths greater than -45 feet MLLW, with the required 10% cash contribution.

(2) For the incremental costs associated with the Selected Plan (the "habitat increment"): 75 percent Federal/25 percent non-Federal.

This proposed cost-share based on the following project-specific issues:

(1) The Port has invested considerable funds to enable reuse of dredged material at the Middle Harbor Enhancement Area. Use of the MHEA will reduce the GNF component of the project approximately $45,000,000 when compared to the next most cost effective alternative at the same depth (ocean disposal, Action Plan F-V).

(2) Habitat benefits accrue from the entire project, including removal of approximately 0.4 mcy of contaminated sediments to be dredged from the Inner Harbor turning basin. Both the MHEA and proposed reuse at the HWR and MWP sites provide substantial habitat benefits.

(3) In addition to habitat benefits, reuse of dredged material at the MHEA and HWR also saves the Federal Government money in its Installation Restoration program, because capping and/or sediment removal costs are reduced by the amount of the NFS cost-share at both locations.

(4) Both the MHEA and Hamilton wetlands restoration are projects that are being completed in conjunction with base closure (BRAC) activities, that represent the cutting edge of conversion to beneficial civilian and ecological reuse.

(5) The Bay Area has been especially hard hit by the BRAC process; the proposed navigation project facilitates conversion and reuse of two closed bases.

These issues are discussed in greater detail in section 5.11. Appendix B.8 provides a summary of the various statutes that may be applicable to a habitat project completed in conjunction with a navigation project, as well as associated cost sharing calculations.

### 5.5.9 Cost Sharing Calculations

Based on the preceding criteria and the information presented in sections 5.5.2 through 5.5.8, the standard and proposed cost sharing for the Selected Plan/LPP, NED and Alternate NED are provided below. Tables 5.6-1 through 5.6-3 summarize the cost share percentages, and the costs allocated to the Federal Government and the Port of Oakland using the cost share formulas described above. The cost share allocation is based on the NED Plan (Action Plan F-I) at -50 feet MLLW. The Selected Plan (Action Plan F-II) at -50 feet MLLW. The NED Plan optimizes at -50 feet MLLW, the Selected Plan optimizes at -49 feet MLLW; however, the local sponsor prefers the deeper channel depth, and the volume of material generated when the channel is dredged to -50 feet MLLW provides enough sediment to accomplish the habitat objectives at MWP and HWR. With this cost share allocation, the Federal Government share of the project first costs is $128,095,000, and the Port of Oakland share is $123,175,000. Escalated to mid-point of construction, the Federal Government share the project first costs is $134,850,000, and the Port of Oakland share is $127,670,000.

In addition, the estimated incremental annual O&M dredging cost is $970,000, of which the Port would be responsible for $680,000 (all of the incremental berth O&M dredging cost and 50 percent of the incremental harbor O&M dredging cost below -45 feet MLLW.)

As shown in Tables 5.6-1 through 5.6-3, because the LERR costs that can be credited against the required additional payment of 10 percent of the cost of the GNF are somewhat less than the required 10 percent contribution, a small cash payment will be required by the non-Federal sponsor to meet this obligation.

## 5.6 REAL ESTATE REQUIREMENTS

The NFS is required to provide all lands, easements, rights-of-way, and utility relocations (LERRs) that are necessary for a navigation project for a harbor. This is in accordance with the provisions of WRDA, and will be included as an obligation of the NFS in the Project Cooperation Agreement. The NED/Selected Plan is for dredging to a depth of -50 feet MLLW. The project features that may have real estate requirements are the required upland portions of the turning basin in the Inner Harbor, a temporary disposal site at Berth 55, stockpile and temporary construction areas for disposal at the Vision 2000 site, the disposal site at Hamilton Army Airfield (which includes a temporary pipeline easement and levee easement), and two utilities: the U.S. Navy sewer pipeline and the BART Anode cables. The total acreage required for these features, to include all temporary stockpile areas, work areas, and access areas is 93.5 acres. The MWP site does not require any

## TABLE 5.6-1

## COST SHARING BASED ON STANDARD NAVIGATION PROJECT to -50 feet MLLW

**Action Plan F-I -- NED Plan**

| Cost Item | Total Cost | Federal Cost Share Percentage | Federal Cost Share | Non-Federal Cost Share Percentage | Non-Federal Cost Share |
|---|---|---|---|---|---|
| GNF to -45 Feet MLLW (a) | $73,620,000 | 75% | $55,220,000 | 25% | $ 18,400,000 |
| GNF to -50 Feet MLLW | $144,490,000 | | | | |
| GNF Cost Between -45 feet MLLW and -50 feet MLLW | $70,870,000 | 50% | $35,435,000 | 50% | $ 35,435,000 |
| **TOTAL GNF** | $144,490,000 | | $90,655,000 | | $53,835,000 |
| Non-Federal Sponsor 10% Cash Contribution | $14,450,000 | 0% | $ (14,450,000) | 100% | $ 14,450,000 |
| Total Non-Federal LERR Cost (b), (c) | $13,850,000 | 0% | $ - | 100% | $13,850,000 |
| LERR Credit | | | $ 13,850,000 | | $ (13,850,000) |
| **TOTAL GNF, OTHER, and LERR COST** | **$ 158,340,000** | | **$ 90,055,000** | | **$ 68,285,000** |
| Berth Dredging to -50 Feet MLLW | $4,310,000 | 0% | $ - | 100% | $ 4,310,000 |
| Aids to Navigation | $260,000 | 100% | $260,000 | 0% | $ - |
| **TOTAL FEDERAL PROJECT BUDGET** | **$ 162,910,000** | | **$ 90,315,000** | | **$ 72,595,000** |
| Total Costs with Escalation to Mid-Point of Construction (d) | $171,500,000 | | $95,070,000 | | $76,420,000 |
| OTHER LSF (e) | $38,160,000 | 0% | $ - | 100% | $ 38,160,000 |
| **FEDERAL/NON-FEDERAL SPONSOR COST BEFORE ESCALATION** | **$ 201,070,000** | | **$ 90,315,000** | | **$ 110,755,000** |
| BART Contribution for Anode Cable Relocation | $ 1,030,000 | | | | |
| **TOTAL FEDERAL/NON-FEDERAL COST BEFORE ESCALATION** | **$ 202,100,000** | | | | |

Notes:

(a) Costs for -45 foot MLLW and -50 foot MLLW were based on separate MCACES; a separate set of -45 foot MCACES were developed (Appendix B.9) to reflect proportional (Option C) rather than actual construction costs

(b) The $70,000 LERR cost for Federal administration is included in the GNF costs.

(c) The BART anode cable relocation will cost an estimated $2,060,000. The sponsor is only receiving LERR credit for 50% of this cost ($1,030,000), as the other 50% of the funding will be provided by BART.

(d) Escalation based on 4 year construction period

(e) LSF excluding berth dredging

## TABLE 5.6-2

### COST SHARING BASED ON STANDARD NAVIGATION PROJECT to -50 feet MLLW

**Action Plan F-II -- Selected Plan**

| Cost Item | Total Cost | Federal Cost Share Percentage | Federal Cost Share | Non-Federal Cost Share Percentage | Non-Federal Cost Share |
|---|---|---|---|---|---|
| GNF to -45 Feet MLLW for Selected Plan (a), (b) | $73,620,000 | 75% | $55,220,000 | 25% | $ 18,400,000 |
| GNF to -50 Feet MLLW for NED | $144,490,000 | | | | |
| GNF Cost Between -45 feet MLLW and -50 feet MLLW | $ 70,870,000 | 50% | $35,440,000 | 50% | $ 35,430,000 |
| **TOTAL GNF** | $144,490,000 | | $90,660,000 | | $53,830,000 |
| Incremental Cost for Habitat Reuse | $50,370,000 | 75% | $37,780,000 | 25% | $12,590,000 |
| **TOTAL ENVIRONMENTAL RESTORATION COSTS** | $50,370,000 | | $37,780,000 | | $12,590,000 |
| Non-Federal Sponsor 10% Cash Contribution for GNF | $14,450,000 | 0% | $ (14,450,000) | 100% | $ 14,450,000 |
| Total Non-Federal LERR Cost (c), (d) | $13,850,000 | 0% | $ - | 100% | $13,850,000 |
| LERR Credit | | | $ 13,850,000 | | $ (13,850,000) |
| **TOTAL GNF, Environmental Restoration, and LERR COST** | **$ 208,710,000** | | **$127,840,000** | | **$80,870,000** |
| Berth Dredging to -50 Feet MLLW | $4,130,000 | 0% | $ - | 100% | $ 4,130,000 |
| Aids to Navigation | $260,000 | 100% | $260,000 | 0% | $ - |
| **TOTAL FEDERAL PROJECT BUDGET** | **$ 213,100,000** | | **$128,100,000** | | **$ 85,000,000** |
| Total Costs with Escalation to Mid-Point of Construction (e) | $224,330,000 | | $134,850,000 | | $ 89,490,000 |
| OTHER LSF (f) | $38,160,000 | 0% | $ - | 100% | $ 38,160,000 |
| **FEDERAL/NON-FEDERAL SPONSOR COST BEFORE ESCALATION** | **$ 251,260,000** | | **$128,100,000** | | **$ 123,160,000** |
| BART Contribution for Anode Cable Relocation | $ 1,030,000 | | | | |
| **TOTAL FEDERAL/NON-FEDERAL COST BEFORE ESCALATION** | **$ 252,290,000** | | | | |

Notes:

(a) The GNF costs for the NED Plan at -45 feet MLLW also form the basis for cost sharing of GNF for the Action Plan F-II (the Selected Plan)

(b) Costs for -45 foot MLLW and -50 foot MLLW were based on separate MCACES; a separate set of -45 foot costs were developed (Appendix B.9) to reflect proportional (Option C) rather than actual construction costs

(c) The $70,000 LERR cost for Federal administration is included in the GNF costs.

(d) The BART anode cable relocation will cost an estimated $2,060,000. The sponsor is only receiving LERR credit for 50% of this cost ($1,030,000), as the other 50% of the funding will be provided by BART.

(e) Escalation based 5 1/2 year construction period

(f) LSF excluding berth dredging

## TABLE 5.6-3

## COST SHARING BASED ON STANDARD NAVIGATION PROJECT to -50 feet MLLW

**Action Plan F-V -- Alternate NED Plan**

| Cost Item | Total Cost | Federal Cost Share Percentage | Federal Cost Share | Non-Federal Cost Share Percentage | Non-Federal Cost Share |
|---|---|---|---|---|---|
| GNF to -45 Feet MLLW for Alternate NED (a) | $93,520,000 | 75% | $70,140,000 | 25% | $23,380,000 |
| GNF to -50 Feet MLLW for Alternate NED | $187,770,000 | | | | |
| GNF Cost Between -45 feet MLLW and -50 feet MLLW | $94,250,000 | 50% | $47,130,000 | 50% | $47,120,000 |
| **TOTAL GNF** | $187,770,000 | | $117,270,000 | | $70,500,000 |
| Non-Federal Sponsor 10% Cash Contribution | $18,780,000 | 0% | $ (18,780,000) | 100% | $ 18,780,000 |
| Total Non-Federal LERR Cost (b), (c) | $13,850,000 | 0% | $ - | 100% | $ 13,850,000 |
| LERR Credit | | | $13,850,000 | | $ (13,850,000) |
| **TOTAL GNF and LERR COST** | **$ 201,620,000** | | **$ 112,340,000** | | **$ 89,280,000** |
| Berth Dredging to -50 Feet MLLW | $8,270,000 | 0% | $ - | 100% | $ 8,270,000 |
| Aids to Navigation | $260,000 | 100% | $260,000 | 0% | $ - |
| **TOTAL FEDERAL PROJECT BUDGET** | **$ 210,150,000** | | **$ 112,600,000** | | **$ 97,550,000** |
| Total Costs with Escalation to Mid-Point of Construction (d) | $221,220,000 | | $118,530,000 | | $102,690,000 |
| OTHER LSF (e) | $38,160,000 | 0% | $ - | 100% | $ 38,160,000 |
| **FEDERAL/NON-FEDERAL SPONSOR COST BEFORE ESCALATION** | **$ 248,310,000** | | **$ 112,600,000** | | **$ 135,710,000** |
| BART Contribution for Anode Cable Relocation | $ 1,030,000 | | | | |
| **TOTAL FEDERAL/NON-FEDERAL COST BEFORE ESCALATION** | **$ 249,340,000** | | | | |

Notes:

(a) Costs for -45 foot MLLW and -50 foot MLLW were based on separate MCACES; a separate set of -45 foot costs were developed (Appendix B.9) to reflect proportional (Option C) rather than actual construction costs

(b) The $70,000 LERR cost for Federal administration is included in the GNF costs.

(c) The BART anode cable relocation will cost an estimated $2,060,000. The sponsor is only receiving LERR credit for 50% of this cost ($1,030,000), as the other 50% of the funding will be provided by BART.

(d) Escalation based on 5 year construction period

(e) LSF excluding berth dredging

LERRs; it will operate as a facility open to the general public and charge a tipping fee. The Real Estate Plan for this project is included as Appendix C to this Feasibility report.

## 5.7 ENVIRONMENTAL IMPACTS

The attached EIS/R presents the project's environmental impacts in detail. The primary impacts deal with short-term effects resulting from the dredging and dredged material disposal operations. These project-related impacts have been evaluated in the EIS/R. The EIS/R documents the selected dredging plan's (dredging plan F) and the reuse/disposal sites' compliance with environmental requirements. Both the NED Plan and the Selected Plan are essentially "self-mitigating," in that the MHEA provides sufficient mitigation for the potential eelgrass loss. Other mitigation requirements, such as monitoring and dredging operations requirements have also been integrated into the plans. As indicated in the EIS/R, all requirements for a Section 404(r) exemption have been met, however, state permitting requirements for disposal areas still apply.

## 5.8 MITIGATION PLANS/OTHER COMMITMENTS

In accordance with paragraph 7-35 of Engineering Regulation 1105-2-100, the planning of Corps projects shall ensure that project-caused adverse impacts to fish and wildlife resources have been avoided or minimized to the extent practicable, and that remaining unavoidable significant adverse impacts are compensated to the extent justified. The Recommended Plan and the NED Plan, if not the same, shall contain sufficient mitigation to ensure that either plan selected will not have more than negligible net (including mitigation) adverse impacts on fish and wildlife resources.

Justification of mitigation features recommended in projects is based on consideration of the monetary and non-monetary values of the last increment of losses prevented, reduced, or replaced, and shall be at least equal to the combined monetary and non-monetary costs of the last added increment, so as to reasonably maximize overall project benefits.

Table S-2 in the EIS/R describes the mitigation requirements for the selected dredging plan and the various reuse/disposal options. The mitigation program required for the Selected Plan is described in Appendix R.

## 5.9 RISK AND UNCERTAINTY

The United States economy is becoming increasingly tied to a global economy relying on international trade. Over 99 percent of intercontinental trade is by sea. A modern port, capable of maintaining fast and consistently scheduled cargo transshipment, is a critical component of efficient trade.

The primary risk and uncertainty for the proposed Port of Oakland deepening project is related to the economic viability and volatility of the containerized cargo transportation industry. The Port of Oakland is primarily an export port, shipping raw materials to the Pacific Rim and importing finished goods. It should be noted that even with the current economic slow-down in Asia, the Port's cargo volume increased by 7.25 percent in Fiscal Year 1998 (July 1997 through June 1998). The Port handles discretionary cargo bound for the Midwest as well as regional cargo bound for the San Francisco Bay Area and Northern and Central California.

Containerized cargo is shipped by ocean carriers who form alliances and vessel sharing agreements to achieve economies of scale. Carriers calling at the Port of Oakland are currently organized into three large alliances and three smaller ones. The specific memberships are in a nearly continual state of transition as new agreements evolve.

Containerized cargo carriers search for greater efficiencies and productivity when making decisions to set up shipping routes. Factors impacting decision making include distance between ports, depths of channels and berths, terminal operating costs, cranes, cargo handling areas, intermodal infrastructure, and labor agreements.

Carriers will divert discretionary cargo to other ports if channel and berth depths are inadequate, terminal operations are inefficient, and/or intermodal infrastructure is non-competitive. Regionally destined cargo can also be diverted to other ports, and then trans-shipped back to Northern California by rail or truck, if marine terminal operations become prohibitively costly due to draft restrictions imposed as a result of insufficient channel and berth depths.

As discussed earlier, fifth and sixth generation container ships, considered to be the most efficient vessels in the current fleet mix, require up to 48 feet of depth at berth, and an additional 5 feet of water in addition to design draft when maneuvering, i.e., a total depth of -53 feet MLLW.[6] Insufficient channel depth results in expensive tidal delays and inefficient use of labor in the loading and unloading of these vessels. Tidal delays reduce the effective time of the vessel at sea, thus resulting in higher unit operating costs for the vessel. For example, if a vessel routinely experiences a 4-hour tidal delay, its overall transport efficiency is reduced by several percent (the average time in port for container vessels is 24 hours or less).

The Port of Oakland must expand and upgrade its facilities to accommodate larger, more efficient vessels. If the Port does not, it will revert to the role of a regional feeder port. The Port of Oakland is responding to this challenge with a three pronged strategy of improving intermodal rail facilities, expanding/reconfiguring terminal operations, and deepening navigational channels and berths.

## 5.10 SELECTED PLAN

As discussed earlier in this report, a Selected Plan/LPP and an NED Plan, and an Alternate NED Plan have been identified. The standard for selecting a Recommended Plan is laid out in Section 5.16 of ER 1105-2-100. In this case, in addition to the direct navigation benefits resulting in a -50 foot MLLW NED Plan, multiple environmental and economic concerns lead to a conclusion that a -50 foot MLLW project, with reuse of material in Middle Harbor, at the Hamilton Wetlands Restoration Project, at the Montezuma Wetlands Project, and in upland construction within the Port should be the recommended plan for the reasons stated below.

First, reuse of dredged material at the MHEA, the HWR project, and the MWP site would provide substantial environmental benefits from the portion of Oakland material that could be reused at those sites. With the material from the Oakland project beginning implementation of the HWR and MWP projects, the sites would be activated

[6] The 5 feet of water in addition to draft are required if the vessel is out of trim by 1 foot; if the vessel is perfectly trimmed, it only requires 4 feet of water in addition to draft: 2 feet for squat, and 2 feet for safety (underkeel clearance).

and returned to habitat decades sooner than would be possible with other restoration techniques. Further, once the HWR and MWP sites have been prepared using Oakland material, they would be available for Federal maintenance material. The MWP site provides the additional benefit of allowing contaminated sediment to be reused in an habitat restoration project.

Second, reuse of dredged material at the HWR site and in Middle Harbor (FISCO) provides substantial national benefits in reuse of closed military bases. A joint reuse project will reduce the cost of preparing Hamilton for reuse as a restored wetland by the amount contributed by the NFS, and may reduce the costs of remediating off-shore sediments at FISCO. Those costs cannot be quantified precisely, but they are substantial.

Third, implementation of this project as a cooperative effort utilizing the input of the Management Committee of the Long Term Management Strategy (LTMS) would provide an important model for implementation of the LTMS. Implementation of the LTMS remains a key goal of the Corps.

Finally, implementation of a -50 foot MLLW project at Oakland, done in a coordinated effort that begins the conversion of FISCO to a modern container shipping port, will also enhance military preparedness. During the Desert Storm operation, more of the long term shipping of goods was accomplished using container facilities than using military wharves.

Finally, availability of container ports is important to the National economy. In the event of a natural disaster on the West Coast, such as an earthquake, it is critical to have redundant capacity available to ensure that the rest of the Nation does not suffer and that disaster relief can be implemented as quickly as possible. The Port of Oakland, with its relatively central location on the West Coast serves an important function in providing that redundant capacity.

For these reasons, the Port believes that the Assistant Secretary of the Army for Civil Works should select the -50 foot MLLW project depth, with a disposal alternative that includes dredged material reuse for habitat creation in Middle Harbor, and at the Hamilton Wetlands Restoration and Montezuma Wetlands Project sites, and with cost sharing for environmental restoration at the Hamilton Wetlands Restoration and Montezuma Wetlands Project sites in accordance with the principles laid out in Section 204 of WRDA 92. In the event that neither site is ready before the midpoint of construction, the material designated for Hamilton and/or Montezuma would be disposed of in the ocean, but in that event, cost-sharing for this material would be limited to the standard navigation features cost share of 50 percent Federal/50 percent non-Federal or as specified in the current WRDA.

## 5.11 PLAN IMPLEMENTATION

### 5.11.1 Institutional Requirements

The proposed schedule is summarized in Appendix A.9 of this report. The following are key project milestones:

- Updated FS Report Forwarded to Corps of Engineers Feb. 1999
- Final Chief's Report Apr. 1999

| | | |
|---|---|---|
| • WRDA | May | 1999 |
| • Project Appropriation | Oct. | 1999 |
| • Executed | Oct. | 1999 |
| • Final Permit Received | Nov. | 1999 |
| • Real Estate Acquisition Completed | Nov. | 1999 |
| • Construction Contract Awarded | Dec. | 1999 |
| • Start Construction | Feb. | 2000 |
| • Project Construction Completed | Jun. | 2004 |

The project is scheduled to be authorized in the Water Resources Development Act (WRDA) of 1999. Following congressional authorization, the project would be eligible for construction funding. The project will be considered for inclusion in the President's budget based on national priorities, magnitude of the Federal commitment, economic and environmental feasibility, level of local support, willingness of the NFS to fund its share of the project cost, and budgetary constraints that may exist at the time of funding.

Once the United States Congress appropriates Federal construction funds, the Corps and the Port of Oakland would enter into a project cooperation agreement (PCA). The PCA would define the Federal and non-Federal responsibilities for funding, implementing, operating and maintaining the project.

The majority of the construction funding would be required in Federal fiscal years 2000 through 2004. The Water Resources Development Act of 1986 requires that the NFS pay 25 percent of the cost of construction of the project to -45 feet MLLW, and 50 percent for depths deeper than -45 feet MLLW. However, because the deeper depths will be constructed in connection with habitat restoration, the Federal cost share should rise to 75 percent for the habitat restoration component.

The NFS is also required to pay an additional ten percent of the total cost of the non-habitat restoration GNF of the project in cash over a period not to exceed 30 years. The value of lands, easements, rights-of-way, and relocations are credited to this payment. The credit received is limited, however, to the ten percent cash contribution required from the local project sponsor. The available LERR credit is somewhat less than the 10 percent contribution for the GNF component of the Selected Plan; therefore, the restoration component of the work will require an additional cash contribution from the local sponsor.

**5.11.2. Division of Responsibilities**

In addition to the cost sharing responsibilities discussed in section 5.6, the Federal Government and non-Federal interest have certain responsibilities in connection with the development and operation and maintenance of general navigation projects which are set forth in Federal law and will be incorporated into a Project Cooperation Agreement (PCA) after the project is authorized. The following general provisions describing the responsibilities of the NFS may be included as part of the PCA, subject to a favorable recommendation by the Secretary:

a. Enter into an agreement which provides, prior to execution of the PCA, 25 percent of design costs;

b. Provide, during construction, any additional funds needed to cover the non-federal share of design costs;

c. Provide, during the period of construction, a cash contribution equal to the following percentages of the total cost of construction of the GNF (which include the

construction of land-based and aquatic dredged material disposal facilities that are necessary for the disposal of dredged material required for project construction, operation, or maintenance and for which a contract for the facility's construction or improvement was not awarded on or before October 12, 1996):

(i) 25 percent of the costs attributable to dredging to a depth in excess of 20 feet but not in excess of 45 feet;

(ii) 50 percent of the costs attributable to dredging to a depth in excess of 45 feet but not in excess of 50 feet;

(iii) 25 percent of the costs attributable to dredging for the portion of the project to which the principles laid out in Section 204 of WRDA 92 (beneficial reuse) apply;

d. Pay with interest, over a period not to exceed 30 years following completion of the period of construction of the project, up to an additional 10 percent of the total cost of construction of GNF (except for that portion of the costs covered by the principles described in Section 204 of WRDA 92). The value of lands, easements, rights-of-way, and relocations provided by the NFS for the GNF, described below, may be credited toward this required payment. If the amount of credit exceeds 10 percent of the total cost of construction of the GNF, the NFS shall not be required to make any contribution under this paragraph, nor shall it be entitled to any refund for the value of lands, easements, rights-of-way, and relocations in excess of 10 percent of the total cost of construction of the GNF;

e. Provide lands, easements, and rights-of-way, and perform or ensure the performance of relocations determined by the Federal Government to be necessary for the construction, operation, maintenance, repair, replacement, and rehabilitation of the GNF (including lands, easements, and rights-of-way, and relocations necessary for dredged material disposal facilities),

f. Provide, operate, maintain, repair, replace, and rehabilitate, at its own expense, the local service facilities in a manner compatible with the project's authorized purposes and in accordance with applicable Federal and State laws and regulations;

g. Accomplish removals determined necessary by the Federal Government other than those removals specifically assigned to the Federal Government;

h. Give the Federal Government a right to enter, at reasonable times and in a reasonable manner, upon property that the NFS owns or controls for access to the GNF for the purpose of inspection, and, if necessary, for the purpose of operating, maintaining, repairing, replacing, and rehabilitating the GNF;

i. Keep, and maintain books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to the project, for a minimum of 3 years after completion of the accounting for which such books, records, documents, and other evidence is required, to the extent and in such detail as will properly reflect total cost of construction of the GNF, and in accordance with the standards for financial management systems set forth in the Uniform Administrative Requirements for Grants and Cooperative Agreements to State and local governments at 32 CFR, Section 33.20;

j. Perform, or cause to be performed, investigations for hazardous substances as are determined necessary to identify the existence and extent of hazardous substances

regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. 9601-9675, that may exist in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be necessary for the construction, operation, maintenance, repair, replacement, or rehabilitation of the GNF, subject to permissible cost recovery from responsible parties. However, for lands that the Government determines to be subject to the navigation servitude, only the Government shall perform such investigation unless the Federal Government provides the NFS with prior specific written direction, in which case the NFS shall perform such investigations in accordance with such written direction;

k. Assume financial responsibility, subject to permissible cost recovery from responsible parties including the Federal Government, as between the Federal Government and the NFS, for necessary cleanup and response costs of CERCLA regulated materials located in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be necessary for the construction, operation, maintenance, repair, replacement, and rehabilitation of the GNF;

l. To the maximum extent practicable, perform its obligations in a manner that will not cause liability to arise under CERCLA;

m. Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended by Title IV of the Surface Transportation and Uniform Relocation Assistance Act of 1987, and the Uniform Regulations contained in 49 CFR Part 24, in acquiring lands, easements, and rights-of-way, required for construction, operation, maintenance, repair, replacement, and rehabilitation of the GNF, and inform affected persons of applicable benefits, policies, and procedures in connection with said act;

n. Comply with all applicable Federal and State laws and regulations, including, but not limited to, Section 601 of the Civil Rights Act of 1964, Public Law 88-352 (42 U.S.C. 2000d), and Department of Defense Directive 5500.11 issued pursuant thereto, as well as Army Regulation 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army;"

o. Provide a cash contribution equal to the non-Federal cost share of the project's total historic preservation mitigation and data recovery costs attributable to commercial navigation that are in excess of 1 percent of the total amount authorized to be appropriated for commercial navigation; and

p. In the case of a deep-draft harbor, provide 50 percent of the excess cost of operation and maintenance of the project over that cost which the Secretary determines would be incurred for operation and maintenance if the project had a depth of 45 feet.

q. Hold and save the United States free from all damages arising from the construction, operation, maintenance, repair, replacement, and rehabilitation of the project, any betterments, and the local service facilities, except for damages due to the fault or negligence of the United States or its contractors;

r. Not use Federal funds to meet the non-Federal sponsor's share of total project costs unless the Federal granting agency verifies in writing that the expenditure of such funds is authorized.

# 6. COORDINATION AND PUBLIC INVOLVEMENT

## 6.1 PUBLIC MEETINGS, WORKSHOPS, AND REPORT CIRCULATION

The San Francisco District of the Corps of Engineers (Corps), in conjunction with the Port of Oakland, conducted a public scoping meeting on August 5, 1997, during the initial stages of the Feasibility Study phase. On March 4, 1998, the Corps and the Port conducted a public comment meeting to provide the interested public with an opportunity to express their views on the study alternatives. Concurrently, the Corps and the Port conducted a public hearing on the Draft Feasibility Report/Environmental Impact Statement/Report.

## 6.2 FEASIBILITY STUDY INVOLVEMENT

Coordination with USFWS was initiated in the Feasibility Study phase, and the USFWS provided a planning aid letter in December 1997. In February 1998, the USFWS provided a Draft Fish and Wildlife Coordination Act Report for the Feasibility Study. USFWS is currently finalizing the Coordination Act Report.

Region 9 of the U.S. Environmental Protection Agency has been a major participant in the study as per its authority under Section 102 of the Marine Protection, Research and Sanctuaries Act, the Clean Water Act, and the Clean Air Act.

Coordination with other agencies and the general public has also occurred at various points during study execution. These other agencies include the National Marine Fisheries Service, U.S. Coast Guard, California Department of Fish and Game, the California Coastal Commission, California Regional Water Quality Control Board, the Bay Area Air Quality Management District, the California Coastal Conservancy, the Bay Conservation and Development Commission (BCDC), the State Historic Preservation Officer (SHPO), Oakland Landmarks Preservation Board, City of Oakland, City of Alameda, U.S. Navy, U.S. Army, Oakland Base Reuse Authority (OBRA), Alameda Reuse and Development Authority (ARRA), San Francisco Bar Pilots Association, Alameda County Public Works Agency, and the East Bay Regional Park District. Public coordination included inclusion of the Sierra Club, the Save San Francisco Bay Association, and the Golden Gate Audubon Society into the planning process..

## 6.3 CIRCULATION OF THE FEASIBILITY REPORT

This Draft Feasibility Report and Draft Environmental Impact Statement/Report was circulated for comments to a wide range of Federal, state, and local agencies including the following:

Federal:

- U.S. Department of the Interior, Office of Environmental Review
- U.S. Environmental Protection Agency, Region 9
- U.S. Fish and Wildlife Service
- U.S. Department of Commerce, National Marine Fisheries Service
- U.S. Coast Guard
- U.S. Navy
- U.S. Army

State of California

- Department of Fish and Game
- California Coastal Commission
- Regional Water Quality Control Board
- Bay Area Air Quality Management District
- State Historic Preservation Officer
- Department of Toxic Substances Control
- California Coastal Conservancy
- California Department of Transportation (CalTrans)

Local

- Alameda County
- City of Oakland
- City of Alameda
- BCDC
- ARRA
- OBRA
- Alameda County Public Works Agency, and
- East Bay Regional Park District
- Alameda County Congestion Management Agency
- Bay Area Air Quality Management District
- BART
- EBMUD
- Solano County

The Report was also made available to all known private organizations and citizens who expressed an interest in the study.

### 6.4 VIEWS OF THE LOCAL SPONSOR

The non-Federal sponsor, the Port of Oakland, prepared this Feasibility Report and has worked closely with the Corps in conducting the Feasibility Study. To date, all required local funds have been provided and the sponsor is committed to cost share in the construction project. Therefore, the Locally Preferred Plan and the Selected Plan both consist of -50 foot MLLW Entrance, Outer Harbor, and Inner Harbor channels and corresponding Inner and Outer Harbor turning basins.

The Port of Oakland has given high priority to authorization of the project in the Water Resources Development Act of 1999, targeting construction to begin during Federal fiscal year 2000.

# 7.0 CONCLUSIONS AND RECOMMENDATIONS

I have given careful consideration to all significant aspects of this study in the overall public interest, including engineering and economic feasibility, as well as social and environmental effect. The selected and locally preferred plan for improvement described in this report provides the implementable solution for navigation improvements at the Oakland Harbor, Oakland, California.

I have also assessed the Port of Oakland's financial capability and ascertained that it is reasonable to expect that ample funds will be available to satisfy the non-Federal sponsor's financial obligation for the project (reference Appendix A.10 to this Feasibility Report).

I recommend that the existing Federal navigation project at Oakland Harbor, authorized by the Water Resources Development Act of 1986, be modified to provide -50 feet MLLW Entrance, Outer Harbor, and Inner Harbor channels, -50 feet MLLW Inner and Outer Harbor turning basins, and selective widening in all of these areas, with such further modifications thereto as in the discretion of the Chief of Engineers may be advisable. In view of the exceptional habitat and other social values that could be accomplished by constructing this project to -50 feet MLLW, I further recommend that a project-specific cost sharing allocation be made as follows: (1) 75 percent Federal/25 percent non-Federal share of the construction cost to -45 feet MLLW; (2) 50 percent Federal/50 percent non-Federal cost share for the general navigation features between -45 feet MLLW and -50 feet MLLW; (3) 75 percent Federal/25 percent non-Federal cost share for the incremental cost of the project that includes disposal/reuse of dredged material at the Hamilton Wetlands Restoration and Montezuma Wetlands Project sites rather than disposal at the San Francisco Deep Ocean Disposal Site (the habitat increment); and (4) 10 percent additional cash for items (1) and (2), with credit for any lands, easements, rights of way, and relocations (LERR) applied against the additional cash (a 10 percent contribution is not required for the habitat increment).

The total investment cost, including interest during construction, is estimated to be $312,910,000, including local service facilities (LSF). This estimate includes $60.6 million for interest during construction calculated at the statutory government rate of 6.875 percent for Fiscal Year 1999. It is estimated that incremental annual costs of approximately $970,000 will be incurred for harbor and berth maintenance dredging (additional shoaling of the project channels with the project in place is expected to be quite limited). Thus, the estimated total average annual project cost is $23,290,000. The incremental annual harbor maintenance dredging costs for the project increment below -45 feet MLLW will be cost shared by the local sponsor at 50 percent Federal/50 percent non-Federal, and the incremental berth maintenance dredging costs for the project will be funded by the non-Federal sponsor. The non-Federal sponsor's share of the incremental annual O&M dredging cost is estimated to be $680,000. With estimated average annual benefits of $187,870,000 in waterborne commerce transportation cost savings, the proposed project is economically feasible with a benefit-to-cost ratio of 8.07:1 and annual net benefits of $164,580,000, thereby warranting Federal participation.

The recommendations contained herein reflect the information available at this time and current Corps policies governing formulation of individual projects. The Selected Plan is designed to include reuse of dredged material at habitat restorations projects outside of the Port (e.g., the Hamilton and Montezuma Wetlands Restoration projects). Reusing dredged materials in the restoration of wetlands brings a significant environmental benefit. Separable, incremental costs for restoration may be allocated to a purpose of ecosystem restoration and the costs for the project have been allocated in accordance with the principles defined in Section 204 of WRDA 96.

The Selected Plan may not reflect program and budgeting priorities inherent in the formulation of the national Civil Works Construction program nor the perspective of higher review levels within the Executive Branch. Consequently, the recommendations may be modified before they are transmitted to the Congress as proposals for authorization and/or implementation of funding. However, prior to transmittal to the Congress, the sponsor, the State, interested Federal Agencies, and other parties should be advised of any modifications and should be afforded an opportunity to comment further.

Date: 1/29/99

JOSEPH WONG
Director of Engineering
Port of Oakland

Date: 1/29/99

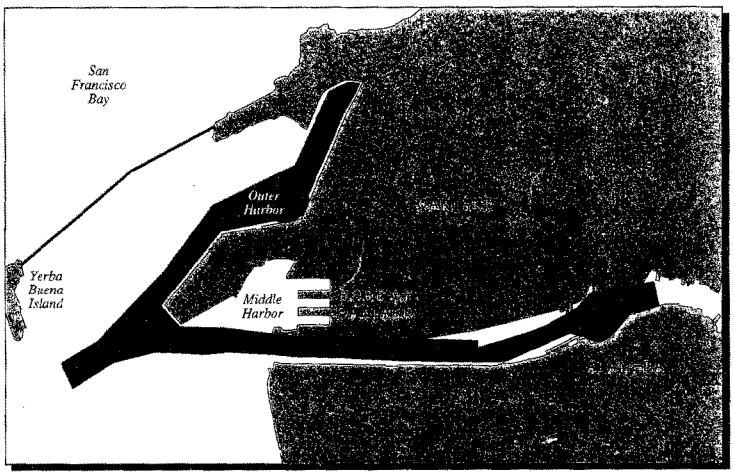
CHARLES FOSTER
Executive Director
Port of Oakland

# Oakland Harbor Navigation Improvement (-50 Foot) Project

## Volume II:

## Final Environmental Impact Statement/ Environmental Impact Report

SCH No. 97072051




*Prepared by*


**U.S. Army Corps of Engineers**
**San Francisco District**
Federal Lead Agency

**Port of Oakland**
State Lead Agency


**MAY 1998**

PORT OF OAKLAND/U.S.ARMY CORPS OF ENGINEERS

NOTICE OF AVAILABILITY

FINAL ENVIRONMENTAL IMPACT STATEMENT/ENVIRONMENTAL IMPACT REPORT/ FEASIBILITY STUDY (FEIS/R/FS)

OAKLAND HARBOR NAVIGATION IMPROVEMENT (50-FOOT) PROJECT

**LEAD STATE AGENCY:** Port of Oakland

**LEAD FEDERAL AGENCY:** Department of the Army, U.S. Army Corps of Engineers

Notice is hereby given that a Final Environmental Impact Statement/Environmental Impact Report and Final Feasibility Study (FEIS/R/FS) has been prepared by the Port of Oakland and the U.S. Army Corps of Engineers (USACE), San Francisco District to evaluate the impacts associated with the proposed Oakland Harbor Navigation Improvement (50-foot) Project, Alameda County, California.

The FS is normally prepared by the USACE to identify a federal interest in a proposed navigation improvement project. The FS is necessary in order to gain Congressional authorization and funding for the project pursuant to the Water Resources Development Act (WRDA) of 1986. Under the provisions of Section 203 of the WRDA, the Port prepared this feasibility analysis directly, co-sponsored with the USACE the EIS/EIR documentation, and is submitting the studies directly to the Secretary of the Army with the intent of obtaining authorization for the project to be included in the WRDA of 1998.

## SUMMARY

The Port of Oakland proposes to deepen the federal channels of Oakland Harbor and Port-maintained berths to a depth of 50 feet below mean lower low water (MLLW) in order to accommodate the newest generation of deep-draft container ships. The proposed navigation improvements would involve the dredging and disposal of 12.8 to 14.5 million cubic yards (mcy) of bottom sediments. The proposed dredging and sediment reuse/disposal is anticipated to last up to 4 years, beginning sometime around February 2000 and ending by February 2004. The federal portion of the project would involve dredging the navigation channels. As the local sponsor, the Port has the sole responsibility for the berth deepening that would occur with this project.

### Proposed Navigation Improvements

The maximum extent of the proposed improvements includes the elements listed below, although all of the listed improvements would not be done under each dredging option.

- Channel deepening and widening (federal action):
    - The Oakland Entrance Channel and Approach;
    - The Outer Harbor Channel; and
    - The Inner Harbor Channel from the Entrance Channel to just past the Howard terminal.

- Berth deepening (local sponsor action):
    - The following berths would be deepened to 50-feet: 22-26, 30, 32, 33, 35, 37, 55-58, 60-63, 67, and 68.
- Turning basin improvements:
    - Deepening and slightly widening the Outer Harbor turning basin to a 1,600-foot diameter; and
    - Deepening and enlarging the Inner Harbor turning basin to a 1,500-foot diameter.
- Infrastructure modifications:
    - Modifying the Bay Area Rapid Transit (BART) anode structure and cable (the project would not affect the BART tube itself); and
    - Lowering or relocating all existing submarine utilities within the project area as necessary, including the Alameda sewer pipeline crossing the Inner Harbor Channel.

### Dredging Options

Five possible dredging options, plus the no-project alternative, were initially considered. The project sponsors also considered dredging somewhere in between the existing 42-foot depth and the proposed 50-foot depth. Three of the five initial dredging options were eliminated from further study because they would not meet the project's objectives. The project sponsors also eliminated consideration of dredging to a depth less than 50 feet because the optimal channel depth for the largest vessels calling at the Port is at least 50 feet.

This FEIS/R/FS analyzes in detail the no-project alternative plus dredging options B and F. Only one of the dredging options would be implemented. Each dredging option is combined with a set of dredged material reuse/disposal options into project alternatives.

### Dredged Material Reuse/Disposal Options

Twenty (20) dredged material reuse/disposal options were initially considered. Of these 20, eight are analyzed in detail in this FEIS/R/FS. These eight are: Vision 2000 Upland, New Berth 21, Middle Harbor Enhancement Area, Former NAS Alameda, SF-DODS, Hamilton Wetlands Restoration, Montezuma Wetlands Restoration, and Various Landfills.

## Project Alternatives

The project alternatives consist of either dredging option B or F plus a set of dredged material reuse/disposal options. Fifteen (15) project alternatives are analyzed in detail in this FEIS/R/FS.

## Impacts

Significant unavoidable impacts would occur for all alternatives in two resource areas: air quality and noise. For the following resource areas there would be significant but mitigable impacts under any of the alternatives: surface water resources, geology and groundwater, biological resources, transportation, hazardous materials and contaminated wastes, and public services.

**The Selected Plan (referred to in the Feasibility Study as the National Economic Development Plan)**

The Selected Plan is identified in the FEIS/R/FS as dredging option F to a depth of 50-feet, with the following reuse/disposal options: Middle Harbor Enhancement Area, Vision 2000 Upland, Various Landfills, and Hamilton Wetlands Restoration or Montezuma Wetlands Restoration or SF-DODS. In the event that the Hamilton Wetlands Restoration project is not permitted by the project sponsor within the timeframe necessary for construction, or if project construction costs are not supportable by the project, reuse of dredged material at the Montezuma Wetlands Restoration project could accomplish many of the same habitat restoration benefits. In the event that neither of the Hamilton or Montezuma sites is available before the midpoint of the 50-foot dredging project, the material designated for wetland restoration would be disposed of at SF-DODS.

## AVAILABILITY AND REVIEW OF THE DOCUMENT:

The public review period for the FEIS/R/FS is from Friday, May 29, 1998 to 5:00 P.M. Monday, June 29, 1998, or 30 days after the Notice of Availability is filed in the *Federal Register*.

The Final EIS/R/FS is available for review at the following locations:

San Francisco Public Library, Stegner Center: Civic Center, Larkin and Grove Street, San Francisco, CA

West Oakland Branch Library: 1801 Adeline Street, Oakland, CA

Oakland Public Library: 125 14th Street, Oakland, CA

City of Alameda Public Library: 2264 Santa Clara Avenue, Alameda, CA

MTC/ABAG Library: 101 8th Street, Oakland, CA

San Leandro Public Library: 300 Estudillo Avenue, San Leandro

University of California Institute of Governmental Studies Library: 109 Moses Hall, Berkeley, CA

University of California Institute of Transportation Studies: 409 McLaughlin Hall, Berkeley, CA

Fairfield-Suisun Library: 1150 Kentucky Street, Fairfield, CA

Petaluma Regional Library: 100 Fairgrounds Drive, Petaluma, CA

Sonoma County Central Library: 3rd and "E" Street, Santa Rosa, CA

Marin County Library: 1720 Novato Blvd., Novato, CA

Corps of Engineers, San Francisco District, 333 Market Street, San Francisco, CA (415) 977-8543*.

Port of Oakland, Environmental Department, 530 Water Street, Oakland, CA (510) 272-1250*.

*Please call for an appointment

The document will also be available on the Internet (without Appendices) as of May 29, 1998, at http:\\www.portofoakland.com.

One hundred (100) copies of the FEIS/R/FS will be available free of charge on a first-come first-served basis (one per person), and may be picked up Monday through Friday between 8 A.M. and 5 P.M. at the Port

of Oakland, 530 Water Street, Oakland, CA. For information on obtaining a document call Gudrun Putz at (510) 272-1250.

### Availability of Documents Referenced in the FEIS/R/FS

Close to 350 documents are referenced in the Final EIS/R/FS. Documents produced by government agencies are available for review at those agencies. Most of the remaining referenced documents are available for review at at least one of the following locations. Please contact Gudrun Putz of the Port of Oakland at (510) 272-1250 to confirm document locations.

| | | |
|---|---|---|
| Port of Oakland<br>530 Water Street<br>Oakland, CA 94607<br>Attn: Gudrun Putz<br>(510) 272-1250 | SAIC<br>816 State Street, Suite 500<br>Santa Barbara, CA 93101<br>Attn: Marianne Lipshutz<br>(805) 966-0811 | Corps of Engineers<br>333 Market Street<br>San Francisco, CA 94105<br>Attn: Eric Jolliffe<br>(415) 977-8543 |

### Comments on the Final EIS/R/FS

Comments concerning the Final EIS/R/FS must be submitted no later than 5:00 P.M. on June 29, 1998, or 30 days after the Notice of Availability is published in the *Federal Register*, to:

Policy Review Branch
HQ U.S. Army Corps of Engineers
CECW-AR(IP)
7701 Telegraph Road
Alexandria, VA 22315-3861

## TABLE OF CONTENTS


SUMMARY ..... 176
- S.1 Introduction ..... 176
- S.2 Summary of Environmental Impacts ..... 176
- S.3 Recommendations ..... 178
- S.4 Mitigation Plan for the Selected Plan ..... 178
- S.5 Known Areas of Controversy or Unresolved Issues ..... 178

1.0 REASON FOR AND CONTEXT OF THE PROJECT ..... 187
- 1.1 Introduction ..... 187
- 1.2 Project Location ..... 187
- 1.3 Planning Context of the Proposed Project ..... 187
- 1.4 Project Objectives ..... 190
- 1.5 Purpose of and Need for the Project ..... 191
- 1.6 Related Projects ..... 192
- 1.7 Regulatory Agency Framework and Compliance ..... 194
- 1.8 Permits/Approvals Required for the Project ..... 195

2.0 PROPOSED ACTION AND ALTERNATIVES ..... 197
- 2.1 Proposed Navigation Improvements ..... 197
  - 2.1.1 The Proposed Dredging Options and Inner Harbor Turning Basin Locations ..... 200
  - 2.1.2 Dredging Methods ..... 212
  - 2.1.3 Associated Maintenance Dredging Requirements ..... 213
- 2.2 Dredged Material Reuse/Disposal Options ..... 214
  - 2.2.1 Reuse/Disposal Options Initially Considered ..... 214
  - 2.2.2 Screening Criteria Used to Eliminate Possible Reuse/Disposal Options from Further Study ..... 214
  - 2.2.3 Reuse/Disposal Options Eliminated from Further Study ..... 216
  - 2.2.4 Reuse/Disposal Options Considered for Further Study ..... 220
- 2.3 Project Alternatives ..... 242
  - 2.3.1 No-Project Alternative ..... 242
- 2.4 Construction Process ..... 247

3.0 DREDGED MATERIAL EVALUATION ..... 248
- 3.1 Testing Requirements for Dredged Material ..... 248
  - 3.1.1 Testing Requirements for Aquatic Disposal ..... 248
  - 3.1.2 Testing Requirements for Wetland/Upland Disposal ..... 253
- 3.2 Summary of Results of Dredged Material Testing ..... 257
  - 3.2.1 Sampling Design ..... 257
  - 3.2.2 Summary of Sediment Chemistry Test Results ..... 265
  - 3.2.3 Summary of Sediment Toxicity Test Results ..... 269
  - 3.2.4 Summary of Leachate Test Results ..... 276
- 3.3 Suitability of Dredged Material for Different Types of Reuse/Disposal ..... 276
  - 3.3.1 Suitability for Ocean Disposal ..... 278
  - 3.3.2 Suitability for Wetland Creation (Tidal/Subtidal) ..... 278

3.3.3 Suitability for Upland Disposal/Reuse ..... 286
3.3.4 Summary of Preferred Disposal Options ..... 286

4.0 AFFECTED ENVIRONMENT ..... 295
4.1 Air Quality ..... 295
4.2 Surface Water Resources ..... 305
4.2.1 Regional Setting ..... 305
4.2.2 Proposed Dredge Area ..... 311
4.2.3 Possible Reuse/Disposal Options ..... 315
4.3 Geology and Groundwater ..... 328
4.3.1 Regional Setting ..... 328
4.3.2 Proposed Dredge Area ..... 335
4.3.3 Possible Reuse/Disposal Options ..... 340
4.4 Biological Resources ..... 357
4.4.1 Proposed Dredge Area ..... 357
4.4.2 Possible Reuse/Disposal Options ..... 369
4.5 Cultural Resources ..... 392
4.5.1 Cultural Setting ..... 393
4.5.2 Proposed Dredge Area ..... 397
4.5.3 Possible Reuse/Disposal Options ..... 399
4.6 Socioeconomics ..... 402
4.6.1 Regional Context ..... 402
4.6.2 Proposed Dredge Area ..... 405
4.6.3 Possible Reuse/Disposal Options ..... 407
4.7 Transportation ..... 410
4.7.1 Vessel Transportation ..... 410
4.7.2 Ground Transportation ..... 417
4.8 Noise ..... 441
4.8.1 Proposed Dredge Area ..... 443
4.8.2 Possible Reuse/Disposal Options ..... 448
4.9 Human Health and Risk ..... 451
4.10 Hazardous Materials and Contaminated Wastes ..... 453
4.10.1 Hazardous Materials ..... 453
4.10.2 Contaminated Sediment ..... 454
4.11 Public Services ..... 456
4.11.1 Proposed Dredge Area ..... 456
4.11.2 Possible Reuse/Disposal Options ..... 458
4.12 Land Use ..... 461
4.12.1 Regional Setting ..... 461
4.12.2 Proposed Dredge Area ..... 461
4.12.3 Possible Reuse/Disposal Options ..... 466
4.13 Visual Resources ..... 471
4.13.1 Proposed Dredge Area ..... 471
4.13.2 Possible Reuse/Disposal Options ..... 478

5.0 ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES ..... 480
5.1 Air Quality ..... 480
5.1.1 Impact Significance Criteria ..... 481
5.1.2 Proposed Dredging ..... 483
5.1.3 Possible Reuse/Disposal Options ..... 483
5.1.4 Other Project Construction Activities ..... 491
5.1.5 Project Operations ..... 492
5.2 Surface Water Resources ..... 499
5.2.1 Impact Significance Criteria ..... 499
5.2.2 Proposed Dredging ..... 500
5.2.3 Possible Reuse/Disposal Options ..... 505
5.3 Geology and Groundwater ..... 521
5.3.1 Impact Significance Criteria ..... 521
5.3.2 Proposed Dredging ..... 521
5.3.3 Possible Reuse/Disposal Options ..... 526
5.4 Biological Resources ..... 539
5.4.1 Impact Significance Criteria ..... 539
5.4.2 Proposed Dredging ..... 542
5.4.3 Possible Reuse/Disposal Options ..... 548
5.5 Cultural Resources ..... 570
5.5.1 Impact Significance Criteria ..... 570
5.5.2 Proposed Dredging ..... 570
5.5.3 Possible Reuse/Disposal Options ..... 571
5.5.4 Unanticipated Discoveries ..... 574
5.6 Socioeconomics ..... 575
5.6.1 Impact Significance Criteria ..... 575
5.6.2 Regional ..... 575
5.6.3 Oakland Harbor ..... 575
5.6.4 Possible Reuse/Disposal Options ..... 577
5.7 Transportation ..... 580
5.7.1 Vessel Transportation ..... 580
5.7.2 Ground Transportation ..... 588
5.8 Noise ..... 599
5.8.1 Impact Significance Criteria ..... 599
5.8.2 Proposed Dredging ..... 599
5.8.3 Possible Reuse/Disposal Options ..... 610
5.9 Human Health and Risk ..... 617
5.9.1 Impact Significance Criteria ..... 617
5.9.2 Human Health Impact Assessment Methodology ..... 617
5.9.3 Proposed Dredging ..... 619
5.9.4 Possible Reuse/Disposal Options ..... 619
5.10 Hazardous Materials and Contaminated Wastes ..... 623
5.10.1 Impact Significance Criteria ..... 623
5.10.2 Hazardous Materials ..... 623

5.10.3 Contaminated Wastes ..... 624
5.10.4 Proposed Dredging ..... 624
5.10.5 Possible Reuse/Disposal Options ..... 625
5.11 Public Services ..... 628
5.11.1 Impact Significance Criteria ..... 628
5.11.2 Proposed Dredging ..... 628
5.11.3 Possible Reuse/Disposal Options ..... 629
5.12 Land Use ..... 633
5.12.1 Impact Significance Criteria ..... 633
5.12.2 Proposed Dredging ..... 633
5.12.3 Possible Reuse/Disposal Options ..... 635
5.13 Visual Impacts ..... 638
5.13.1 Impact Significance Criteria ..... 638
5.13.2 Proposed Dredging ..... 638
5.13.3 Possible Reuse/Disposal Options ..... 639

6.0 CONSISTENCY WITH ADOPTED PLANS AND POLICIES ..... 641
6.1 Regionally Applicable Plans and Policies ..... 641
6.1.1 BCDC San Francisco Bay Plan ..... 641
6.1.2 San Francisco Bay Area Seaport Plan ..... 648
6.1.3 The San Francisco Bay Trail Plan ..... 651
6.2 Local Plans and Policies ..... 651
6.2.1 Oakland Comprehensive Policy Plan ..... 651
6.2.2 Open Space, Conservation, and Recreation Element ..... 653
6.2.3 City of Alameda General Plan ..... 656
6.2.4 Plans Related to the Montezuma Wetlands Restoration ..... 656
6.2.5 Plans Related to the Hamilton Wetlands Restoration ..... 657
6.2.6 Navy Installation Restoration Program (IRP) and Remedial Investigation/Feasibility Study Schedule for FISCO ..... 659
6.3 Consistency with Plans that have not yet been Adopted ..... 658
6.3.1 Long-Term Management Strategy ..... 659
6.3.2 Proposed Bay Plan Amendment ..... 659
6.3.3 NAS Alameda Community Reuse Plan ..... 663

7.0 ENVIRONMENTAL JUSTICE ..... 664
7.1 Regulatory Setting ..... 664
7.2 Affected Environment ..... 665
7.3 Project Impacts and Mitigation Measures ..... 671
7.4 Cumulative Impacts ..... 677

8.0 PROJECT ALTERNATIVES ANALYSIS ..... 679
8.1 Definition of Project Alternatives ..... 679
8.2 Comparison of Impacts by Project Site ..... 679
8.2.1 Air Quality ..... 682
8.2.2 Surface Water Resources ..... 682
8.2.3 Geology and Groundwater ..... 683
8.2.4 Biological Resources ..... 684

8.2.5 Cultural Resources ..... 686
8.2.6 Socioeconomics ..... 686
8.2.7 Transportation ..... 686
8.2.8 Noise ..... 689
8.2.9 Human Health and Risk ..... 689
8.2.10 Hazardous Materials and Contaminated Wastes ..... 690
8.2.11 Public Services ..... 690
8.2.12 Land Use ..... 690
8.2.13 Visual Resources ..... 691
8.3 Comparison of the Project Alternatives ..... 691
8.3.1 Air Quality ..... 691
8.3.2 Surface Water Resources ..... 693
8.3.3 Geology and Groundwater ..... 695
8.3.4 Biological Resources ..... 696
8.3.5 Cultural Resources ..... 698
8.3.6 Socioeconomics ..... 698
8.3.7 Transportation ..... 699
8.3.8 Noise ..... 701
8.3.9 Human Health and Risk ..... 702
8.3.10 Hazardous Materials and Contaminated Wastes ..... 702
8.3.11 Public Services ..... 703
8.3.12 Land Use ..... 703
8.3.13 Visual Resources ..... 704
9.0 CUMULATIVE IMPACTS ..... 705
9.1 Description of Cumulative Projects ..... 705
9.1.1 Projects Initially Considered but Eliminated from the Cumulative Impact Analysis ..... 705
9.1.2 Projects Considered in the Cumulative Impact Analysis ..... 706
9.2 Cumulative Impact Analysis ..... 715
9.2.1 Air Quality ..... 715
9.2.2 Surface Water Resources ..... 720
9.2.3 Geology and Groundwater ..... 720
9.2.4 Biological Resources ..... 721
9.2.5 Cultural Resources ..... 722
9.2.6 Socioeconomics ..... 723
9.2.7 Transportation ..... 724
9.2.8 Noise ..... 731
9.2.9 Human Health and Risk ..... 737
9.2.10 Hazardous Materials and Contaminated Wastes ..... 737
9.2.11 Public Services ..... 737
9.2.12 Land Use ..... 737
9.2.13 Visual Resources ..... 738

10.0 RECOMMENDATIONS ..... 739
10.1 Locally Preferred Plan ..... 739
10.2 Environmentally Preferred Plan ..... 739
10.3 The Selected Plan ..... 741

11.0 UNAVOIDABLE SIGNIFICANT IMPACTS ..... 743
11.1 Air Quality ..... 743
11.2 Ground Transportation ..... 743
11.3 Noise ..... 743

12.0 GROWTH-INDUCING IMPACTS ..... 744

13.0 RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY ..... 746

14.0 IRREVERSIBLE OR IRRETRIEVABLE COMMITMENTS OF RESOURCES ..... 749

15.0 PUBLIC INVOLVEMENT AND INTERAGENCY COORDINATION ..... 750
15.1 Public Involvement ..... 750
15.2 Interagency Coordination ..... 751
15.2.1 Coordination with Environmental Agencies ..... 751
15.2.2 Coordination with Other Agencies ..... 752
15.3 Comments from the Oakland Community, Environmental Organizations and Private Citizens ..... 752

16.0 REFERENCES ..... 753

17.0 PERSONS AND AGENCIES CONTACTED ..... 782

18.0 LIST OF PREPARERS AND CONTRIBUTORS ..... 784

19.0 GLOSSARY OF TERMS ..... 788

20.0 ACRONYMS ..... 792

21.0 LIST OF MEASUREMENTS ..... 797

# APPENDICES

Appendices A through E are part of the Feasibility Study (Volume I), and are bound separately as Volume III. Appendices F through X are part of the EIS/R (Volume II), and are bound separately as volumes IV through VII as noted below.

**Appendices in Volume III:**

A. Engineering Report
B. Cost Estimate and Optimization
C. Real Estate Plan
D. Geotechnical Investigation
E. Hydrogeological Investigation

**Appendices in Volume IV:**

F. NOP/NOI and Scoping Comments Overview
G. Regulatory Agency Framework and Compliance
H. Sediment Characterization
I. Air Quality Emissions Tables and Mitigation Measures Considered and Rejected
J. Air Quality Conformity Determination (will be included in the Final EIS/R/FS)
K. Middle Harbor Habitat Enhancement Area Dredging and Disposal Plan
L. Endangered Species Act Section 7 Biological Assessment — Executive Summary
M. Inner Harbor Turning Basin Information

**Appendices in Volume V:**

N. USFWS Planning Aid Letter
O. Modeling of Water Quality Impacts
P. Clean Water Act Section 404(b)(1) Evaluation
Q. Human Health Risk Assessment
R. Mitigation Monitoring and Reporting Plan
S. Ground Transportation Information
T. Construction Process
U. Hydrodynamic Modeling of Middle Harbor Enhancement Area
V. National Historic Preservation Act Section 106 Documentation
X. Responses to Comments on the Draft EIS/R/FS

**Appendices in Volume VI:**

W1. Comments on the Draft EIS/R/FS from Agencies and Environmental or Community Groups

**Appendices in Volume VII:**

W2. Comments on the Draft EIS/R/FS from Businesses and Individuals

## FIGURES


| | | |
|---|---|---|
| 1.1-1 | Oakland Harbor Area | 188 |
| 2.1-1 | Proposed Dredge Area in Oakland Harbor | 198 |
| 2.1-2 | Berth Areas in Oakland Harbor | 199 |
| 2.1-3 | Difference between Dredging Option B and Dredging Option F | 202 |
| 2.1-4 | Alternative Locations for the Inner Harbor Turning Basin | 204 |
| 2.2-1 | Potential Reuse/Disposal Options | 215 |
| 2.2-3 | Possible Dredged Material Rehandling Sites | 223 |
| 2.2-4 | New Berth 21 | 225 |
| 2.2-5 | Area Designated for Middle Harbor Enhancement | 227 |
| 2.2-6 | Preliminary Habitat Design Concept for the Middle Harbor Enhancement Area | 229 |
| 2.2-7 | Placement of Material Stockpile at Former NAS Alameda | 232 |
| 2.2-8 | San Francisco Deep Ocean Disposal Site (SF-DODS) | 233 |
| 2.2-9 | Hamilton Airfield Site Proposed for Wetland Restoration | 234 |
| 2.2-10 | Montezuma Wetland Site | 239 |
| 2.2-11 | Location of Altamont Landfill and Vasco Road Landfill | 241 |
| 2.2-12 | Location of Redwood Landfill | 243 |
| 2.3-1 | Potential Decrease in Port of Oakland's Local Cargo Circle of Influence under the No-Project Alternative | 245 |
| 3.1-1 | Protocol for Determining Suitability of Dredged Material for Ocean Disposal | 252 |
| 3.1-2 | Upland or Wetland Disposal Options: SF-RWQCB Decision Flowchart | 254 |
| 3.2-1 | Hypothetical Sediment Profiles for (a) 42-foot Channel and Berths, (b) Bank Widening Areas, and (c) Turning Basin Expansion | 258 |
| 3.2-2 | Composite Cells for the MS/OBM Sediment Layer (OM) | 261 |
| 3.2-3 | Composite Cells for the Upper 4-foot Interval of YBM (YS) | 262 |
| 3.2-4 | Composite Cells for the 4-foot to 8-foot Interval of YBM (YM) | 263 |
| 3.2-5 | Composite Cells for the 8-foot to MS/OBM Contact YBM Level (YB) | 264 |
| 4.1-1 | San Francisco Bay Area Air Basin | 296 |
| 4.3-1 | Regional Fault Map | 329 |
| 4.3-2 | Geologic Map of the Proposed Project Site | 331 |
| 4.3-3 | East-West Trending Cross Section of the Site | 334 |
| 4.4-1 | Idealized Cross-Section View of the Habitats Surveyed during Aquatic Studies | 359 |
| 4.6-1 | Counties in the San Francisco Bay Area | 403 |
| 4.7-1 | Approach Lanes and Separation Zones in the Gulf of the Farallones | 411 |
| 4.7-2 | Regulated Navigation Areas in San Francisco Bay | 413 |
| 4.7-3 | Regional Highway and Street System with Daily Traffic Volumes | 418 |
| 4.7-4 | Adjusted Existing A.M. Peak Hour Traffic Volumes | 424 |
| 4.7-5 | Adjusted Existing P.M. Peak Hour Traffic Volumes | 425 |
| 4.7-6 | Traffic Volumes on Maritime Street South of Burma Road | 428 |
| 4.7-7 | Traffic Volumes on 7th Street Extension | 428 |
| 4.7-8 | Traffic Volumes on Middle Harbor Road South of 3rd Street | 429 |

| | | |
|---|---|---|
| 4.7-9 | Daily Vehicle Trips Along Regional Access Routes to the Altamont and Vasco Road Landfills | 432 |
| 4.7-10 | Daily Vehicle Trips along Regional Access Routes to the Redwood Landfill | 435 |
| 4.8-1 | Noise Measurement Locations | 444 |
| 4.8-2 | Existing and Future Oakland and Alameda Noise-Sensitive Receptors | 444 |
| 4.11-1 | Utility Locations Within the Proposed Dredge Area | 457 |
| 4.12-1 | Regional Setting | 462 |
| 4.12-2 | Overview of Land Uses in the Project Area | 463 |
| 4.13-1 | Viewpoints within the Project Area — Location of Photographs | 473 |
| 4.13-2A | Viewpoints within the Project Area | 474 |
| 4.13-2B | Viewpoints within the Project Area | 475 |
| 4.13-2C | Viewpoints within the Project Area | 476 |
| 4.13-2D | Viewpoints within the Project Area | 477 |
| 7.2-1 | West Oakland Community | 666 |
| 9.1-1 | Projects Considered in the Cumulative Impact Analysis | 711 |
| 9.1-2 | Timing of Proposed 50-Foot Project and Other Related Port Projects | 712 |

## TABLES


S-1 Comparison of Impacts by Project Alternative ..... 177
S-2 Summary of Environmental Consequences ..... 179
2.1-1 Dredging Options Initially Considered ..... 201
2.1-2 Comparison of the Eight Possible Alignments of the Inner Harbor Turning Basin ..... 206
2.2-1 Maximum Sediment Volume by Reuse/Disposal Option ..... 220
2.3-1 Distribution of Dredged Volume by Dredging Option and Reuse/Disposal Option 243
3.1-1 Implementation Manual's Tiered Testing Approach ..... 250
3.1-2 SF-RWQCB Interim Sediment Screening Criteria for Wetland/Upland Reuse ..... 255
3.2-1 Summary of Sediment Samples and Analyses Conducted ..... 266
3.2-2 Oakland Sediment Concentration Ranges for MS/OBM ..... 267
3.2-3 Oakland Sediment Concentration Ranges for YBM from Outer Harbor Areas ..... 270
3.2-4 Oakland Sediment Concentration Ranges for YBM from Inner Harbor Areas ..... 272
3.2-5 Summary of Toxicity Test Results ..... 274
3.2-6 Comparisons of Modified Waste Extraction Test Procedure Analytical Results with State of California Drinking Water Standards ..... 277
3.3-1 Suitability of Dredging Units for Various Disposal Options ..... 280
3.3-2 Port Preferences for Disposal of Each Dredging Unit ..... 288
4.1-1 Maximum Pollutant Concentrations Monitored in the Project Area, 1994-1996 ..... 299
4.1-2 $PM_{2.5}$ Concentration Measurements[a] ..... 302
4.1-3 1995 Emission Inventory for the San Francisco Bay Area Air Basin ..... 303
4.2-1 1995 Water Quality Data for the San Francisco Bay near the Oakland 50-foot Project ..... 306
4.2-2 Concentrations of Metals and Organics in San Francisco Bay Waters ..... 307
4.2-3 Summary of Contaminants above Water Quality Objectives or Criteria ..... 309
4.3-1 Calculated Factors of Safety — Shoreline Slope Stability for Static Loading Conditions ..... 336
4.3-2 Estimated Relative Performance of Shoreline Slopes Design Seismic Loading Conditions ..... 336
4.3-3 Mean Values of Sediment Conventional Variables by Sediment Type and Area — 50-foot Project ..... 337
4.3-4 Mean Concentrations of Selected Toxicants in Surficial Sediments from Three Basins and Four Peripheral Areas of San Francisco Bay ..... 339
4.3-5 Overall Average Concentrations (± Standard Deviations) of Selected Toxicants and Numbers of Samples Tested in Basin and Peripheral Areas ..... 340
4.3-6 Summary of Sediment Quality Data for the SF-DODS ..... 348
4.4-1 Special Status Species that Have the Potential to Occur within the Proposed Dredge Area and Vicinity ..... 364
4.4-2 Special Status Species that have Potential to Occur within the Proposed Former NAS Alameda Disposal Site and Vicinity ..... 375
4.4-3 Densities of Marine Mammals and Key Marine Bird Species within Study Area 5 ..... 379
4.4-4 Special Status Species that have Potential to Occur within the Proposed San Francisco Deep Ocean Disposal Site (SF-DODS) and Vicinity ..... 381




62-376 00 - 7

4.4-5 Hamilton Site: Special Status Plants Potentially Occurring ..... 386
4.6-1 Population of the San Francisco Bay Region ..... 404
4.6-2 Existing and Projected Jobs of the San Francisco Bay Region ..... 404
4.6-3 Existing and Projected Mean Household Income for the San Francisco Bay Region ..... 405
4.6-4 Existing and Projected Households in the San Francisco Bay Region ..... 406
4.6-5 Employment Related to Port Operations (1990-1995) ..... 406
4.6-6 Distribution of Direct Employment Impact by County of Residence 1995 ..... 407
4.7-1 Existing Freeway Operations -- P.M. Peak Hour ..... 421
4.7-2 Existing Intersection Operations ..... 426
4.7-3 Intersection Operations after Completion of the Cypress Freeway -- 1998 ..... 426
4.7-4 Peak Hour Vehicle Classification Counts ..... 427
4.7-5 Port Employee Trip Distribution ..... 427
4.7-6 Truck Traffic Distribution from Marine Terminals and Intermodal Railyards ..... 429
4.7-7 Existing Freeway Operations on I-580 East of I-238 P.M. Peak Hour ..... 433
4.7-8 Existing Traffic Operations for Roadways Serving Altamont Landfill ..... 434
4.7-9 Existing Freeway Operations for Routes Leading to the Redwood Landfill ..... 437
4.7-10 Existing Traffic Operations for the Redwood Landfill Access ..... 437
4.7-11 Existing Traffic Operations for Vasco Road ..... 439
4.8-1 Typical Sound Levels Measured in the Environment ..... 442
4.8-2 Existing Noise Levels in the West Oakland Area ..... 446
4.8-3 City Of Oakland Maximum Allowable Receiving Noise Standards ..... 447
4.8-4 City of Alameda Maximum Allowable Receiving Noise Standards ..... 448
5.1-1 Emissions for Dredging, Transport, and Reuse of Material at Vision 2000 Upland Area ..... 484
5.1-2 Emissions for Dredging, Transport, and Reuse of Material at New Berth 21 ..... 485
5.1-3 Emissions for Dredging, Transport, and Reuse of Material at the MHEA ..... 486
5.1-4 Emissions for Dredging and Reuse of Material at the NAS Alameda ..... 486
5.1-5 Emissions for Dredging and Transport of Material to SF-DODS ..... 487
5.1-6 Emissions for Dredging and Transport of Material to Hamilton Airfield ..... 488
5.1-7 Emissions for Dredging and Transport of Material to Montezuma Wetlands ..... 488
5.1-8 Emissions from Handling and Transport to Landfill of Contaminated Dredge Material ..... 489
5.1-9 Emissions from Other Construction Activities ..... 491
5.1-10 Emissions from Project-Related Operation Sources at Port of Oakland ..... 493
5.1-11 Mitigation Measures Selected to Reduce Emissions from Oakland Harbor 50-Foot Project Operation Sources ..... 496
5.2-1 Comparison of Historical Contaminants Release Data during Dredging Basin Plan Water Quality Objectives ..... 504
5.3-1 Mitigation Required for the 52- foot Dredge Depth ..... 524
5.3-2 Wharf Evaluations at Current and Proposed 52-foot Dredge Depths ..... 525
5.3-3 Model-Predicted Deposit Thickness, Areal Coverage, and Material Loss at SF-DODS ..... 532
5.4-1 Habitat Changes under the MHEA Reuse Option ..... 552

5.6-1 Economic Analysis of Dredging Project Alone ..... 576
5.7-1 Number and Average Size (DWT) of Container Vessels Calling at Port of Oakland (50-Foot Deepening Alternatives) ..... 581
5.7-2 Maximum Number of Barge Trips Required by Disposal Site ..... 584
5.7-3 Intersection Operations for Project Construction — Year 2000 A.M. Peak Hour ..... 591
5.7-4 Intersection Operations for Project Construction — Year 2000 P.M. Peak Hour ..... 592
5.7-5 Freeway Junction Operations for Project Construction, Year 2000 A.M. Peak Hour ..... 593
5.7-6 Freeway Junction Operations for Project Construction, Year 2000 P.M. Peak Hour ..... 593
5.7-7 Intersection Analysis Summary for Port Operations — Year 2003 ..... 597
5.7-8 Intersection Operations — Year 2010 ..... 598
5.7-9 Intersection Operations with Project Mitigation — Year 2010 ..... 598
5.8-1 Estimated Dredging-Related Noise Levels at Sensitive Receptors by Project Component ..... 601
7.2-1 West Oakland Community Groups (partial list) ..... 668
8.1-1 Sediment Volume Destined for Reuse/Disposal Sites under Each Project Alternative ..... 680
8.2-1 Comparison of Impacts by Project Site ..... 681
8.3-1 Comparison of Impacts by Project Alternative ..... 690
8.3-2 Emissions Associated with the No-Project Alternative ..... 692
8.3-3 Comparison of Construction Phase Mitigated Emissions Associated with Each Alternative ..... 693
8.3-4 Number of Average Size (DWT) of Container Vessels Calling at Port of Oakland (No-Project Alternative) ..... 700
9.1-1 Foreseeable Projects ..... 707
9.2-1 Mitigation Measures Selected to Reduce Significant Cumulative Impacts ..... 716
9.2-2 Cumulative Socioeconomic Effects ..... 723
9.2-3 Cumulative Construction Employees ..... 726
9.2-4 Intersection Operations for Cumulative Project Construction — Year 2000 A.M. Peak Hour ..... 727
9.2-5 Intersection Operations for Cumulative Project Construction — Year 2000 P.M. Peak Hour ..... 727
9.2-6 Intersection Operations — Year 2003 Cumulative Conditions ..... 728
9.2-7 Intersection Operations — Year 2010 Cumulative Conditions ..... 730
9.2-8 Cumulative Construction-Related Noise Impacts at Sensitive Receptors ..... 733

# SUMMARY

## S.1 INTRODUCTION

The proposed project would deepen Oakland Harbor channels and berth areas from 42 feet mean lower low water (MLLW) to 50 feet MLLW, with 2 feet overdredge allowance; some portions of the channel would also be widened. If authorized to be constructed as a federal navigation improvement project, through the Water Resources Development Act of 1998, the project would be constructed through a partnership between the U.S. Army Corps of Engineers (Corps) and a non-federal sponsor. The Port of Oakland is the non-federal (local) sponsor of the federal project. (A federal project is one that the federal government will participate in and fund; a non-federal sponsor is a sponsor that is not a federal agency.)

The deepening is needed because the harbor channels are no longer adequate to efficiently and cost-effectively accommodate modern, deep-draft container vessels. The objectives of the navigation improvements are to reduce tidal-caused delays associated with containership passages, to increase economies of scale for waterborne commerce, and to increase navigation safety. The proposed project would provide national benefits through reducing vessel delays due to tides, and would reduce the potential for vessel collisions and groundings. The proposed project also would increase the Port's ability to benefit from economies of scale and improve the Port of Oakland's economic competitiveness with other west coast ports.

This document is a combined Environmental Impact Statement, Environmental Impact Report, and a Feasibility Study (EIS/R/FS). The complete report consists of five volumes: the FS (Volume I), the EIS/R (this Volume II), the FS appendices (Volume III), the EIS/R appendices (Volume IV), and an Executive Summary. The document fulfills the requirements of the National Environmental Policy Act (NEPA) to support decisionmaking on authorization for proposed federal civil works projects and the California Environmental Quality Act (CEQA) requirements for state decisions related to the proposed project. The Corps is the federal lead agency for the project under NEPA, and the Port is the state lead agency under CEQA. This EIS/R/FS is an informational document that will inform and assist public decisionmakers and the general public of the significant effects of the project and describe feasible alternatives. The EIS/R/FS is intended to support the permitting processes of all agencies whose discretionary approvals must be obtained for particular elements of the project. This document assesses short-term, long-term, and cumulative impacts of the project. The document identifies a recommended plan (section S.3), but this is subject to change as a result of public input. Any such revision would be identified in the Final EIS/R/FS, which is also subject to public review.

## S.2 SUMMARY OF ENVIRONMENTAL IMPACTS

The level of impact of each of the project alternatives on each resource area analyzed in this document is summarized in Table S-1. The project alternatives include the no-project alternative and 15 dredging/disposal alternatives. The dredging/disposal alternatives consist of a combination of a dredging option (defined in section 2.1.1) and a set of reuse/disposal options for the dredged material (described in section 2.2.4). The alternatives listed in Table S-1 are introduced in section 2.3 and defined in section 8.1.

In Table S-1, many of the alternatives have the same level of impact on a given resource. This is because the impact(s) that determine or "drive" the level of impact for an alternative are either due

## Table S-1. Comparison of Impacts by Project Alternative[1]

| Resource Area | Project Alternative | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *No-Project* | *B1* | *B2* | *B3* | *B4* | *B5* | *B6* | *F1* | *F2* | *F3* | *F4* | *F5* | *F6* | *F7* | *F8* | *F9* |
| Air Quality[2] | B | -3 | -3 | -3 | -3 | -3 | -3 | -3 | -3 | -3 | -3 | -3 | -3 | -3 | -3 | -3 |
| Surface Water Resources | 0 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 |
| Geology and Groundwater | 0 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 |
| Biological Resources | 0 | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B |
| Cultural Resources[3] | 0 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 |
| Socioeconomics | 0 | B | B | B | B | B | B | B | B | B | B | B | B | B | B | B |
| Vessel Transportation | -3 | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B |
| Ground Transportation | 0 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 |
| Noise | 0 | -3 | -3 | -3 | -3 | -3 | -3 | -3 | -3 | -3 | -3 | -3 | -3 | -3 | -3 | -3 |
| Human Health and Risk | 0 | -1 | -1 | -1 | -1 | -1 | -1 | -1 | -1 | -1 | -1 | -1 | -1 | -1 | -1 | -1 |
| Hazardous Materials & Contaminated Wastes | 0 | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B |
| Public Services | 0 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 |
| Land Use[4] | 0 | 0/B | 0/B | 0/B | 0/B | 0/B | 0/B | 0/B | 0/B | 0/B | 0/B | 0/B | 0/B | 0/B | 0/B | 0/B |
| Visual Resources | 0 | 0/B | 0/B | 0/B | 0/B | 0/B | 0/B | 0/B | 0/B | 0/B | 0/B | 0/B | 0/B | 0/B | 0/B | 0/B |

*Notes:*

1. For adverse impacts:
   - -3 = significant and unavoidable adverse impact
   - -2 = significant but mitigable adverse impact
   - -1 = adverse but not significant impact
   - 0 = negligible or no impact

   For beneficial effects:
   - B = beneficial
2. Impacts associated with the operation phase (i.e., after dredging/disposal is complete).
3. If the former Todd Shipyard is determined to be eligible for the National Register of Historic Places, the removal of some of its structures may be a significant impact, but that impact would be mitigated to a level of less than significance.
4. The number in the table refers to compatibility with existing and proposed land uses.

to the dredging (which is common to all alternatives) or to a particular reuse/disposal option that is also common to all alternatives (this is further explained in section 8.3).

The significant impacts of the project and the recommended mitigation measures, which would avoid or reduce these impacts, are described in Table S-2. Table S-2 includes the significant impacts at all possible reuse/disposal sites considered for the project, not all of which would be part of the selected plan (section S.3). Note that Table S-2 presents only the significant or potentially significant project-specific impacts; adverse but insignificant impacts, which are not included in this table, are discussed in chapters 5 and 6. Cumulative impacts of the proposed project in combination with other reasonably foreseeable projects are also not included in Table S-2; these impacts are discussed in Chapter 9.

## S.3 RECOMMENDATIONS

Alternative F2 is both the environmentally preferred plan and the selected plan for the proposed project. Alternative F2 includes dredging option F and the following reuse/disposal options: Vision 2000 Upland area (0.5 million cubic yards [mcy]), Middle Harbor Enhancement Area (7.0 mcy), Hamilton Wetlands Restoration site (5.2 mcy), and the Various Landfills (0.1 mcy). The basis for concluding this is the environmentally preferred plan is described in section 10.2; the basis for concluding this is the selected plan is described in section 10.3.

## S.4 MITIGATION PLAN FOR THE SELECTED PLAN

The mitigation plan for the selected plan (Alternative F2) is included in Appendix R in the form of a Mitigation Monitoring and Reporting Plan.

## S.5 KNOWN AREAS OF CONTROVERSY OR UNRESOLVED ISSUES

There are two principal areas of controversy or unresolved issues: creation of the Middle Harbor Enhancement Area, and whether the Hamilton Wetlands Restoration or Montezuma Wetlands Restoration site will be available in time to receive dredged material from the proposed project. Both of these sites involve reuse/disposal options that include reuse of the material for habitat enhancement and that are part of the selected plan.

**Middle Harbor Enhancement Area**

The Middle Harbor Enhancement Area (MHEA) is a key component of the proposed project. It is a reuse/disposal option that is very close to the proposed dredging areas, it could accommodate a large volume of the dredged material (7.0 mcy) compared to the other reuse/disposal sites considered, and it is owned by the Port. Two aspects of this site are unresolved: whether this proposed fill in the Bay will be permitted by the BCDC, and the use of non-cover material in an aquatic site.

Placing dredged material in the Middle Harbor to create the proposed shallow water habitat would constitute filling in the Bay, which may be consistent with the current policies of the San Francisco Bay Plan. The San Francisco Bay Conservation and Development Commission (BCDC) has initiated a proposal to amend the Bay Plan. If adopted by the Commission, the Bay Plan would be modified to provide the policy guidance for permitting fill in a wildlife refuge. The

**Table S-2. Summary of Environmental Consequences[1]**
(page 1 of 7)

Note: This table reflects the significant impacts of the project, organized mainly by site, including the dredge area and the reuse/disposal sites. If a reuse/disposal site does not appear in this table it is because there would be no significant impacts associated with the use of that site for the proposed project.

| *Resource Area* | *Site Where Impact Would Occur* | *Significant Impact* | *Mitigation Measure* | *Significance After Mitigation* |
|---|---|---|---|---|
| IMPACTS ASSOCIATED WITH THE DREDGING | | | | |
| **Surface Water** | Dredge Area | Dredging could cause the release of soluble organics from the YBM in the Inner Harbor turning wing, which exceed water quality criteria. | Dredging with a dredge pipe of 18 inches in diameter or a clamshell dredge shall be required at this site. | Not significant |
| **Geology and Groundwater** | Dredge Area | Dredging near berths could cause slope instability along wharves by over-steepening of the bank, decreased capacity of existing piles (piles would be under-strength) from removal of confining bearing material, and intrusion of piles into some wharves as sediment is removed. | Add piles at waterside crane girders; build sheet pile wall at the toe of shore slope of the impacted wharves, or other appropriate structural improvements designed and constructed according to the Port's latest wharf design ordinance. | Not significant |
| **Biological Resources** | Dredge Area | Turbidity from the dredging could disrupt herring spawning and result in mortality to eggs. | A qualified observer shall be present on site during dredging operations near herring spawning areas between December 1 and March 1. If spawning is observed within 200 meters of the dredging, all dredging-related activities shall stop in the area for 2 weeks. | Not significant |
| **Cultural Resources** | Dredge Area | Expansion of the Inner Harbor turning basin would remove some structures from the former Todd Shipyard, which site might be eligible for the National Register of Historic Places, so this is potentially a significant impact. | Consult with relevant agencies. Record and document structures. | Not significant |

**Table S-2. Summary of Environmental Consequences[1]**
(page 2 of 7)

| *Resource Area* | *Site Where Impact Would Occur* | *Significant Impact* | *Mitigation Measure* | *Significance After Mitigation* |
|---|---|---|---|---|
| IMPACTS ASSOCIATED WITH THE DREDGING | | | | |
| Vessel Transportation | Dredge Area | Dredging could impede vessel access to the berths. | Schedule dredging in consultation with terminal managers to ensure that access to berths is available when needed. | Not significant |
| | | Dredging could cause structural damage to the berths. | Use precautions while dredging near berths (see Geology and Groundwater mitigation measures). Document the condition of the berths prior to dredging; repair any damage specifically attributable to the dredging. | Not significant |
| | | Use of a clamshell dredge in the Inner Harbor could cause delays in ferry schedules. | Clamshell dredges shall not be used in the Inner Harbor Channel during peak morning and afternoon ferry transit hours. Allowable times shall be established in consultation with the ferry operator. | Not significant |
| Noise | Dredge Area | Proposed hours of dredging would not be consistent with Alameda Noise Ordinance time restrictions and project construction-related dredging and pile driving noise in Alameda would exceed construction noise standards. | When feasible, use noise controls on pile driving equipment. Controls include:<br>• Sonic or vibratory pile drivers;<br>• Acoustical enclosures around the pile driver.<br>• Engine and pneumatic exhaust controls<br>Use of electric-powered cutterhead dredge in the Inner Harbor.<br>Use of electric-powered clamshell dredge in the Inner Harbor turning basin. | Significant |

**Table S-2. Summary of Environmental Consequences[1]**
(page 3 of 7)

| *Resource Area* | *Site Where Impact Would Occur* | *Significant Impact* | *Mitigation Measure* | *Significance After Mitigation* |
|---|---|---|---|---|
| IMPACTS ASSOCIATED WITH THE DREDGING | | | | |
| Public Services | Dredge Area | Deepening and widening the Outer Harbor Channel would damage the cathodic protection system on the Bay Area Rapid Transit (BART) Transbay Tube. | Replace the impacted part of the system after dredging is completed. | Not significant |
| | | Deepening and widening the Outer Harbor Channel would damage the sanitary sewer force main that crosses the Inner Harbor and services Alameda. | Replace the main during dredging of the channel; transfer service during non-peak time. | Not significant |
| IMPACTS ASSOCIATED WITH THE VISION 2000 UPLAND REUSE/DISPOSAL OPTION | | | | |
| Surface Water | Vision 2000 Upland | Discharge of potentially contaminated water from the rehandling facility to the Bay may exceed water quality standards. | Design and construct the rehandling facility to contain the water and prevent uncontrolled discharge, using standard engineering practices for this type of facility; sample, test, and treat water under permit with the SF-RWQCB prior to discharge, or allow to evaporate. | Not significant |
| | MHEA | Rebuilding of a new stormwater system, which would be necessary at the Vision 2000 Upland site, may direct stormwater into the sensitive Middle Harbor Enhancement Area (MHEA). | Rebuild the stormwater system to direct stormwater away from the MHEA. | Not significant |
| Hazardous Materials and Contaminated Wastes | Vision 2000 Upland | Contaminated dredged material could be spilled accidentally from the clamshell bucket while being transferred to the Vision 2000 Upland site. | Develop procedures for loading and unloading contaminated sediments that minimize the potential for spillage. Establish clean-up procedures. | Not significant |

**Table S-2. Summary of Environmental Consequences[1]**
(page 4 of 7)

| *Resource Area* | *Site Where Impact Would Occur* | *Significant Impact* | *Mitigation Measure* | *Significance After Mitigation* |
|---|---|---|---|---|
| IMPACTS ASSOCIATED WITH THE VISION 2000 UPLAND REUSE/DISPOSAL OPTION | | | | |
| **Hazardous Materials and Contaminated Wastes** | **Vision 2000 Upland** | **While drying at the rehandling facility, the small quantity of dredged sediments with leachable constituents could contaminate groundwater.** | During the period when this material is drying, an impermeable liner or membrane should seal the bottom and sides of the rehandling facility. | Not significant |
| IMPACTS ASSOCIATED WITH THE NEW BERTH 21 REUSE/DISPOSAL OPTION | | | | |
| **Surface Water** | **New Berth 21** | **Placement of dredged material would block existing stormwater outfalls along the wharf.** | Rebuild the stormwater system at the shoreline as appropriate to allow infilling without obstructing the stormwater system. | Not significant |
| | | **TSS concentrations could exceed TSS thresholds for a short period of time in the localized area of the disposal.** | Wetland non-cover material shall be carefully placed to meet TSS thresholds. The dike shall be sufficiently elevated above the bottom of the fill area to minimize TSS impacts. A silt curtain shall be used if TSS levels outside the dike exceed 1500 mg/L on a continuous basis. | Not significant |
| **Biological Resources** | **New Berth 21** | **Filling would eliminate 27 acres of deepwater and wharf piling habitat.** | Bay fill shall be removed elsewhere to restore an equivalent acreage of marine habitat. | Not significant |
| IMPACTS ASSOCIATED WITH THE MIDDLE HARBOR ENHANCEMENT AREA REUSE/DISPOSAL OPTION | | | | |
| **Surface Water** | **MHEA** | **TSS concentrations could exceed the TSS threshold for a short period of time in the localized area of the disposal.** | Wetland non-cover material shall be carefully placed to minimize TSS levels. The dike, sill and submerged berm shall be sufficiently elevated above the bottom of the fill area to minimize TSS impacts. A silt curtain shall be used if TSS levels outside the dike exceed 1500 mg/L on a continuous basis. | Not significant |

**Table S-2. Summary of Environmental Consequences[1]**
(page 5 of 7)

| *Resource Area* | *Site Where Impact Would Occur* | *Significant Impact* | *Mitigation Measure* | *Significance After Mitigation* |
|---|---|---|---|---|
| IMPACTS ASSOCIATED WITH THE MIDDLE HARBOR ENHANCEMENT AREA REUSE/DISPOSAL OPTION | | | | |
| Biological Resources | MHEA | Widening the Inner Harbor channel and dredged material placement at the MHEA would likely remove a portion or all of the eelgrass bed at the western margin of the U.P. Mole; any remaining portions of the eelgrass bed may be impacted by increased turbidity and sedimentation from the dredging. | Establishment and long-term monitoring of an eelgrass bed of equal or greater area and density as the impacted eelgrass bed. This eelgrass habitat would be established in the proposed MHEA. | Not significant |
| IMPACTS ASSOCIATED WITH THE FORMER NAS ALAMEDA REUSE/DISPOSAL OPTION | | | | |
| Biological Resources | NAS Alameda | Construction of the dewatering cell and stockpile area could eliminate burrowing owl nests, if present. | Avoid destruction of active nests; relocate nests. | Not significant |
| | | Potential nesting of least terns and snowy plovers on stockpiled sand. | Use any combination of the following:<br>• Undulating landscape<br>• Vegetation planting to reduce the area of bare ground<br>• Hazing techniques<br>• Human presence<br>• Aerial devices | Not significant |
| Noise | NAS Alameda | Disposal-related noise would temporarily increase noise levels at planned campus housing at former on-base bachelors housing (receptor location #6, Figure 4.8-2). | Comply with Alameda Noise Ordinance time restrictions for construction activities. | Not significant |

**Table S-2. Summary of Environmental Consequences[1]**
(page 6 of 7)

| *Resource Area* | *Site Where Impact Would Occur* | *Significant Impact* | *Mitigation Measure* | *Significance After Mitigation* |
|---|---|---|---|---|
| IMPACTS ASSOCIATED WITH THE VARIOUS LANDFILLS DISPOSAL OPTION | | | | |
| Ground Transportation | Altamont Landfill Haul Route | Degraded intersection LOS at:<br>• 3rd/Adeline<br>• Southfront/I-580 ramps | Operational changes:<br>• When necessary, change lane assignments/phasing; disallow hauling operations from 3 P.M. to 7 P.M.<br>• Disallow hauling operations from 3 P.M. to 7 P.M. | Not significant |
| | Redwood Landfill Haul Route | Degraded intersection LOS at the intersection of Sanitary Landfill Road and U.S. 101. | Limit hauling operations to the hours between 3 A.M. and 6 A.M. and between 10 A.M. and 3 P.M. | Not significant |
| | | Degraded freeway LOS at U.S. 101 south of Redwood Landfill | Limit hauling operations to the hours between 3 A.M. and 6 A.M. and between 10 A.M. and 3 P.M. | Not significant |
| | Vasco Road Landfill Haul Route | Degraded intersection LOS at:<br>• 3rd/Adeline<br>• Vasco Road/Northfront Road | Disallow hauling operations from 6 A.M. to 9 A.M. and from 3 P.M. to 7 P.M. | Not significant |
| | | Increased V/C (volume to capacity) ratio on freeway ramps already operating at LOS F:<br>• Eastbound off-ramp after I-580 diverge<br>• Westbound on-ramp before I-580 merge | Disallow hauling operations from 6 A.M. to 9 A.M. and from 3 P.M. to 7 P.M. | Not significant |

**Table S-2. Summary of Environmental Consequences[1]**
(page 7 of 7)

| *Resource Area* | *Site Where Impact Would Occur* | *Significant Impact* | *Mitigation Measure* | *Significance After Mitigation* |
|---|---|---|---|---|
| IMPACTS ASSOCIATED WITH THE OPERATIONS PHASE (AFTER CHANNEL DEEPENING) | | | | |
| Air Quality | Bay Area Air Basin | Increases in ROG, NOx, SOx, and PM10 emissions from the new vessel, truck, train, and terminal sources that would be allowed by the channel deepening would exceed BAAQMD significance thresholds of 80 pounds/day and 15 tons/year. | Refer to Table 5.1-11 in section 5.1.5 for a list of proposed air quality mitigation measures. | Significant |
| Ground Transportation | Port Area | In 2010, degraded intersection LOS:<br>• 7th Street/7th Street Extension<br>• 3rd/Adeline | Operational changes:<br>• When necessary, add southbound left turn lane<br>• When necessary, change lane assignments/phasing | Not significant |

*Notes:* 1. For the Hamilton and Montezuma reuse/disposal options, only the impacts of transporting the dredged material from Oakland Harbor to the site would be attributable to the proposed 50-foot project. The impacts of offloading the dredged material and activities related to wetland restoration at these sites would not be attributable to the proposed project.

2. All acronyms are identified in Chapter 20 of this document.

BCDC is expected to hold a hearing and vote on the proposed amendment in May 1998. The MHEA reuse option would be consistent with the proposed Bay Plan amendment.

Under the proposed design of the MHEA, both cover and non-cover quality dredged material would be used to create the proposed shallow water habitat in Middle Harbor. There is concern, particularly among some resource agencies (e.g., EPA, USFWS, BCDC, RWQCB), about the precedent setting potential of the proposal.

**Hamilton Wetlands Restoration Site**

It is uncertain whether the Hamilton Wetlands Restoration site will be available to accept dredged material by the time the 50-foot project begins construction (currently anticipated in February 2000). The Hamilton site consists of three parcels in Novato, California, including the former Hamilton Army Airfield, adjacent ball fields, and the former Antenna Field. Currently, the site is being prepared for transfer (to the state of California) and reuse per the Base Realignment and Closure (BRAC) of 1988. Remediation of contaminants at both the airfield and antenna field is necessary and will be completed prior to transfer of the properties. A Wetland Restoration Plan is currently being prepared for the site by the City of Novato. The California Coastal Conservancy and the BCDC are beginning preparation of an Environmental Impact Report on the proposed wetland restoration project, but that environmental review process is several months behind that of the proposed 50-foot project. Similar to the proposed deepening project, the BCDC and the Coastal Conservancy will seek Congressional authorization for the proposed Hamilton Wetlands Restoration project. It is uncertain whether this federal authorization will be obtained in time for the site to be ready to accept Oakland Harbor sediment by February 2000.

# 1.0 REASON FOR AND CONTEXT OF THE PROJECT

## 1.1 INTRODUCTION

This Environmental Impact Statement/Environmental Impact Report/Feasibility Study (EIS/R/FS) has been prepared in accordance with the requirements of the National Environmental Policy Act (NEPA) (42 USC 4341 *et seq.*) and the California Environmental Quality Act (CEQA) (PRC 21000 *et seq.*).[1] Guidance for implementing NEPA (and thus the EIS portion of this document) is provided through the U.S. Army Corps of Engineers (Corps) Engineering Regulation (ER) 200-2-2, which supplements the Council on Environmental Quality (CEQ) regulations (40 CFR 1500-1508). The EIR portion of the document follows CEQA Guidelines (California Code of Regulations [CCR] Title 14, sections 15000-15387). The Feasibility Study is a document normally prepared by the Corps to identify a national (federal) interest in a proposed navigation improvement project prior to seeking Congressional authorization for the project. Under the provisions of Section 203 of the Water Resources Development Act of 1986 (WRDA 86), the Port of Oakland (Port) is preparing the environmental documentation and feasibility analysis to seek authorization for this project as a federal cost-shared project through WRDA 98 (scheduled for October 1998). The three studies (EIS, EIR, and Feasibility Study) have been combined into a single document for efficiency, since so much of the analysis found in a Feasibility Study parallels that found in NEPA and CEQA documentation, and to avoid inconsistency between the studies. This document assesses short-term, long-term, and cumulative impacts of deepening the channel and transporting the dredged material to reuse/disposal sites.

The Corps is the federal lead agency for the project, and the Port is the state lead agency. This EIS/R/FS is an informational document that will inform and assist public decisionmakers and the general public regarding significant effects of the project and describe feasible alternatives. Public input is also solicited as part of the environmental process. This EIS/R/FS is intended to support the permitting processes of agencies from whom discretionary approvals must be obtained for particular elements of the project. Responsible agencies and associated permits and approvals are described in section 1.8.

## 1.2 PROJECT LOCATION

Oakland Harbor is located on the east side of San Francisco Bay in the City of Oakland, Alameda County, California (Figure 1.1-1). Along the Port of Oakland's 19 miles of waterfront are 535 acres of marine terminal facilities, which handle a broad spectrum of import and export cargo. The Port of Oakland consists of an Outer Harbor, a Middle Harbor, and an Inner Harbor; the entrance channel to all three areas is known as the Bar Channel. The main navigation channels (federal channels) maintained by the Corps provide access to berthing areas that serve container, break-bulk cargo, and roll-on/roll-off vessels.

## 1.3 PLANNING CONTEXT OF THE PROPOSED PROJECT

The Port of Oakland has been operating at its current location since 1927. Since that time, the Port has operated maritime shipping activities as well as construction and maintenance activities that

1. A glossary of terms is provided in Chapter 19, and a list of acronyms is provided in Chapter 20.

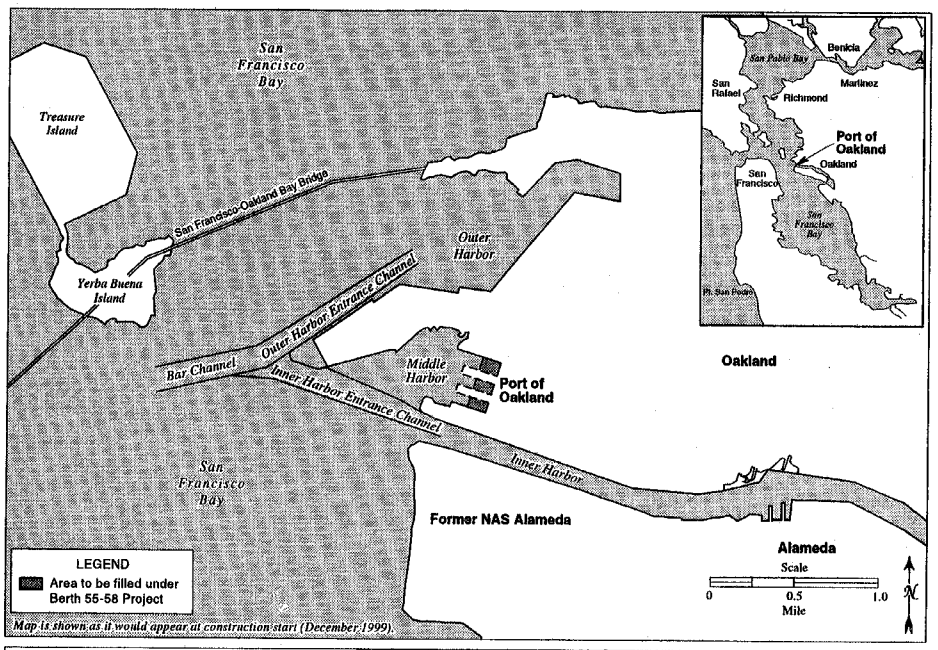



**Figure 1.1-1**

**OAKLAND HARBOR AREA**

improve its competitive standing within the maritime industry. In addition, under specific legal arrangements, portions of the Port site historically have been used by others for non-commercial maritime purposes. The most notable of these arrangements has been the Fleet and Industrial Supply Center, Oakland (FISCO), which includes a portion of the Middle Harbor Enhancement Area. FISCO was deeded to the U.S. Navy by the City of Oakland in 1940, with a reversionary clause to return title of the land to the Port once the Navy no longer had use of the site.

In recent decades, the Port of Oakland has undertaken a number of efforts to improve its ability to serve maritime customers and remain a leader in the West Coast shipping industry, including the proposed 50-foot project. This section describes the background of relevant issues regarding development of the proposed project, as well as planning efforts undertaken for this project.

In the 1970s, the Corps and Port identified the need to deepen (dredge) the channels that provide access to the Port from 38 feet mean lower low water (MLLW) to 42 feet MLLW. Several separate and joint environmental documents were prepared during the 1970s and 1980s regarding dredging projects for the Port (COE 1979, 1984, 1988; Port of Oakland 1988, 1989). In 1986, the Corps and Port were authorized by Congress to implement the dredging-related improvements known as the 42-foot project. In 1988, due to legal and regulatory difficulties regarding deep ocean disposal of dredged materials, dredging of the channels to 42 feet MLLW (the -42-foot project) was suspended. In 1994, the Corps and Port prepared a Supplemental EIS/EIR and approved and certified that document. They subsequently obtained all required permits and approvals and commenced dredging in 1996; the project is scheduled for completion in 1998.

During the 1980s, legal and regulatory negotiations regarding the 42-foot project continued. Meanwhile, the size of container ships used throughout the industry increased, with most large vessels operating at a minimum 46-foot draft (Maersk operates some vessels with a 47-foot draft). This trend toward larger vessels is expected to continue. All major U.S. west coast container ports, except the Port of Oakland, currently offer their maritime customers, or are dredging to, the industry-standard channel depth of 50 feet MLLW that, under normal operating conditions, will accommodate the largest cargo vessels. Even upon completion of the 42-foot project in 1998, the Port will still be unable to accommodate these vessels on an unrestricted schedule.

The Port's inability to achieve sufficient operating efficiencies for its maritime customers has resulted in a decrease in bigger, more efficient, less polluting ship "calls" (trips), as well as a documented loss of Port business. Port-maintained audits of sailing schedules indicate that it is more cost effective for larger ships wishing to enter the Port to sail "light" (not completely loaded) rather than wait for favorable tides. In this manner, they ride higher and can enter the Port's relatively shallow channels at their most convenient schedule. Because these ships are not operating at full capacity, more trips are required to move the same amount of cargo, and ship calls increase in inverse proportion to the amount of cargo shipped. While the Port has not developed empirical data, it is logical to assume these more numerous, less efficient trips do and will continue to result in relatively greater environmental impacts (primarily those related to air quality) per unit of cargo shipped. Two combined factors could worsen these local inefficiencies and environmental impacts in the short term:

- The maritime industry's trend toward even larger ships, phasing out smaller vessels; and
- The Port of Oakland's 42-foot MLLW channel depth, which limits unrestricted access of larger, industry-standard vessels.

When these combined factors make shipping to the Port infeasible, shippers will either relocate to other west coast facilities or attempt to construct new facilities in the Bay Area.

Moreover, shipping inefficiencies at the Port have resulted in documented business losses. This was demonstrated by the withdrawal of American President Line (APL) from the Port. APL began shipping operations at the Port of Oakland in 1972 and was consistently one of the top three Port customers, as measured by revenue-tons. In 1996, in part due to the operational inefficiencies resulting from shallow channel depth, APL withdrew from the Port of Oakland and now operates only at the ports of Los Angeles and Seattle. APL's relocation resulted in the loss of a number of full-time local jobs. Added to this direct loss of business and jobs is the non-quantified opportunity cost of losing unknown customers to other ports who can serve their needs more effectively.

Out of concern for the Port's inability to optimally serve its customers' needs, the resultant loss of jobs, and potential increase in shipping-related environmental impacts without equal or greater counter-balancing economic benefits, in the early 1990s the Corps and Port began planning further deepening of the access channels to increase efficiencies of shipping operations. The Corps and Port have identified the industry standard of 50 feet MLLW as the channel depth necessary to maintain acceptable operating conditions. The proposed effort, which is evaluated in this document, is called the 50-foot project. This EIS/R/FS, as well as other permitting and regulatory actions, will provide the framework for determining and mitigating environmental effects and for establishing parameters for construction, operation, and maintenance of the 50-foot project.

During the early 1990s, the Port and U.S. Navy developed state and federal environmental review documents evaluating the effects of the Navy's leasing portions of the FISCO site to the Port prior to the Navy permanently reverting title. In 1997, the Navy and Port approved and certified a joint EIS/EIR (U.S. Navy and Port of Oakland 1997b) analyzing the following:

- The Navy's disposal of FISCO, returning ownership and control of this site to the Port; and
- The Port's reuse of this site and nearby areas to implement the Port's Vision 2000 Maritime Development Program (referred to as Vision 2000).

The EIR portion of the Vision 2000 environmental document analyzed impacts at a programmatic level and identified program-level mitigation. Additional project-specific environmental documentation is necessary to identify and analyze the specific impacts of each Vision 2000 component project, as well as mitigation measures necessary to avoid or reduce impacts to a level that is less than significant. These project-specific environmental documents will "tier" from the program EIS/EIR. The Middle Harbor Enhancement Area element of the 50-foot project (but not the entire project) is a component of Vision 2000 and is identified and analyzed in the 1997 program EIS/EIR.

## 1.4 PROJECT OBJECTIVES

The Corps' overall planning objective for the authorized project is to provide deep-draft navigation improvements for the federal channels in Oakland Harbor that would contribute to National Economic Development (NED). The Corps' planning process requires that the objective be consistent with protecting the environment, pursuant to environmental statutes, relevant executive orders, and other federal planning requirements. The specific planning objectives for the Oakland Harbor deepening are to reduce tidal delays associated with container ship passages,

to increase economies of scale for waterborne commerce, and to increase navigation safety. The authorized project deepening would not only improve the efficiency of vessel movement in the harbors, but would also improve navigational safety by reducing the potential for vessel collisions and groundings, and would lessen the need for tidal dependence by deepening and widening the channel (COE 1988).

The Port's objective is consistent with the Corps' objective. The Port is undertaking the modernization of its seaport facilities in order to maintain the viability of container shipping to and from the San Francisco Bay Area. The objective of the navigation improvements project is to provide unconstrained access for the largest, most modern container vessels currently in service and the even larger "super post-Panamax" vessels being delivered now or expected in the next 10 years. As a project co-sponsor, the Port of Oakland has sole responsibility for deepening the berth areas to 50 feet MLLW in order to provide access to the Port in an efficient, cost-effective, and environmentally sensitive manner.

## 1.5 PURPOSE OF AND NEED FOR THE PROJECT

The existing federal channels that provide access to the Port of Oakland are currently being dredged to 42 feet MLLW, with completion expected in April 1998. All other major West Coast container ports currently offer, or are dredging to, the industry minimum standard of 50 feet MLLW.

In 1996, over 15 percent of the vessels calling at the Port had design drafts of 44 feet or greater and required a minimum channel depth of 48 feet to avoid tidal delays. By the end of 1999, that percentage will increase to 45 percent and, by 2010, more than 75 percent of all vessels expected to use the Port will be super post-Panamax vessels that will require a minimum of 50 feet MLLW in order to access the Port through the federal channels while fully laden without tidal delays (Port of Oakland 1997m).

The Port's ocean carrier customers are currently faced with one of two choices when using the Port of Oakland facilities: (1) use smaller, less competitive vessels that are more expensive to operate, or (2) wait for favorable high tides if they operate new, larger vessels. The second alternative causes serious disruption in all phases of cargo operations and increases cargo handling costs.

The international container shipping industry is extremely competitive, and individual ocean carriers are under intense pressure to cut costs. Rationalization, consortia (inter-shipper alliances), mega-terminals, and deregulation are among the new realities of the industry; many of the Port's ocean carrier customers have formed alliances to share assets and thereby reduce their costs. The delay of a single ship because of the decision to use larger vessels and wait for favorable high tides impacts all partners in such an alliance.

If the Port does not deepen its channels, the long-term repercussions would be severe. At best, the Port of Oakland would become a second-tier port, used only by smaller, older vessels. Ultimately, these calls will decline as the ocean carriers phase these older vessels out of service. Two major ocean carriers have already stopped deploying their large, post-Panamax vessels to Oakland, a clear signal of the worsening competitive position. At worst, international ocean carriers would bypass the Port of Oakland entirely, using only trade gateway ports in the Seattle/Tacoma and Los Angeles/Long Beach regions. Cargo destined to or from the San Francisco Bay Area would be shipped by truck or rail via these trade gateways, causing roadway and rail traffic congestion and other environmental problems (e.g., job loss and increased air pollution from vehicle emissions).

Thirty-three ocean carriers currently use Port facilities and contribute approximately $1.3 billion in business revenue to the regional economy. In 1995, the Port of Oakland maritime industry was responsible for 8,800 direct maritime jobs, 2,000 indirect jobs with business suppliers, and 5,300 induced jobs due to the ripple effect of employee spending on goods and services (Martin Associates 1995; Martin O'Connel Associates 1992). Without channel deepening, both increased jobs and business revenue would be lost; however, if the deepening occurs, there is a potential for increasing benefits to the Oakland region.

## 1.6 RELATED PROJECTS

The 50-foot project is one of several ongoing and planned marine and landside activities and improvements the Port and/or Corps are undertaking or plan to undertake in the near- to mid-future at the Port of Oakland. In addition to day-to-day maritime and maintenance activities, several other ongoing or planned actions are related to the proposed 50-foot project. While related, these projects are independent; that is, the successful construction or operation of one is not dependent upon another. They are related to one another through physical proximity, the timing of their construction and operation, or because their combined implementation would achieve maximum maritime operational efficiencies. (Figure 9.1-2 in Chapter 9 reflects the relative timing of the proposed 50-foot project and other related Port projects.) This synergistic or "compounding" effect would result in greater cargo throughput than can be achieved by implementation of a single project alone.

**Oakland Harbor 42-Foot Project**

The proposed deepening would cover essentially the same footprint as the area that is currently being dredged as part of the Port's 42-foot deepening project. Dredging for the 42-foot project began in December 1994 and is expected to be completed in Spring 1998. The 42-foot project involves deepening the channels from either 35 feet MLLW or 38 feet MLLW to 42 feet MLLW. Approximately 7 million cubic yards (mcy) of sediment will be dredged under the 42-foot project, with reuse/disposal at Sonoma Baylands (wetland restoration) in southern Sonoma County, Galbraith Golf Course (fill for a reconstructed golf course) in the City of Oakland, and the San Francisco Deep Ocean Disposal Site (SF-DODS) approximately 50 miles west of the Golden Gate.

**Joint Intermodal Terminal (JIT) Project**

Under this tiered Vision 2000 program component project, the Port would construct, operate, and maintain a JIT (a railyard to be operated jointly by two railroads: Union Pacific and Burlington Northern-Santa Fe) on portions of the FISCO site. The Port cannot currently provide efficient rail service, and terminal capacity is expected to reach its limit in the year 2003. The purpose of this project is to improve current rail service at the Port, allow increased cargo shipments by rail mode relative to truck mode, and to accommodate anticipated future growth in intermodal container cargo (cargo that moves from one mode of transportation to another mode, in this case from ship to rail). The Port is currently preparing environmental documentation for this proposed project, and construction is anticipated to begin in 1998. The proposed JIT project would consist of the following activities and facilities:

- Demolition of approximately 60 existing structures;
- Construction of a terminal comprising eight rail lines, an entrance gate, roadway access, vehicle parking areas, cargo storage areas, infrastructure, and support facilities; and

- Operation and maintenance activities.

While implementation of only the JIT in isolation would increase the cargo handling efficiency of the Port, in combination with implementation of the 50-foot project these efficiencies are compounded (Jordan Woodman Dobson [JWD] 1997)[2]. Cargo-handling efficiencies would be further compounded and benefits maximized with implementation of other related projects (see below).

**Berth 55-58 Project**

Under this tiered Vision 2000 program, the Port would construct and lease new berths, wharves, and terminals on portions of the FISCO site, as well as create public access and recreational facilities in the Middle Harbor area. The Port currently does not have sufficient berth capacity and, as stated above, terminal capacity will meet its limit in the year 2003. Without creation of additional capacity at the Port of Oakland, cargo will enter the Bay Area either from ships using other new Bay Area port facilities (which must be developed) or via train or long-haul truck from existing Port facilities outside the region in southern California or the Pacific Northwest. The purpose of the Berth 55-58 project is to increase public access to the area, allow the Port to handle cargo efficiently, and improve the Port's ability to meet maritime customer's needs. The Port is currently preparing environmental documentation for this project, and construction is anticipated to begin in 1998. The proposed Berth 55-58 project would comprise the following activities and facilities:

- Demolition of two existing Navy piers in the Middle Harbor area;
- Removal of rail lines in the upland area;
- Excavation and reuse of approximately 4.3 to 4.7 mcy of upland and subtidal material from the north bank of the Inner Harbor Channel;
- Using the excavated and dredged material for construction of a dike across the area where the Navy piers were removed (perpendicular to where the piers were);
- Disposal of materials from this project on the upland side of the dike to create fastland;
- Construction of a tugboat wharf (550 linear feet) and four cargo wharves along the excavated north bank of the Inner Harbor Channel;
- Creation of terminal yards upland from the wharves, raising the grade of this area by using material excavated from the Berth 55-58 project and dredged material from the 50-foot project;

---

2. In October 1997, the Port commissioned a study evaluating potential growth of container cargo movement through the year 2010 under numerous scenarios which included three principal projects: the 50-foot project, JIT, and Berths 55-58. In general, these scenarios evaluated implementation of the following: none of the three planned projects; all three planned projects; any one of the projects; and various combinations of the projects. The findings of this analysis indicated that little or no growth could be expected without improvements, incremental improvement would be expected with implementation of any one of the planned actions, and that implementation of a combination of two or more compounded the benefits to cargo handling efficiencies. The greatest benefit to cargo handling efficiencies would result from implementation of the proposed deepening, berths, and rail projects (JWD 1997). This study established the independent utility of the three proposed projects, while also quantifying the project-specific and compounded efficiencies and benefits of implementing all three projects.

- Creation of a new 31+ acre public access area (park) surrounding the Middle Harbor area on three sides;
- Realignment of Middle Harbor Road, and creation of non-motorized public access facilities (to the new park) along this roadway; and
- Operation and maintenance of these facilities.

While implementing only the Berth 55-58 project would increase the cargo handling efficiency, cargo storage capacity, and throughput capacity of the Port, combining this project with the 50-foot and JIT projects would compound these efficiencies (JWD 1997).

**Navy Installation Restoration Program and Remedial Investigation/Feasibility Study for FISCO**

The Navy is implementing a program to restore contaminated sites on FISCO through the Installation Restoration Program (IRP). The Remedial Investigation/Feasibility Study (RI/FS) and Record of Decision (ROD) is expected to be completed in December 1998. This will allow the Port to develop many portions of FISCO without restriction, as planned through the Vision 2000 program. Remedial actions on specific contaminated sites may proceed or be expedited through Port construction activities. Currently, remediation is expected to continue through 2006.

**New Berth 21**

In the future, the Port may propose modernization of Berth 8, 9, 10, 20, and 21 and creation of new land to support a larger terminal complex that could accommodate super post-Panamax vessels. The creation of land for use in terminal expansion would be through conveyance of a portion of the former Oakland Army Base submerged land, now a part of the Base Realignment and Closure (BRAC) process.

**Long-Term Management Strategy (LTMS)**

The dredging component of the proposed project is related to the existing Long-Term Management Strategy (LTMS) program, which is designed to provide a regional plan for the disposal of dredged material from the San Francisco Bay over the next 50 years. The LTMS program began in January 1990 as a federal/state partnership between the five agencies that have regulatory authority for dredged material in the San Francisco Bay area: the Corps; the U.S. Environmental Protection Agency (EPA), Region IX; the San Francisco Bay Regional Water Quality Control Board; the State Water Resources Control Board; and the San Francisco Bay Conservation and Development Commission. These five lead agencies share responsibility for managing the various components of the LTMS. A Draft EIS/EIR addressing policy alternatives for future placement of dredged material under the LTMS program was released in April 1996 (LTMS 1996). These policy alternatives involve different volumes of dredged sediment being disposed at in-Bay, ocean, and upland/wetland reuse sites. It is anticipated that any dredged material disposal required for the Oakland Harbor 50-foot project would occur within the framework of the LTMS program as it becomes more defined.

## 1.7 REGULATORY AGENCY FRAMEWORK AND COMPLIANCE

The regulatory framework that would govern the proposed dredging and reuse/disposal of the dredged material includes an international treaty; several executive orders; numerous federal,

state, and local regulations; and other governmental plans and policies. These requirements are summarized in Appendix G. Local regulatory plans and policies are addressed in Chapter 6.

## 1.8 PERMITS/APPROVALS REQUIRED FOR THE PROJECT

The following section describes the permits and/or approvals that would be required to implement the project, including the reuse/disposal sites that are evaluated in detail.

**Federal Agencies**

- The Corps would:
  - Issue the Record of Decision under NEPA.
  - Issue a Section 10 permit for dredging the berths and 404 permit for aquatic disposal of berth material.
  - Submit a proposed Conformity Determination to EPA for the Clean Air Act.
  - Submit a proposed Consistency Determination to the San Francisco Bay Conservation and Development Commission (BCDC) under the Coastal Zone Management Act.
  - Issue a Section 103 permit for ocean disposal of berth dredged material if SF-DODS is part of the selected plan.
- The EPA would:
  - Concur with ocean disposal if SF-DODS were part of the selected alternative.
  - Concur with the Clean Air Act Conformity Determination.
- The U.S. Fish and Wildlife Service (USFWS) would:
  - Issue a "No Jeopardy" opinion under the Endangered Species Act (ESA).
  - Prepare a Coordination Act Report for the Corps to use in evaluating the project.

**State Agencies**

- BCDC:
  - Concur with the Consistency Determination for dredging and dredged material disposal/reuse within the Bay and within 100 feet of the Bay shoreline.
  - Amend the Bay Plan to define the conditions under which fill may be placed in the Bay to create or enhance wildlife refuge under the McAteer-Petris Act, as proposed for the Middle Harbor Enhancement Area.
  - Would be required to issue a permit to the Port for berth deepening.
- California Coastal Commission:
  - If SF-DODS is part of the selected alternative, either a consistency determination from the Corps or a consistency certification from the Port would be required.
- San Francisco Regional Water Quality Control Board (SF-RWQCB):

- Issue a National Pollutant Discharge Elimination System (NPDES) permit and/or Waste Discharge Order for disposal if there is an effluent discharge (e.g., from the proposed rehandling facility).
- Construction of shoreside components of the proposed project may also require a General Construction Activity Stormwater Permit as required by the National Pollutant Discharge Elimination System (NPDES).

- State Historic Preservation Office (SHPO):
  - Review the project to determine if it would result in significant adverse impacts to cultural resources per Section 106 of the National Historic Preservation Act (NHPA). The Corps would consult with the SHPO to determine whether the project would affect cultural resources on, or eligible for listing on, the National Register of Historic Places.

- State Lands Commission (SLC):
  - Issue a Dredging Lease to the Port for berth deepening in specific locations where the SLC retains mineral rights.

**Regional Agencies**

- Bay Area Air Quality Management District (BAAQMD):
  - Issue a permit for the dredge if the dredge is tied up to a dock or pier or if the dredge offloads dredged materials directly onto land.
  - A permit may also be required for operating pumps if dredged material is pumped in a slurry pipeline.

**Local Agencies**

- Port of Oakland:
  - Certify the EIR, issue Findings of Overriding Considerations, if any, approve the Mitigation Monitoring and Reporting Program, and approve the project in its entirety.
  - Determine that the channel deepening is consistent with the City of Oakland General Plan.
  - Obtain miscellaneous construction easements.
  - Prepare permit application for berth deepening.
  - Obtain, if applicable, any demolition permits required for Inner Harbor Turning Basin construction.
  - Obtain permits for disposing dredged material at landfills, if applicable.

- City of Alameda:
  - May require a permit for pile driving at the Inner Harbor turning basin for compliance with the City of Alameda Noise Ordinance.

# 2.0 PROPOSED ACTION AND ALTERNATIVES

The proposed project would involve the dredging and disposal of 12.8 to 14.5 million cubic yards (mcy) of channel bottom sediments, including overdepth, depending on which dredging option is selected. ("Overdepth" refers to the fact that, in dredging to attain a minimum depth, in this case 50 feet, some additional sediment will be picked up due to inaccuracies in the dredging operation.) For this project, a volume equivalent to 2 feet of overdepth is assumed. The dredging and sediment reuse/disposal construction period is anticipated to last up to 4 years, beginning sometime around February 2000 and ending by approximately February 2004.

Under the provisions of Section 203 of the Water Resources Development Act of 1986 (WRDA 86), the Port of Oakland is preparing this EIS/EIR/FS on the proposed project. The Port will submit this document and related necessary studies through the U.S. Army Corps of Engineers to the Secretary of the Army with the intent of obtaining authorization for the project in WRDA 98.

## 2.1 PROPOSED NAVIGATION IMPROVEMENTS

The maximum extent of the proposed improvements is shown in Figure 2.1-1 and includes the elements listed below, although all of the listed improvements would not be done under each dredging option (see section 2.1.1). All areas that would be deepened are assumed to be dredged to an effective depth of 50 feet (plus a maximum of 2 feet of overdepth).

- Channel deepening and widening:
  - The Oakland Entrance Channel and Approach;
  - The Outer Harbor Channel; and
  - The Inner Harbor Channel from the Entrance Channel to just past the Howard terminal.
- Berth deepening at berths 22-26, 30, 32, 33, 35, 36, 37, 55-58, 60-63, 67, and 68 (Figure 2.1-2).
- Turning basin improvements:
  - Deepening and slightly widening the Outer Harbor turning basin to a 1,600-foot diameter; and
  - Deepening and enlarging the Inner Harbor turning basin to a 1,500-foot diameter (the basis for the location of this turning basin is explained in section 2.1.1 since it affects property owners besides the Port).
- Infrastructure modifications:
  - Modifying the Bay Area Rapid Transit (BART) anode structure and cable (the project would not affect the BART tube itself); and

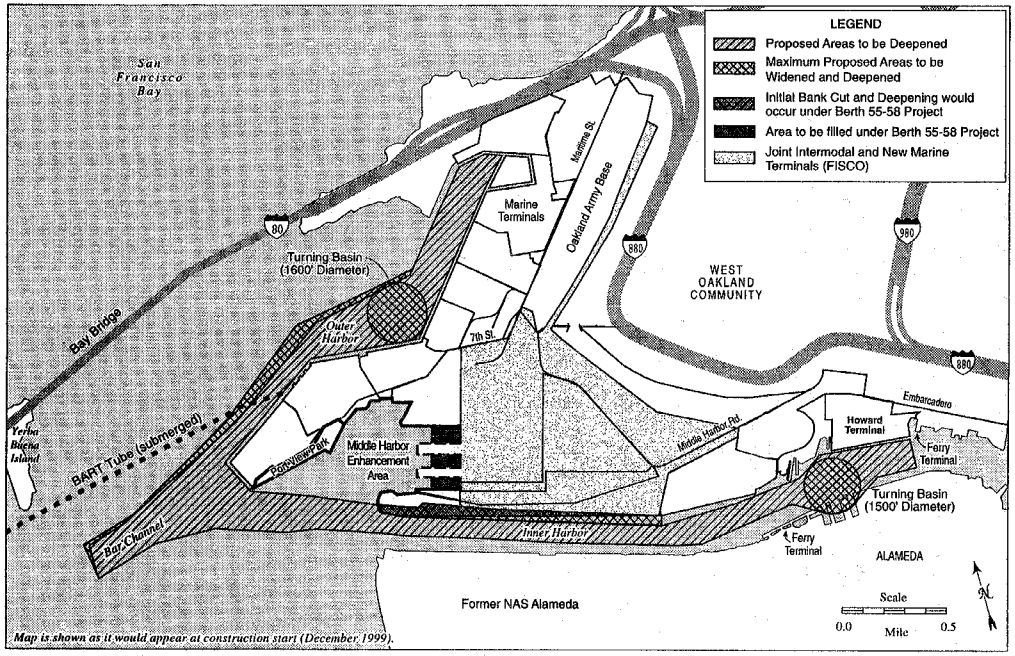



**Figure 2.1-1**

**PROPOSED DREDGE AREA IN OAKLAND HARBOR**

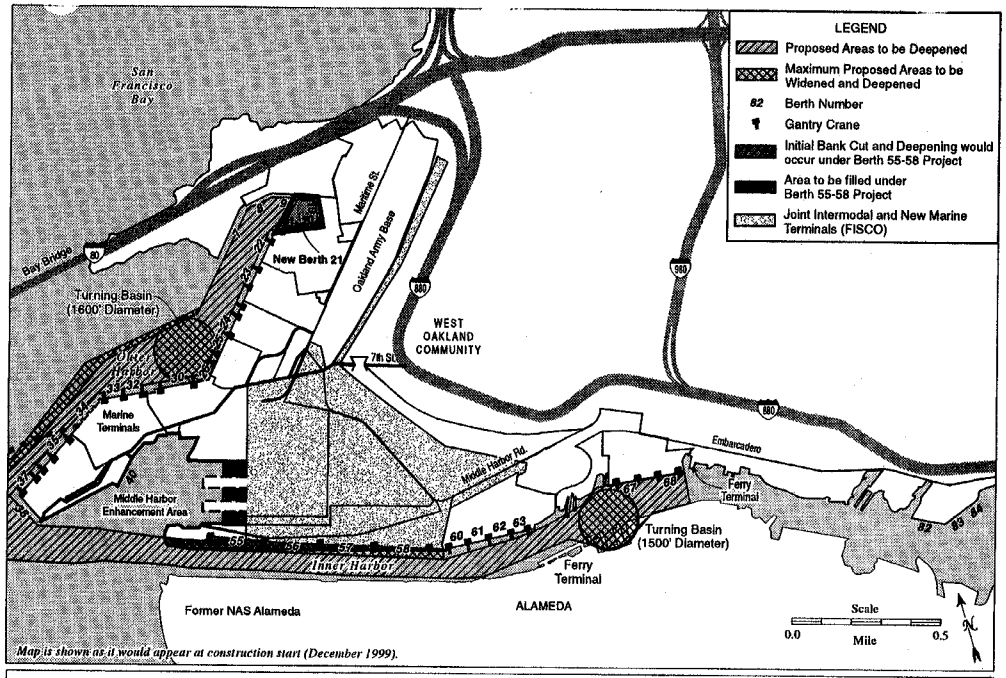



**Figure 2.1-2**

**BERTH AREAS IN OAKLAND HARBOR**

- Lowering or relocating all existing submarine utilities within the project area as necessary, including the Navy's Alameda sewer pipeline crossing the Inner Harbor Channel.

### 2.1.1 The Proposed Dredging Options and Inner Harbor Turning Basin Locations

The Port considered several dredging options and eight locations for the Inner Harbor turning basin, as described in this section.

*Dredging Options*

Only one of the dredging options would be implemented. Each dredging option would be combined with four or more of the disposal options (described in section 2.2.3) into project alternatives (described in section 2.3 and Chapter 8).

*Dredging Options Initially Considered*

Five possible dredging options (plus the no-project option) were initially considered, as summarized in Table 2.1-1. The Port also considered dredging to a depth somewhere in between the existing 42-foot depth and the proposed 50-foot depth.

*Dredging Options Eliminated from Further Study*

Three of the five initial dredging options were eliminated from further study because they would have improved only the Inner Harbor (Option C) or only the Outer Harbor (Options D and E). The decision to eliminate these dredging options from further study was based on the Port's decision that indicated that any dredging option that only improved access to the Outer Harbor or only improved access to the Inner Harbor would not meet the Port's objectives.

In considering dredging to a depth less than the proposed 50 feet, the Port eliminated depths less than 50 feet for the following reason. The largest vessels currently calling at Oakland Harbor draft 46 feet when fully loaded. These vessels typically experience a phenomena referred to as "squat," whereby the vessel rides lower in the water when moving than when stopped. At an operating speed of 7 knots (the minimum required speed for entering the Inner Harbor Channel), squat can exceed 2 feet. With an underkeel clearance of 2 feet, the optimal channel depth for these vessels would be at least 50 feet (46 feet draft +2 feet underkeel clearance +2 feet "squat" = 50 feet).

*Dredging Options Considered for Further Study*

With the elimination of dredging options C, D, and E, dredging options B and F and the no-project alternative (Option A) are analyzed in detail in this EIS/R/FS. The same areas would be deepened under dredging options B and F; the difference between the two options is the areas that would be widened (in addition to deepened). Under dredging option B, a wider area along the outer boundary of the Outer Harbor would be widened than under dredging option F; the other areas that would be widened would be the same for the two dredging options. The difference in the area of the Outer Harbor that would be widened under dredging options B and F is shown in Figure 2.1-3. Both dredging option B and F are evaluated at the 50-foot depth as explained above. The impacts of dredging options B and F are described, by resource area, in Chapter 5.

**Table 2.1-1. Dredging Alternatives Initially Considered**

| *Dredging Alternative* | *Total Estimated Dredge Volume* | *Working Name* | *Effect on Inner Harbor* | *Effect on Outer Harbor* | *Assumed Effects on Marine Terminals/Berths* |
|---|---|---|---|---|---|
| A | 0 mcy | No-Project | • Existing 42-foot depth and footprint | • Existing 42-foot depth and footprint | Assumes no improvements |
| B | 14.5 mcy | Unrestricted Access for "K" Class Shipping Requirements | • 50-foot depth<br>• 750-foot wide channel<br>• 1,500-foot diameter turning basin | • 50-foot depth<br>• 1,000-foot wide channel<br>• 1,600-foot diameter turning basin | • 4 existing berths constructed at entrance of Inner Harbor from Vision 2000 project<br>• 1 replacement marine terminal (Berth 21) |
| C | 8.1 mcy | Inner Harbor Access for "K" Class Shipping Requirements | • 50-foot depth<br>• 750-foot wide channel<br>• 1,500-foot diameter turning basin | • Existing 42-foot depth and footprint | • 4 existing berths constructed at entrance of Inner Harbor from Vision 2000 project |
| D | 7.7 mcy | Outer Harbor Access for "K" Class Shipping Requirements | • Existing 42-foot depth and footprint | • 50-foot depth<br>• 1000-foot wide channel<br>• 1,600-foot diameter turning basin | • 1 replacement marine terminal (Berth 21) |
| E | 5.3 mcy | Outer Harbor Access for "K" Class Shipping Requirements | • Existing 42-foot depth and footprint | • 50-foot depth<br>• 750-foot wide channel<br>• 1,600-foot diameter turning basin | • 1 replacement marine terminal (Berth 21) |
| F | 12.8 mcy | Outer Harbor & Inner Harbor Access for "K" Class Shipping Requirements | • 50-foot depth<br>• 750-foot wide channel<br>• 1,500-foot diameter turning basin | • 50-foot depth<br>• 750-foot wide channel<br>• 1,600-foot diameter turning basin | • 4 existing berths constructed at entrance of Inner Harbor from Vision 2000 project<br>• 1 replacement marine terminal (Berth 21) |

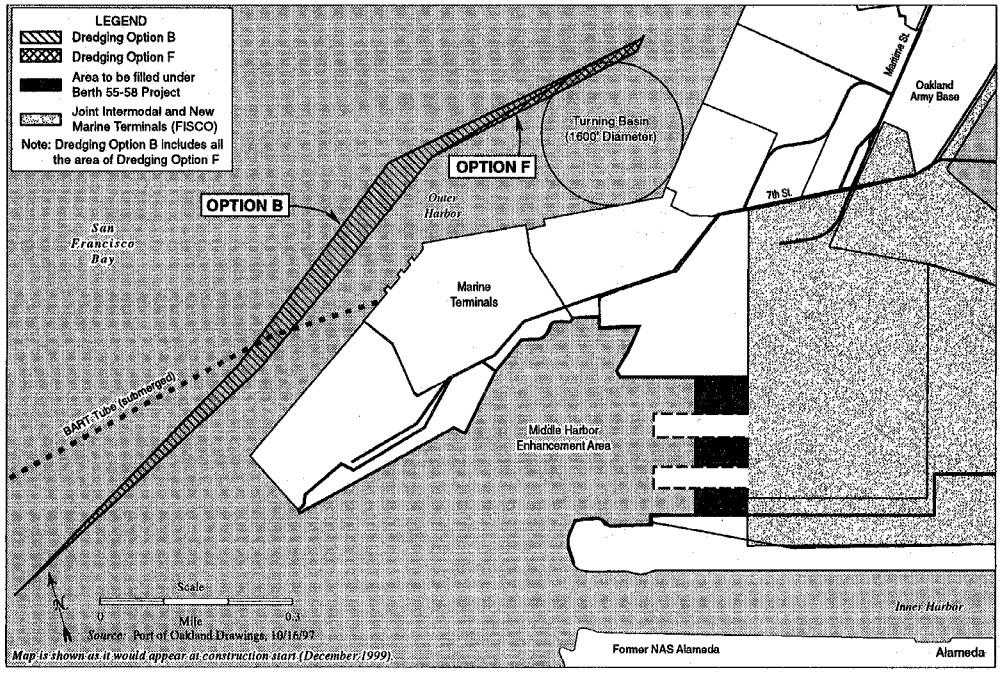



**Figure 2.1-3**

**DIFFERENCE BETWEEN DREDGING OPTION B AND DREDGING OPTION F**

*Size and Locations Considered for the Inner Harbor Turning Basin*

*Size Considerations*

An extensive analysis and engineering design effort resulted in the current 1,200-foot diameter Inner Harbor turning basin being located where it is today. The design vessel used as the basis for that design had an overall length of 960 feet. Although the criteria for the design of turning basins would indicate the need for a basin roughly 50 percent larger than the vessel's overall length (1,440 feet for the 960-foot vessel), the desire to reduce the impact of the turning basin on adjacent property owners led to the smaller turning basin. This design was based on extensive work with the Bar Pilots, including ship simulation modeling. It was concluded that, with sufficient navigational aids, 1,200 feet was adequate given the sheltered conditions at this location.

However, the 1,139-foot design vessel now under consideration is 179 feet longer than the previous design vessel. The 1,200-foot turning basin will not be adequate for this larger design vessel. Using the standard criteria, the 1,139-foot design vessel would call for a 1,709-foot turning basin. Given the turning basin's sheltered location, however, the project sponsors have determined, based on discussions with the San Francisco Bar Pilots and a senior captain of a 1,139-foot vessel, as well as on the project sponsors' experience in designing the 1,200-foot turning basin, that with adequate tug assistance and navigational aids, a 1,500-foot turning basing will be adequate for the 1,139-foot vessels.

*Location Considerations*

Eight alternative turning basin locations (Figure 2.1-4) were evaluated against the five criteria listed below (Table 2.1-2) and a comparison of environmental impacts. Appendix M.1 contains the complete evaluation.

- **Project Objectives**: Is the alignment consistent with the overall project objective of enhancing maritime operations at the Port?
- **Environmental Concerns and Land Use Policy Constraints**: What are the potential environmental impacts or benefits associated with each alignment? Is the alignment consistent with existing land use policies?
- **Cost**: Is the alignment cost effective?
- **Social and Economic Considerations**: What are the potential social impacts (such as job loss, tax base, business closure and relocation) associated with each alignment?
- **Plans, Land Use, and Deed Restrictions**: Are there any planning designations, policies, or zoning or deed restrictions that would hinder or prevent any alignment?

A single location — Alignment 2 in Figure 2.1-4 and Table 2.1-2 — has been selected for evaluation in this EIS/R. This proposed location has been situated to minimize the amount of upland excavation required. A summary of the rationale for selecting Alignment 2 is provided below. Full analysis of all the above criteria for each of the eight turning circle alignments is provided in Appendix M.1.

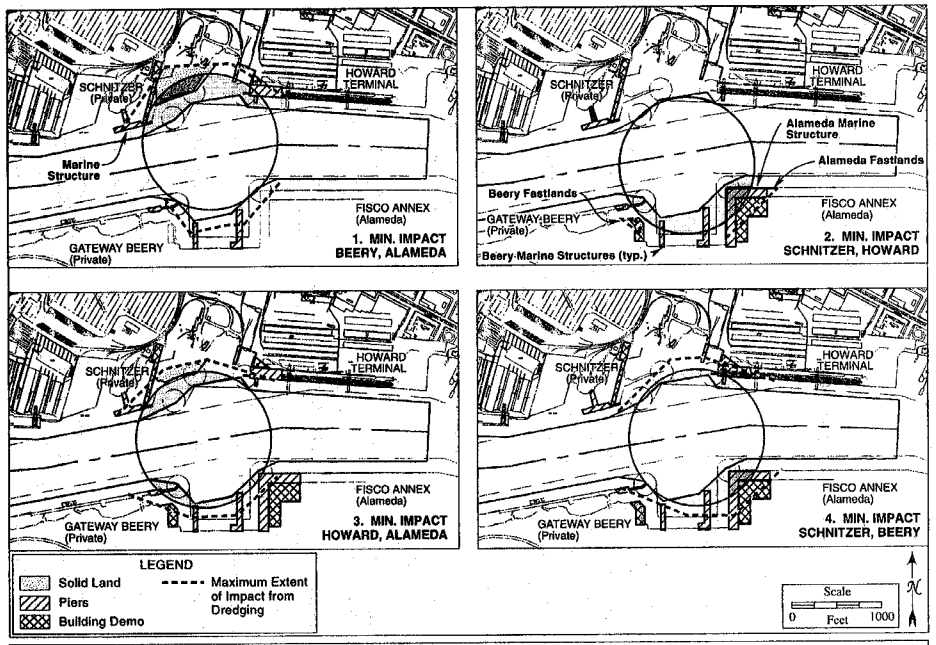



**Figure 2.1-4A**

**ALTERNATIVE LOCATIONS FOR THE INNER HARBOR TURNING BASIN (LOCATIONS 1 THROUGH 4)**

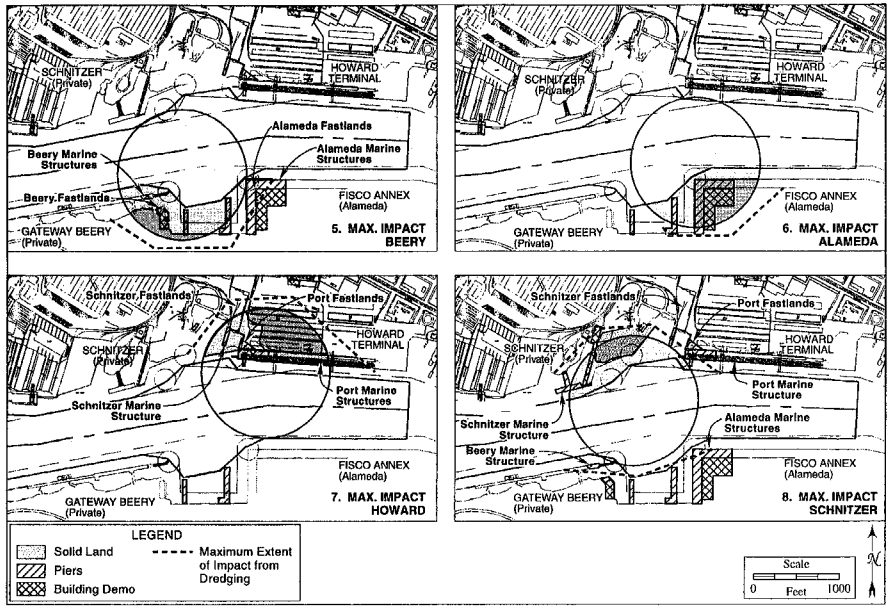



**Figure 2.1-4B**

**ALTERNATIVE LOCATIONS FOR THE INNER HARBOR TURNING BASIN (LOCATIONS 5 THROUGH 8)**

## Table 2.1-2. Comparison of the Eight Possible Alignments of the Inner Harbor Turning Basin

(page 1 of 5)

| *Alignment* | *Alignment Consistent with Project Objectives?* | *Environmental Concerns and Land Use Policy Constraints* | *Cost* | *Social and Economic Considerations* | *Plans, Land Use, and Deed Restrictions* | *Structures/ Fastland Impacted (in acres)* | *Total Volume to be Excavated (in mcy)* |
|---|---|---|---|---|---|---|---|
| 1 | No | • Large volume of contaminated soil/sediment requiring landfill disposal. Landfill disposal will require large numbers of trucks resulting in air quality and traffic impacts during construction.<br>• SF-RWQCB imposed lease restriction on Schnitzer limits excavation.<br>• Volume inconsistent with policy of minimizing dredged volumes.<br>• Environmental benefits not greater than other options.<br>• Inconsistent with Seaport Plan port priority use designation. | • High construction cost due to structures needed to retain shoal on North side of estuary.<br>• High cost for landfill disposal. Landfill disposal necessary due to concentration of contaminants on Howard and Schnitzer.<br>• Relatively high volume increases cost. | • Forced closure of Schnitzer Steel. Loss of 100 full-time positions and $100 million per year in revenue. Many indirect jobs lost. Major recycling facility closed.<br>• Large reduction of cargo handling at Howard. Loss of over 5% of Port cargo capacity. Loss of more than 700 direct and indirect jobs. | • Deed restriction imposed by SF-RWQCB on Schnitzer Steel to prevent excavation of that site.<br>• Removal of maritime facilities inconsistent with Oakland General Plan, Estuary Plan, and Seaport Plan. | 2.3/4 | 1.5 |
| 2 | Yes | • Reduced volume of contaminated soil/sediment requiring little or no landfill disposal, therefore reduced or no trucking related air quality and traffic impacts.<br>• Capacity to reuse materials within the Port area.<br>• Reduced excavation volume more consistent with policies to reduced dredging volume.<br>• Environmental benefits similar to other options.<br>• Reduced risk since reduced volume of lower level contamination. | • Moderate construction costs, similar to alignment 4. Less than alignments 1 and 3 due to less/no landfill disposal.<br>• Much lower cost than alignments 5 through 8 due to reduced volumes, fewer structures and less contamination. | • Forced relocation of Bay Ship and Yacht. Bay Ship employs approximately 300 full-time workers and generates $20 million in revenues annually. Since most of Bay Ship infrastructure is floating drydock, they are more easily relocated than Schnitzer Steel or Howard Terminal. Bay Ship may benefit from infrastructure improvements proposed.<br>• Alameda is planning for reuse of FISC Annex. Impact of shoreline excavation on future plans can be minimized. | • This alignment does not appear to conflict with any deed restrictions.<br>• It could conflict with future plans for reuse of FISC Annex. Since reuse plans have not been enacted, nor the environmental analysis of the plan completed, it may be possible to accommodate the excavation and benefit from the shoreline reconfiguration. | 2.4/2.3 | 1.1 |

**Table 2.1-2. Comparison of the Eight Possible Alignments of the Inner Harbor Turning Basin**

(page 2 of 5)

| *Alignment* | *Alignment Consistent with Project Objectives?* | *Environmental Concerns and Land Use Policy Constraints* | *Cost* | *Social and Economic Considerations* | *Plans, Land Use, and Deed Restrictions* | *Structures/ Fastland Impacted (in acres)* | *Total Volume to be Excavated (in mcy)* |
|---|---|---|---|---|---|---|---|
| 3 | Yes | • Reduced volume of contaminated soil/sediment. Some landfill disposal will be required due to the types and concentration of contaminants on Schnitzer site, therefore trucking related air quality and traffic impacts.<br>• Capacity to reuse most material within the Port area.<br>• Reduced excavation volume more consistent with policies to reduced dredging volume.<br>• Environmental benefits similar to other options.<br>• Inconsistent with Seaport Plan port priority use designation. | • High construction costs, similar to alignments 1 and 4 due to landfill disposal and shoal along north side of estuary.<br>• Lower cost than alignments 5 through 8 due to reduced volumes, fewer structures and less contamination. | • Forced relocation of Bay Ship and Yacht. Bay Ship employs approximately 300 full-time workers and generates $20 million in revenues annually. Since most of Bay Ship infrastructure is floating drydock, they are more easily relocated than Schnitzer Steel or Howard Terminal. Bay Ship may benefit from infrastructure improvements proposed.<br>• Forced closure of Schnitzer Steel. Loss of 100 full-time positions and $100 million per year in revenue. Many indirect jobs lost. Major recycling facility closed. | • Deed restriction imposed by SF-RWQCB on Schnitzer Steel to prevent excavation of that site.<br>• No apparent inconsistency with other existing plans. | 2.2/1.9 | 0.9 |

**Table 2.1-2. Comparison of the Eight Possible Alignments of the Inner Harbor Turning Basin**
(page 3 of 5)

| *Alignment* | *Alignment Consistent with Project Objectives?* | *Environmental Concerns and Land Use Policy Constraints* | *Cost* | *Social and Economic Considerations* | *Plans, Land Use, and Deed Restrictions* | *Structures/ Fastland Impacted (in acres)* | *Total Volume to be Excavated (in mcy)* |
|---|---|---|---|---|---|---|---|
| 4 | No | • Reduced volume of contaminated soil/sediment requiring little landfill disposal, therefore reduced trucking related air quality and traffic impacts. Some landfill disposal will be required due to the types and concentration of contaminants on Howard site.<br>• Capacity to reuse some material within the Port area.<br>• Reduced excavation volume consistent with policies to reduced dredging volume.<br>• Environmental benefits similar to other options.<br>• Some risk since moderate volume of higher level contamination from Howard Terminal.<br>• Inconsistent with Seaport Plan port priority use designation. | • Higher construction cost due to structures needed to retain shoal on north side of estuary.<br>• High cost for landfill disposal of material from Howard Terminal. | • Large reduction of cargo handling at Howard. Loss of over 5% of Port cargo capacity. Loss of more than 700 direct and indirect jobs.<br>• Forced closure of Schnitzer Steel because ship mooring within turning circle is prohibited. Loss of 100 full-time positions and $100 million per year in revenue. Many indirect jobs lost. Major recycling facility closed.<br>• Alameda is planning for reuse of FISC Annex. Impact of shoreline excavation on future plans can be minimized. | • Deed restriction imposed by SF-RWQCB on Schnitzer Steel to prevent excavation of that site. Removal of maritime facilities inconsistent with Oakland General Plan, Estuary Plan, and Seaport Plan.<br>• Conflict with future plans for reuse of FISC Annex. Since reuse plans have not been enacted, nor the environmental analysis of the plan completed, it may be possible to accommodate the excavation and benefit from the shoreline reconfiguration. | 3.7/2.1 | 1.0 |
| 5 | Yes | • Some contaminated soil/sediment. Some landfill disposal will be required due to the types and concentration of contaminants likely to be encountered on Beery upland site, therefore trucking related air quality and traffic impacts.<br>• Insufficient capacity to reuse most material within the Port area.<br>• Increased excavation volume inconsistent with policies to reduced dredging volume.<br>• Environmental benefits similar to other options. | • Very high cost for construction due to extensive shoreline excavation. Longer and therefore more expensive buklhead structures.<br>• Most material not eligible for aquatic disposal, therefore trucking required with related air quality and traffic impacts.<br>• These impacts are minimized through other alignments. | • Forced relocation of Bay Ship and Yacht. Bay Ship employs approximately 300 full-time workers and generates $20 million in revenues annually. Since most of Bay Ship infrastructure is floating drydock, they are more easily relocated than Schnitzer Steel or Howard Terminal.<br>• Bay Ship unlikely to benefit from proposed infrastructure improvements since extensive excavation would be required. | • Minor excavation required at FISCO Annex. Conflict with future plans for reuse of FISC Annex. Since reuse plans have not been enacted, nor the environmental analysis of the plan completed, it may be possible to accommodate the excavation and benefit from the shoreline reconfiguration. | 2.7/8.4 | 2.0 |

**Table 2.1-2. Comparison of the Eight Possible Alignments of the Inner Harbor Turning Basin**
(page 4 of 5)

| *Alignment* | *Alignment Consistent with Project Objectives?* | *Environmental Concerns and Land Use Policy Constraints* | *Cost* | *Social and Economic Considerations* | *Plans, Land Use, and Deed Restrictions* | *Structures/ Tastland Impacted (in acres)* | *Total Volume to be Excavated (in mcy)* |
|---|---|---|---|---|---|---|---|
| 6 | Yes | • Some contaminated soil/sediment. Some landfill disposal will be required due to the types and concentration of contaminants likely to be encountered on FISC Annex upland site, therefore trucking related air quality and traffic impacts.<br>• Insufficient capacity to reuse most material within the Port area.<br>• Increased excavation volume inconsistent with policies to reduced dredging volume.<br>• Environmental benefits similar to other options. | • Extremely high cost for construction due to extensive shoreline excavation. Longer and therefore more expensive bulkhead structures.<br>• Most material not eligible for cost-effective aquatic disposal/reuse, therefore trucking required with related air quality and traffic impacts.<br>• These impacts are minimized through other alignments. | • Alameda is planning for reuse of FISC Annex. Impact of shoreline excavation on future plans would be the highest of any alignment. It is likely that this alignment would affect future development plans. | • Conflict with future plans for reuse of FISC Annex. | 2.6/10.1 | 1.8 |
| 7 | No | • Large volume of contaminated soil/sediment. Landfill disposal will be required due to the types and concentration of contaminants likely to be encountered on Howard upland site, therefore trucking related air quality and traffic impacts.<br>• Insufficient capacity to reuse most material within the Port area.<br>• Increased excavation volume inconsistent with policies to reduced dredging volume.<br>• Environmental benefits similar to other options.<br>• Inconsistent with Seaport Plan port priority use designation. | • Very high cost for construction due to extensive shoreline excavation. Longer and therefore more expensive bulkhead structures.<br>• Most material not eligible for aquatic disposal, therefore trucking required with related air quality and traffic impacts.<br>• These impacts are minimized through other alignments. | • High reduction of cargo handling at Howard. Entire terminal would be closed. Loss of over 10% of Port cargo capacity. Loss of one of only two public terminal in Oakland. Public terminals extremely valuable due to the flexibility they provide. Loss of more than 1,500 direct and indirect jobs. | • Removal of maritime facilities inconsistent with Oakland General Plan, Estuary Plan, and Seaport Plan. | 4.4/15.1 | 2.5 |

**Table 2.1-2. Comparison of the Eight Possible Alignments of the Inner Harbor Turning Basin**
(page 5 of 5)

| *Alignment* | *Alignment Consistent with Project Objectives?* | *Environmental Concerns and Land Use Policy Constraints* | *Cost* | *Social and Economic Considerations* | *Plans, Land Use, and Deed Restrictions* | *Structures/ Fastland Impacted (in acres)* | *Total Volume to be Excavated (in mcy)* |
|---|---|---|---|---|---|---|---|
| 8 | No | • Large volume of contaminated soil/sediment. Landfill disposal will be required due to the types and concentration of contaminants likely to be encountered on Schnitzer Steel upland site, therefore trucking related air quality and traffic impacts.<br>• Insufficient capacity to reuse most material within the Port area.<br>• Increased excavation volume inconsistent with policies to reduced dredging volume.<br>• Environmental benefits similar to other options.<br>• Inconsistent with Seaport Plan port priority use designation. | • Very high cost for construction due to extensive shoreline excavation. Longer and therefore more expensive bulkhead structures.<br>• Most material not eligible for cost-effective aquatic disposal, therefore trucking required with related air quality and traffic impacts.<br>• These impacts are minimized through other alignments. | • Forced closure of Schnitzer Steel. Loss of 100 full-time positions and $100 million per year in revenue. Many indirect jobs lost. Major recycling facility closed. | • Removal of maritime facilities inconsistent with Oakland General Plan, Estuary Plan, and Seaport Plan. | 2.4/5.6 | 1.5 |

Based on the first evaluation criterion – is the alignment consistent with project objectives – three of the eight alignments (alignments 1, 4, and 7) were eliminated first from further analysis.

These three alignments require the removal of land from the Howard Terminal. The removal of approximately 1.0 acre of Howard Terminal (the minimum amount required by any of the three options), mostly consisting of wharf, would remove at least one berth from operation. In 1995, the Port completed a $15.5 million expansion and modernization of Howard Terminal. Removal of one of the two berths available at the terminal would make the terminal less desirable for cargo carriers to the point of reducing its use to less than half the current throughput. Howard Terminal is one of only two public terminals in the Port. Public terminals, especially modern terminals, are extremely valuable to shippers due to the flexibility that they provide. Last year (1997), approximately 126,000 TEU (20-foot equivalent units) were transported through Howard Terminal. This represents approximately 10 percent of the Port's total TEU throughput. Disrupting or limiting operations at Howard Terminal is counter to the purpose of the 50-foot deepening project, which is to enhance the Port's maritime operations. It would also be inconsistent with the Seaport Plan, which designates the site as a port priority use area. Eliminating alignments 1, 4, and 7, left alignments 2, 3, 5, 6, and 8 for further consideration.

Environmental impacts and benefits could occur from each of the eight alignments. There is a potential for marginal habitat benefits from the increased aquatic habitat that would be created by maximizing upland excavation. Construction of the turning basin will create deep dredged habitat. Deep dredged channels are common in the estuary and considered of marginal value. Thus, maximizing upland removal would not provide high quality or rare habitat. Maximizing upland removal is also contrary to the regional policy of minimizing dredging and disposal that is currently being developed by the agencies that permit dredging projects in the Bay Area. Further, each of the upland sites has various levels of contamination (see Appendix M.1). For this reason, upland soil cannot be disposed in aquatic sites. Further, each alignment has at least some soil contamination that would require landfill disposal. However, some sites (Schnitzer Steel and Howard Terminal) have higher expected concentrations of soil contamination. Therefore, alignments that have increased volumes of upland excavation would increase the need for landfill disposal, trucking (and therefore air quality impacts), and the risk of exposing the estuary to contaminants. Alternative 8 also would require the closure of the Schnitzer facility, which would be inconsistent with the Seaport Plan. For these reasons, three additional alignments – alignments 5, 6, and 8 – were eliminated from further consideration; this left alignments 2 and 3 for further study.

The cost to construct the two remaining alignments – alignments 2 and 3 – were then examined. The construction costs for these two remaining options would be similar. It is anticipated that the cost to construct the shoreline support structure would be higher under Alignment 3 than Alignment 2 due to a greater thickness of shoal material on the north side of the basin (Alignment 3 would affect more of the north side of the Inner Harbor than Alignment 2 would). However, that cost increase for this option is offset by the slightly reduced volume of material requiring removal under Alignment 3 compared to Alignment 2.

The economic effects of alignments 2 and 3 were then compared. The loss of business as well as direct and indirect jobs were evaluated. The location of the turning circle under Alignment 3 would encroach on the Schnitzer Steel wharf. Ships cannot be berthed within the turning circle and this alignment would prevent ships from docking at the Schnitzer facility. The lack of ship access would force the closure of this facility, which would be inconsistent with the Seaport Plan. The Schnitzer facility is not mobile and could not be easily moved to a nearby location. Schnitzer

Steel generates over $100 million in revenues each year and is directly responsible for more than 100 full-time jobs. Economic activities at the Schnitzer Steel facility generate many more indirect jobs; the facility also fills an important role in the recycling of ferrous and non-ferrous metals. In addition, this configuration would also impact Bay Ship and Yacht floating dry-dock operations. Bay Ship directly employs 300 full-time workers and generates $20 million in revenues each year. Bay Ship is somewhat more mobile than Schnitzer Steel, so could potentially move their operation to a nearby location. In contrast, Alignment 2 would impact Bay Ship operations alone. Again, Bay Ship could potentially move to a nearby location, and may benefit from the shoreline improvement included in Alignment 2.

Finally, Alignment 3 would require upland excavation at Schnitzer Steel. Schnitzer Steel operates their facility under a deed restriction issued by the San Francisco Regional Water Quality Control Board (SF-RWQCB). The deed restriction prohibits the removal of a concrete cap on that site. The cap is in place to prevent exposure of soil contamination on that site. Excavation on Schnitzer is contrary to the deed restriction placed on the property by the SF-RWQCB. Although all the alignments have some site contamination, none of the other properties have such restrictions. Each alignment was evaluated in terms of both the volume of contaminated soil in the alignment and the mixture and concentration of contaminants. Although the Port could reuse, or treat and reuse, some contaminated soil, the amount of contaminated soil and the cost to deal with it needed to be evaluated for each alignment. Some contaminants could not be reused without causing additional restrictions on the Port or causing an unacceptable risk to on-site workers or the environment. More detail regarding this analysis is provided in Appendix M.1.

For the reasons described above and further detailed in Appendix M.1, Alignment 2 was selected as the preferred configuration for the Inner Harbor turning circle. Alignment 2 would have the fewest economic impacts. The environmental impacts of Alignment 2 would vary depending on the resource area considered, as described in Appendix M.1. For several resource areas, the level of impact would not vary substantially with the particular alignment.

The proposed configuration would minimize upland and total excavation required for creation of the turning circle and would remove a portion of the current Navy Fleet Industrial Supply Center Oakland (FISCO) Annex, and a small portion of the John Beery property shoreline. The City of Alameda intends to pursue redevelopment projects on the former Navy property. The demolition of portions of the wharves and warehouse on this site would be necessary for the expanded turning basin to be located as proposed. A ship simulation model will be performed for the Inner Harbor turning basin during the design phase and, together with the geotechnical design study, will be used to refine the turning basin design, and potentially reduce its footprint.

### 2.1.2 Dredging Methods

Several different types of dredges could be used, including: marine excavator, hydraulic cutterhead, clamshell, and hopper. The dredges could be either diesel-powered or electric powered, with no difference in performance characteristics. However, electric-powered dredges are more expensive and difficult to operate than diesel dredges because of the movement logistics associated with the power cable.

Two or three dredges could operate simultaneously. With a clamshell dredge, a dredging rate of 2,500 to 5,000 cy per dredge per day could be achieved; with a hydraulic cutterhead dredge, 20,000 to 32,000 cy per day could be achieved; and with a marine excavator dredge 5,000 to 7,500 cy per day could be achieved. Dredging could occur 24 hours per day, 7 days per week. Associated pile

driving activities could occur during the daytime in accordance with the Oakland and Alameda Noise Ordinances. Pump equipment could also be used to transport the dredged material to a number of possible reuse or disposal sites. Alternatively, the sediment could be loaded onto a barge for transport to the reuse/disposal site or to another site for drying (e.g., the "Various Landfills" disposal option [section 2.2.4]).

Ultimately, the choice of dredge will depend on cost-effectiveness, the reuse/disposal site, the type of dredged material, and environmental constraints. However, the exact dredging rate would vary with the reuse/disposal options selected and the type of material being dredged. Dredging of the softer muds (fine grained sediments) will be done in such a way to minimize sediment loss during the dredging cycle including possibly slower cycling times and the use of environmental buckets. While using the cutterhead dredge, no undercutting would be allowed which would prevent sediment above the area being dredged from slumping in on the cutterhead thereby increasing turbidity. During dredging of specific contaminated areas of the Inner Harbor turning basin, booms would be placed around the dredging area to contain oily substances or floating material that might be released from the sediments.

Material dredged with a cutterhead dredge would all be pumped directly to the reuse/disposal site. Material dredged by clamshell dredges would be transported by bottom-dump scows (i.e., barges that have an opening in their hull to dump the sediment) ranging in capacity from 800 cy to 6,000 cy. Use of a bottom dump scow does not necessarily mean the material would be bottom dumped; in some cases, the material would be pumped or scooped from the scows onto a land reuse/disposal site. For clamshell-filled barges of sediments suitable for aquatic disposal, the 5,000-cy scows could hold approximately 4,000 cy of actual sediment (i.e., they are 80 percent efficient); the rest of the scow's capacity would be taken up by the water that is picked up in the bucket. Hydraulically filled barges would likely be hauling much less solid material because of the relatively greater volume of water entrained by hydraulic dredges. Reuse/disposal sites close to the dredging site may have sediments placed via cutterhead suction dredge, or clamshell bucket or pumped from the barge onto land. The number of scow trips necessary to transport the sediment to the reuse/disposal sites would depend on the selected dredging equipment.

Barge overflow is standard operating procedure to achieve a cost-effective load (i.e., so that the proportion of sediment is maximized), unless sediment contamination precludes this procedure. Overflow would only be allowed at the dredge site (not en route to the reuse/disposal site), only for sediments deemed suitable for unrestricted aquatic disposal, and would not exceed a period of 15 minutes, unless otherwise allowed by the RWQCB under WDRs. No intentional overflow or spillage would be allowed at any time during transit to the reuse/disposal site. Also, during dredging any petroleum products, chemicals, or other toxic or deleterious material would be prevented from entering the water.

The sediment would be unloaded at the reuse/disposal site from the barge by a clamshell bucket, slurry pump, or bottom dumped unless mitigation requirements limit disposal options. Sediment could be placed in the fill areas by several methods; the method will be determined during the design process. However, sediment suitable for construction fill will be offloaded directly into the rehandling facility. Placement methods are also discussed further in section 2.4.

### 2.1.3 Associated Maintenance Dredging Requirements

Currently, suitable material from routine maintenance dredging (referred to as operation and maintenance [O&M] dredging) of Oakland Harbor channels and berths are disposed at the

aquatic disposal site (SF-11) near Alcatraz Island. The disposal volume at this site from O&M dredging of Oakland Harbor has averaged approximately 370,000 cy per year from 1975 through 1996.

There would be increased maintenance dredging requirements associated with the proposed deepening of Oakland Harbor (Federal Channel). Estimated annual maintenance dredging requirements for the -50 foot Inner and Outer Harbor channels would be increased by112,000 cy for an estimated maximum total annual maintenance dredging volume of482,000 cy. The *incremental* increase in maintenance dredging due to the project would thus be112,000 cy. On an annual basis, this incremental increase due to the project (112,000 cy) represents a 30 percent increase over the historical maintenance dredging volume for the Federal channels (370,000 cy of material from maintenance dredging per year). See Appendix B.3.

The estimated annual maintenance dredging requirement for Port of Oakland berths is expected to be 190,000 cy. Thus the total annual maintenance dredging of channels plus berths is estimated to be672,000 cy. This would represent a 45 percent increase over historical maintenance dredging volumes for the Oakland Harbor.

While the project would result in a substantial increase in the *volume* of O&M dredging for the Oakland Harbor, the associated environmental *impact* would be insignificant because the project would be maintained under the LTMS policies, and the increased volume would be within the "volume targets" (4 mcy per year) established for the aquatic disposal site (SF-11) near Alcatraz Island. However, use of the Alcatraz site for maintenance dredging in the harbor could change depending upon increasingly stringent sediment quality testing standards and changes in regional policies proposed by the LTMS agencies. In any case, maintenance dredging and disposal associated with the project would be consistent with the LTMS program. Maintenance "episodes" have separate authorizations from dredging projects that involve deepening, and each maintenance episode would be evaluated with respect to the National Environmental Policy Act (NEPA), the California Environmental Quality Act (CEQA), and the Clean Water Act (CWA); as a result, this document does not evaluate the impacts associated with maintenance dredging. Some future maintenance dredging could also be regulated under the Marine Protection, Research, and Sanctuaries Act to the extent that the LTMS Management Plan directs disposal of such material to the San Francisco Deep Ocean Disposal Site (SF-DODS) instead of in-Bay sites.

## 2.2 DREDGED MATERIAL REUSE/DISPOSAL OPTIONS

### 2.2.1 Reuse/Disposal Options Initially Considered

The reuse/disposal options initially considered are shown on Figure 2.2-1.

### 2.2.2 Screening Criteria Used to Eliminate Possible Reuse/Disposal Options from Further Study

The screening criteria listed below have been used to focus the environmental analysis on the reuse/disposal options that are practicable and most likely to be implemented. Only those reuse/disposal site options that meet all of the screening criteria below will be analyzed in detail in this document. For the reuse/disposal options that are eliminated from further environmental

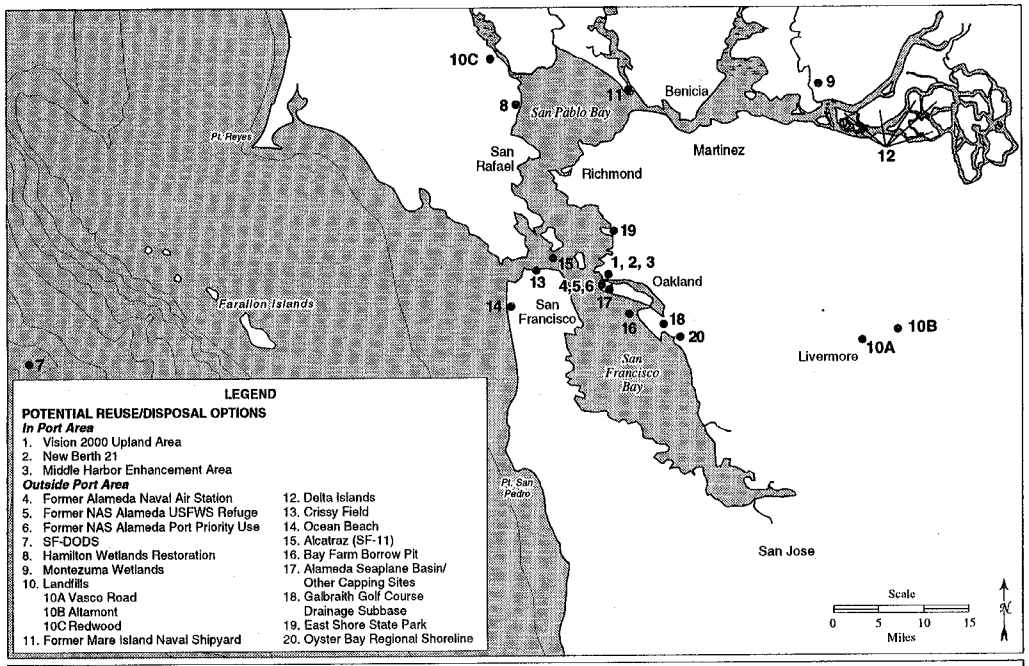



**Figure 2.2-1**

**POTENTIAL REUSE/DISPOSAL OPTIONS**

analysis in this document, it does not mean that the site cannot be eventually used for dredged material reuse or disposal.

1. The reuse/disposal site sponsor is willing to accept dredged material from the proposed project.

2. Sufficient information is available regarding the proposed reuse/disposal site during preparation of this EIS/R/FS to evaluate the impacts from the use of the site.

3. The reuse/disposal site is permitted, or on track to be permitted before or during the duration of the construction phase of the project, to accept dredged material from the proposed project.

4. Infrastructure is in place, or expected to be in place by February 2000, for the reuse/disposal site to accept dredged material from the proposed project.

5. The cost for use of the reuse/disposal site is feasible to be borne by the project sponsor under existing rules and regulations to fund delivery of dredged material to a specific reuse/disposal site.

6. Use of the reuse/disposal site may avoid or substantially lessen any of the significant impacts of the project.

Criteria 3 and 4 above are reasonable because the Port of Oakland must be modernized to accept K Class vessels in a timely manner to retain existing tenants. Existing tenants are presently, and over the next 10 years, adding vessels and replacing vessels with the largest K Class vessels. Historic trends have shown that delayed deepening of the Oakland channel to current depths has caused Port tenants such as American President Lines (APL), Maersk, COSCO, and OOCL to remove larger vessels from calling at the Port of Oakland on regular rotations along their Pacific Rim trade route. In fact, APL has stopped calling at the Port completely because of lack of sufficient depth for incoming ships. Following the necessary legislative authorization and appropriation of funds for the project, the project is expected to commence construction in October 2000. In order to meet this construction start date the sediment reuse/disposal options must be available at that time.

### 2.2.3 Reuse/Disposal Options Eliminated from Further Study

Based on the screening criteria in section 2.2.2, the following possible reuse/disposal sites that were initially considered have been eliminated from further study. References to "project sponsor" in this section refer to the party that has responsibility for the indicated reuse/disposal site (e.g., the property owner or manager).

*Former Mare Island Shipyard*

Three possible reuses for dredged material on the former Mare Island Naval Shipyard were initially considered: the dredge ponds, wetland restoration, and general fill or landfill capping material. Locations for the latter two types of reuse have not been defined and are unlikely to be available for the proposed project. The dredge ponds are located on the western side of the former shipyard. The ponds were used as a confined disposal facility for materials generated from maintenance dredging along the berths. The ponds are adjacent to the San Pablo Bay National

Wildlife Refuge, and the USFWS is interested in acquiring a building and three of the active ponds as part of the refuge. The City of Vallejo is in the process of evaluating whether it is economically feasible to reactivate the existing dredge ponds. The removal of Navy ordnance (munitions) from the ponds may preclude the City's use of the ponds until at least 1999 (possibly longer), and could also involve filling the ponds to current capacity.

This site was eliminated from further consideration because it did not meet screening criteria 2 through 5 (section 2.2.2). There is no stable project description for this reuse option, and no environmental documentation, permits, or infrastructure expected within the time-frame required. Also, the Port expects that delivering sediment to the site would require a large tipping fee (personal communication, R. Olejniczak to G. Staba, 1997). The combination of these factors makes this reuse option impractical.

*Delta Islands*

Under this reuse/disposal option, dredged material would be used to maintain and rehabilitate levees on islands located in the western part of the Delta. This option was eliminated because it does not meet screening criteria 1 through 4. The project sponsor at present, the Corps, is interested in receiving dredged material for levees on the Delta islands, but the existing documentation does not support the use of sediments from saline environments for this purpose. There are also a considerable number of historic resources on the Delta islands that could be impacted by the placement of dredged material. The Department of Water Resources indicates they do not have the detailed information necessary to include this reuse option in the analysis for the 50-foot project (personal communication, M. Floyd to K. LeBlanc, 1997), although this opinion conflicts with the LTMS Draft EIS/R, which acknowledges constraints on Delta disposal. The LTMS estimates only one million cubic yards of Bay sediment would be used each year in the Delta. Disposal of sediments from saline environments on Delta levees would also conflict with the State Water Resources Control Board's non-degradation policy.

*Crissy Field*

Under this reuse/disposal option, dredged material would be used for upland habitat enhancement at Crissy Field, which is located on the northern edge of San Francisco, just east of the Golden Gate Bridge. This option was eliminated at the request of the local sponsor.

*Ocean Beach Nourishment*

Under this reuse/disposal option, dredged material would be used for aquatic and upland beach nourishment at Ocean Beach, which is located on the northwestern portion of San Francisco. This option was eliminated at the request of the local sponsor.

*Former NAS Alameda — USFWS Refuge*

Under this reuse/disposal option, dredged material would be used for habitat enhancement in the area designated as a wildlife refuge proposed by USFWS as part of the reuse plan for the former Alameda Naval Air Station, which is now called Alameda Point. The proposed wildlife refuge would be located on the western portion of Alameda Point. However, restoration plans are still uncertain and no project schedule has been developed. Furthermore, USFWS does not believe that dune creation would be a likely element of management of the refuge, thus there does not appear to be a beneficial end use. Therefore, this option was eliminated.

*Former NAS Alameda — Port Priority Use*

This reuse/disposal option refers an area that was previously designated for port priority use under the Seaport Plan element of the San Francisco Bay Plan. The port priority use designation for this area was removed by the BCDC in 1997. This option was eliminated from further consideration because there was no local sponsor interested in pursuing port use of the former NAS Alameda. The Reuse Plan for the former NAS has different plans for this area.

*Aquatic Disposal at SF-11, "Alcatraz"*

Under this disposal option, dredged material would be deposited at the designated aquatic disposal site SF-11 south of Alcatraz Island. There are monthly and annual "target restrictions" on the amount of sediment that can be disposed at this site. The annual restriction is 4 mcy. The monthly restriction is 400,000 cy from October through April, and 300,000 cy from May through September; during either of these two periods, no more than 150,000 cy may be clamshelled material. This option was eliminated from further consideration by the request of the Corps. Reasons for this decision include the fact that many other smaller maintenance dredging projects want to use this site, based on a case-by-case review by the Dredged Material Management Office. Also, the relatively clean Oakland sediment would not be beneficially reused if deposited here, and the regulatory agencies strongly discourage in-Bay disposal.

*Bay Farm Borrow Pit*

Under this disposal option, dredged material would be used for aquatic habitat enhancement at the Bay Farm Borrow Pit, which is located in San Francisco Bay just west of Bay Farm Island. This site was originally dredged to provide sediments that were used to create fastland on Bay Farm Island in the 1950s. The area is roughly 2-by-0.5 nautical miles, and has a water depth ranging from 27 to 48 feet MLLW. Unlike the Alcatraz site, the Bay Farm Borrow Pit is not a designated in-Bay disposal site. This site was eliminated from further consideration because the project sponsor (the Corps — San Francisco District) stated in a letter dated September 9, 1997 to the Port that the Corps has no plans to begin the process of designating this site as a dredged material disposal site. The City of Alameda has also objected to its use as a disposal site for this project or any other Port projects.

Also, depositing sediment here would be inconsistent with existing policies of both the San Francisco Bay Conservation and Development Commission (BCDC) and the Regional Water Quality Control Board. According to BCDC, this use of this site would constitute a permanent fill in San Francisco Bay, which is in direct conflict with the San Francisco Bay Plan. Also, on previous dredging projects in the Bay (the Port's 42-foot project; Richmond Harbor's 38-foot deepening project), other resource agencies have expressed the need for detailed site-specific studies prior to serious consideration of this site as a disposal option.

*Alameda Seaplane Basin and Other Capping Sites*

Under this option, dredged material would be placed in an aquatic environment and capped with clean sediment. This is known as confined aquatic disposal (CAD). The main area currently considered for this type of disposal is the former Seaplane Harbor on the south side of Alameda Island. The Alameda Reuse and Redevelopment Authority (ARRA) proposes to convert the harbor to a marina. Dredged sediment could be reused in two ways: to cap existing contaminated sediments in place, or to decrease depths in the basin to support the marina.

This harbor contains sediments believed to be contaminated by industrial releases from the former NAS Alameda. Because of this, the former Seaplane Harbor is an Installation Restoration (IR) site. The Navy is currently conducting sampling to evaluate the concentrations of compounds in the harbor sediments. The sediments within the Seaplane Harbor are not completely characterized but appear to be of very poor quality. The sediments have an unpleasant odor and, when disturbed, frequently cause an oil slick on the water surface. These sediments are also of very low density, so they would be prone to disturbance by any capping effort.

The end use of the harbor as a yacht harbor would expose the bottom to erosive forces from boat drives. Thus it appears that capping sediments at this site with sandy Oakland material would be less protective of the environment than removal of the sediments which is currently proposed by the City of Alameda (personal communication, J. Hunt 1997).

This site was eliminated from further consideration because it does not meet screening criterion 1.

At this time, no other aquatic capping sites have been identified for this type of disposal option.

*East Shore State Park*

Reuse of the dredged material at this site was suggested by the East Bay Regional Park District (EBRPD) in a letter received during the scoping period for the proposed project. The Park District thought this newly acquired park might be well suited for the reuse of clean dredged materials to cap contaminated upland soils, for the creation of emergent tidal marsh, or the creation of artificial islands to benefit shorebirds (e.g., the endangered California least tern). This site was eliminated from further consideration because it does not meet screening criteria 2 through 4.

*Oyster Bay Regional Shoreline*

Like the site above, reuse of the dredged material at this site was suggested by the EBRPD in a letter received during the scoping period for the proposed project. The Park District notes that the undeveloped portion of this park will require a substantial volume of clean, dry, fill material to cap the existing municipal landfill in order to receive closure from the Regional Water Quality Control Board. After closure, the Park District plans to construct new facilities in the park. This site was eliminated from further consideration because it does not meet screening criteria 2 through 4.

*Galbraith Golf Course Drainage Subbase*

Under this disposal option, clean sand from the dredged material would be used to raise grades an additional 2 feet at the Galbraith Golf Course (this would be 2 feet *above* the 2 feet that grades were raised at this site from reuse of dredged material from the Port's 42-foot deepening project). Sediment destined for this disposal site would first be dried at the rehandling facility that would be constructed on Port property that is currently part of FISCO. Once dry, the sand would be trucked to the Galbraith Golf Course. This reuse option was eliminated from further consideration for the 50-foot deepening project because the Port determined that it would be better suited as a reuse site for dredged material from the proposed Berth 55-58 project.

### 2.2.4 Reuse/Disposal Options Considered for Further Study

The eight reuse/disposal options considered for further study are described below and shown in Figure 2.2-1. These reuse/disposal options represent a variety of beneficial reuses of the dredged

material, including aquatic fill for shallow-water habitat enhancement and creation of new terminals and upland construction fill. Ocean disposal is also considered. Landfill disposal is considered for both sediment that would be suitable for daily cover (e.g., a Class III landfill), as well as some of the most contaminated sediments (e.g., a Class I or II landfill). The maximum reuse/disposal volume analyzed in this document for each of the sites is shown in Table 2.2-1.

**Table 2.2-1. Maximum Sediment Volume by Reuse/Disposal Option**

| *Sediment Reuse/Disposal Option* | *Maximum Sediment Volume (mcy)* |
|---|---|
| Vision 2000 Upland | 2.5 |
| New Berth 21 | 2.5 |
| Middle Harbor Enhancement Area | 7.0 |
| Former NAS Alameda | 0.75 |
| SF-DODS | 19.2[1] |
| Hamilton Wetlands Restoration | 7.0[2] |
| Montezuma Wetlands Restoration | 14.0[3] |
| Various Landfills | 0.1 |

*Notes:*
1. 4.8 mcy per year [maximum allowable disposal volume at SF-DODS] x 4 years [duration of construction period] = 19.2 mcy. This is greater than the maximum proposed dredge volume.
2. 7.0 mcy is the sediment volume that was estimated for wetland restoration at the Hamilton site in the John F. Baldwin navigation channel EIR/S (COE and Contra Costa County 1997).
3. 14.0 mcy is based on 10 to 12 mcy going to Phases I and II of the independently proposed Montezuma Wetlands Project (MWP), and another 2.0 mcy going to the sediment rehandling facility that is proposed as part of the MWP.

The existing conditions at the reuse/disposal sites are described in Chapter 4 and impacts at each site are described in Chapter 5.

***Vision 2000 Upland***

This reuse/disposal option includes both sediment placement in an upland environment on former FISCO to raise grades for construction, and a rehandling facility to dry and prepare dredged material for reuse or disposal upland. The proposed sediment placement upland and the proposed rehandling facility are discussed separately below.

The Vision 2000 upland reuse site is located in former FISCO; the site is in the Port of Oakland's planning jurisdiction, and plans for redevelopment of FISCO were the subject of a previous EIS/R (U.S. Navy and Port of Oakland 1997b). Redevelopment plans include new berths, shipping terminals, a Joint Intermodal (rail) Terminal, a park, marine habitat enhancements, and roadway access and infrastructure/utility improvements. It is expected that construction of the first berths and terminal complex will commence in the area of Berths 55-56 (see Figure 2.1-2) before dredging of this project begins. The berths and terminal development is the subject of a separate study (see section 1.6, Related Projects)

One-half million cubic yards (0.5 mcy) to 2.5 mcy of dredged sediments from the 50-foot project are proposed to be reused at the site to raise grades 4 to 5 feet above existing grades, which are currently at about 12 feet MLLW. Dredged material would be placed on existing fastland at FISCO, or on land already created as part of Berth 55 in the former Navy pier area. Both wetland non-cover material and construction material (see Chapter 3 for characterization) would be used in this option. Young Bay Muds (YBM) would be dredged and used as part of this option during the first years of construction of this project. Sediments would be clamshell dredged, loaded into

barges, transported to the site, and unloaded by another clamshell dredge to the rehandling facility for further drying for conditioning or to a stockpile site adjacent to the rehandling facility before placement on the site. Sediments would then be spread and contoured on the Vision 2000 Upland site using conventional earth-moving equipment.

Several locations on the Vision 2000 Upland site are known to have contamination. These areas include sediments in the Middle Harbor (in the offshore portion of the base). The Navy is responsible for remediating contaminated areas before release for redevelopment activities. The remediation process includes development of a Feasibility Study (FS) that defines the best way to remediate contamination given the proposed future use of the site (this is referred to as the "remedy"). U.S. EPA has developed most likely remedies for several commonly encountered situations, including contaminated offshore sediments. Capping-in-place is one such remedy, and the Navy is likely to propose capping as the remedy for contaminated sediments at former FISCO (now called Vision 2000 offshore and upland). The availability of sediments from the 50-foot project would make capping cost-effective compared to removing sediments and disposal at a landfill. The Navy, Port, and California EPA-DTSC are coordinating evaluation and remedy efforts to achieve maximum benefit from these simultaneous actions.

*Sediment Placement Activities*

Under the Vision 2000 Upland reuse/disposal option, approximately 0.5 to 2.5 mcy of dredged material would be place as upland fill (Figure 2.2-2). The upland fill would raise grades and augment existing fastland as a base for paved terminal areas. Engineered contours are necessary as part of the Vision 2000 redevelopment to place rail lines, pave terminals, and to ensure that drainage and rainwater management occur in a manner that enhances water quality.

*Rehandling Facility*

The proposed project would require a dredged material rehandling facility located on Vision 2000 upland property. The rehandling facility would receive clamshelled sediments that contain about 50 percent Bay water for drying and/or conditioning before use in construction on the site, or before trucking off site for reuse or disposal at a landfill. Typically soil contains about 30 percent water; dredged Bay mud that is pumped typically contains 80 percent water. The reason for dredging sediments with a clamshell is to minimize the amount of water that must be decanted from the sediments during the drying process.

The proposed rehandling facility could be located at one of five locations on the FISCO property (Figure 2.2-3), and could change as the project progresses. The five proposed sites range from 5 to 45 acres. If none of the five sites is available when needed, the existing Berth 10 would be used.

Dredged or excavated Merritt Sand would be used to construct the rehandling facility. The facility is envisioned to include 2 to 3 cells enclosed in one outer berm, with dikes between each adjacent cell. The drying cells would have a total capacity of about 100,000 cy. Another cell would serve to hold water decanted from the drying cells. Loading the drying cells with 100,000 cy of dredged material would take about 30 days; subsequent drying time would take 30 to 90 days. The addition of lime, Portland cement, or another material to condition the sediment and improve construction properties would decrease drying time.

After sediments were dried at the rehandling facility, they would be spread on the Vision 2000 Upland site with earth-moving equipment to raise grades, or be loaded into trucks or rail cars by

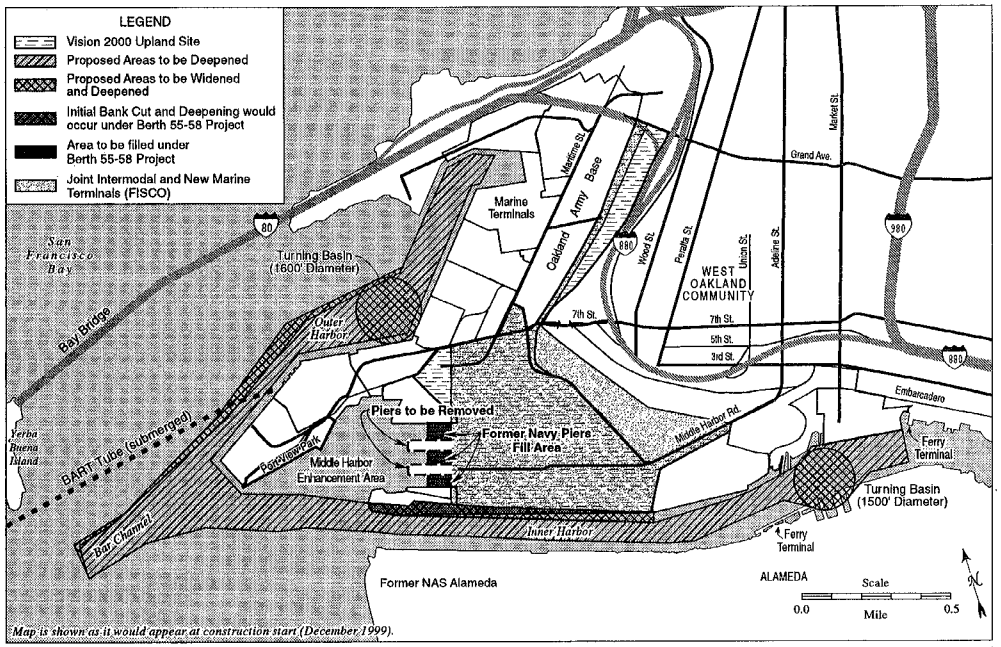



**Figure 2.2-2**

**VISION 2000 UPLAND REUSE/DISPOSAL OPTION**

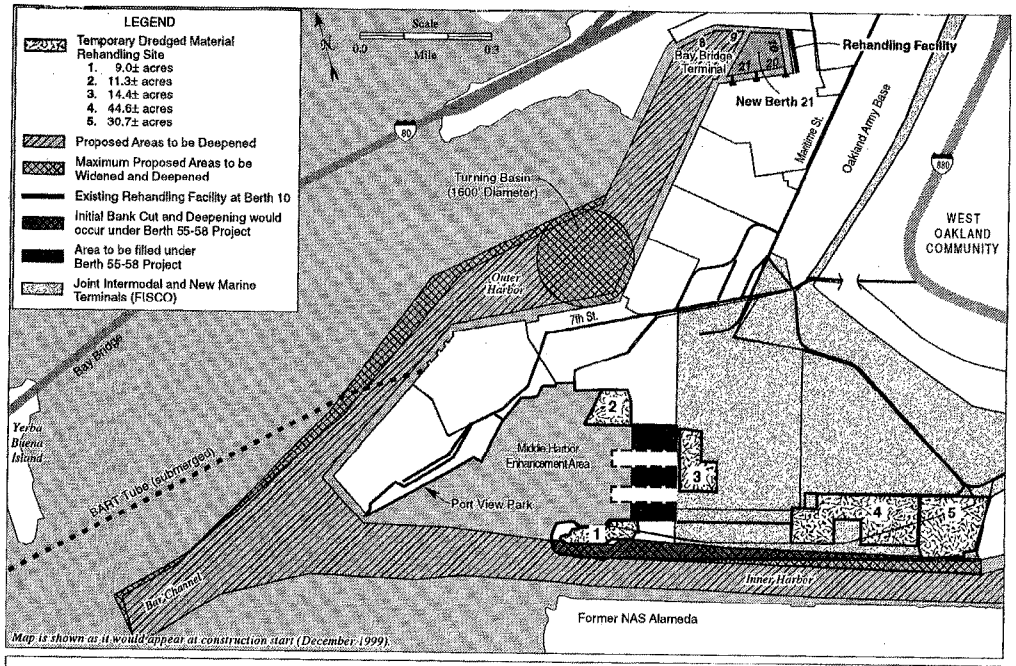



**Figure 2.2-3**

**POSSIBLE DREDGED MATERIAL REHANDLING SITES**

earth-moving equipment for disposal at a landfill. SF-RWQCB would be a primary regulatory agency involved in this reuse/disposal option.

*New Berth 21*

Under this reuse/disposal option, dredged material may be placed in the future as aquatic fill at the end of Outer Harbor to create new Berth 21 (Figure 2.2-4). This area is located in the City of Oakland in Alameda County and is within the Port's planning jurisdiction (U.S. Navy and Port of Oakland 1997). The submerged area in the Outer Harbor is owned by the City of Oakland and U.S. Army. The site is currently navigable water used for maritime transportation; it is surrounded by upland industrial, maritime uses, and the closing Oakland Army Base (OAB).

The Vision 2000 Maritime Development Program proposes to build a new marine terminal on Port and OAB property by placing approximately 2.5 mcy of dredged material to fill a 27-acre submerged area (Figure 2.2-4). The site is located in the Outer Harbor submerged area bordered by Berths 8, 9, 10, 20, and 21 (Figure 2.1-2) which, together, wrap around the proposed area of new Berth 21. Berth 10 and the upland area adjacent to Berth 10 are owned by the Port; the adjacent upland area is used as a dredged material rehandling site. The upland area adjacent to Berths 20 and 21, as well as Berth 22, are owned by the Port and used as an active marine terminal for Sealand. Berths 7 through 10, a total of 63 acres, are leased to the Port by the U.S. Army and are referred to as the Bay Bridge Terminal. The construction of the new Berth 21 wharf and terminal will effectively replace the smaller, less efficient existing configuration of Berths 20 and 21.

Prior to filling the site with dredged material, a rock dike would be constructed along the outer (seaward) boundary of this site. This rock dike (constructed at a 1:1.5 slope) would be constructed up to 18 feet MLLW to allow barges to enter the site and bottom dump sediment. The barges would probably require about 12 feet of water (for a safety margin). The most contaminated material would be placed as the bottom "layer" of the area to be filled. After the barges could no longer clear the dike, the dike would be raised in stages up to 14 feet MLLW. Dredged material would be placed behind the dike using a bottom dump barge or pumped through pipelines.

The dredged material would be bottom dumped into the fill area until the water becomes too shallow for the scow; at that time, the dike would be closed up, and the remaining sediment destined for this site would be pumped, clam-shelled, trucked, or placed by some other means of mechanical conveyance (e.g., a mining-type soil conveyor) into the fill area. After the barges are no longer able to come in, the Port may either periodically raise the dike as sediment is delivered to keep ahead of the sediment deposition, or they may close it entirely, and either discharge the water back to the Bay via pipeline or allow it to naturally filter through the dike.

Fine-grained materials would be deposited first. In addition, the amount of water that would be displaced when the barge dumps the sediment is not substantial, so there should be no large wave after the barge bottom dumps its load. The dredged material expected to go into this site would be material dredged from the berth areas, of which only about 8,000 cy would not meet the criteria for wetland non-cover material (for wetland non-cover criteria, see Wolfenden and Carlin 1992).

Later material (that could be pumped, moved along a conveyor, or clamshelled after the barges can no longer be floated in) would consist primarily of sand, resulting in few turbidity problems. The excess water would be discharged in conformance with applicable water quality permits.

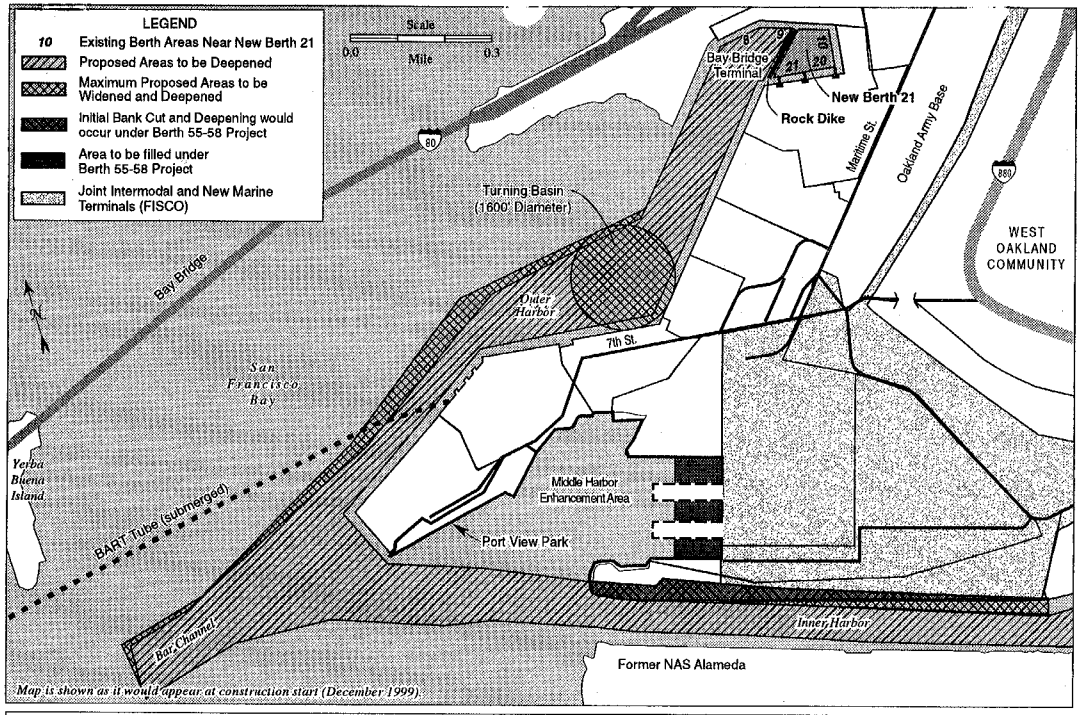



**Figure 2.2-4**

**NEW BERTH 21**

The OAB is on the Base Realignment and Closure (BRAC) List. Use of this site for dredged material reuse/disposal and creation of new Berth 21 is not expected to begin until at least 2002 and would require Army approval and the appropriate designation under the Community Reuse Plan. It is unlikely that the planning process will be completed in time for the site to be available for the 50-foot project. Actual construction of Berth 21 is expected to be completed after subsurface consolidation is complete.

*Middle Harbor Enhancement Area*

The Middle Harbor Enhancement Area (MHEA) site (Figure 2.2-5) involves placing dredged material in Middle Harbor to create a more biologically productive, shallow-water habitat. All of the fill required for this site would be provided by the 50-foot project. Placement of dredged material in this area would also act to cap existing contaminated sediment; this reuse option for the 50-foot project may be adopted as remediation for the former FISCO offshore property.

The MHEA is located in the City of Oakland in Alameda County and within the Port of Oakland's planning jurisdiction (U.S. Navy and Port of Oakland 1997b). The site is currently navigable water used for maritime transportation by the Navy, surrounded by upland industrial and maritime uses and Port View Park. The majority of the MHEA is reversionary Navy property, but also includes some State Tide Lands Trust property. The California State Lands Commission has jurisdiction of the State Tide Lands property which includes ungranted tidelands, submerged lands, and navigable waters (Public Resources Code Section 6301).

A rock jetty will be constructed to a level above extreme high tide across the inner channel side of the site leaving an approximately 300 foot opening, although the actual width will be determined in the final design. The dike for the MHEA would thus separate the MHEA from the Inner Harbor; it would extend from approximately Port View Park on the west to the western end of the North Jetty of the Inner Harbor on the east and would protect the site from wave damage associated with passing ships. An opening in the dike would allow tidal action in the enhanced habitat. Across the opening there will be a sill to 10 feet MLLW. In addition, behind the sill there will be a deep hole to 20 feet MLLW that will serve as a sediment trap. The bank between the MHEA and the Inner Harbor Channel would have a standard slope of approximately 3 to 1.

A possible construction scenario would be that there will be two basins created within MHEA for the purposes of sediment placement. The Main Basin will be enclosed behind a submerged berm at an initial elevation of 10 feet MLLW. The sediment will be bottom dumped to 10 feet MLLW. The fill to 20 feet MLLW will be wetland non-cover quality material. The sediment filled from 20 to 10 feet MLLW will be wetland cover quality material. The submerged berm, initially constructed to 10 feet MLLW, will be raised in phases but it will always be a minimum of 4 feet above the disposed sediment. Between 10 to 4 feet MLLW, the final design depth, the sediments will be placed by pipeline with a diffuser on the end to minimize turbidity.

After the Main Basin is filled with the fine sediment material, the area between the Main Basin submerged berm and the jetty will be filled with wetland cover quality material. Final elevation of the fill in the Outer Basin will be approximately 6 feet MLLW. A small setback channel immediately inboard of the jetty and sill will be only minimally filled to prevent scouring sediment to the navigation channel.

As part of the Vision 2000 Maritime Development Program's Reduced Harbor Fill Alternative, it is currently expected that dredged material would be placed in the Middle Harbor to enhance an

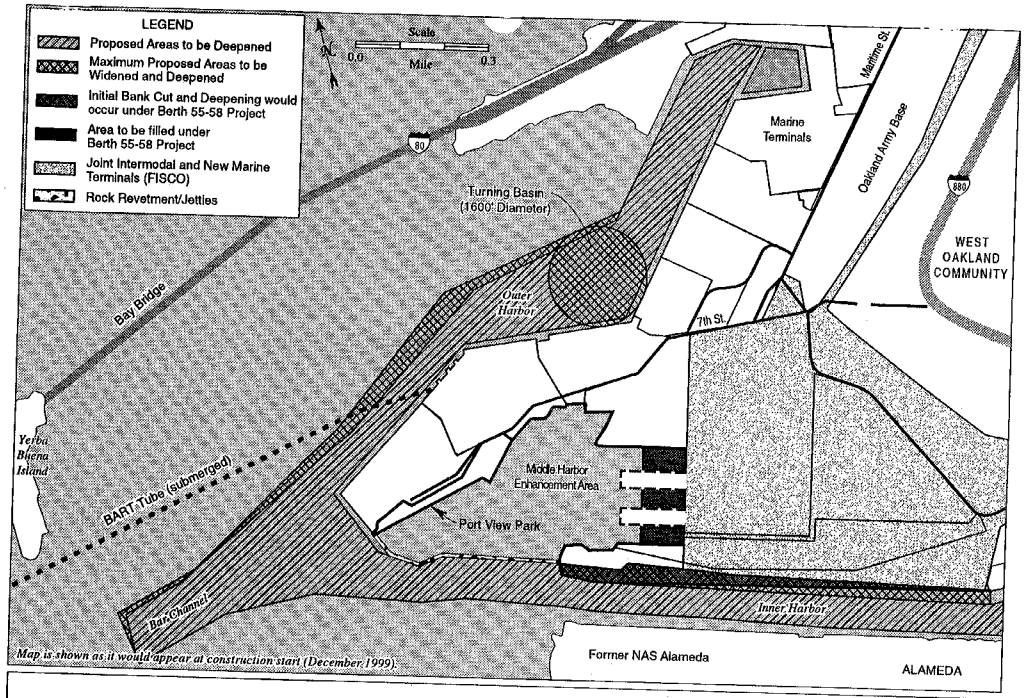



**Figure 2.2-5**

**AREA DESIGNATED FOR MIDDLE HARBOR ENHANCEMENT**

approximately 190-acre habitat area by building and expanding substrate for eelgrass, intertidal mudflats/sandflats, intertidal rocky substrata, subtidal rocky substrata, islands, and deep holes and channels. Consistent with the preferred alternative evaluated in the FISCO/Vision 2000 EIS/R, this project includes placement of approximately 7 mcy of dredged material for habitat enhancement. The design includes using approximately 7 mcy of dredged material, including both cover and non-cover material, to fill the Middle Harbor to an average depth of 4 to 6 feet below MLLW. Depending on the alternative selected, the proportion of cover material to non-cover material would vary (see Table 8.1-1). The design considerations and possible sequence of construction activities related to the placement and encapsulation of the non-cover material are described in Appendix K.

Prior to initiating development of the MHEA, the existing piers of Middle Harbor would be demolished and the shoreline reconfigured as part of the Berth 55-58 project (see section 1.2) (Figure 2.2-6).

The MHEA design plan focuses on providing the maximum potential yield of shallow water eelgrass habitat, with the remaining dominant habitat being shallow water flats and channels (Figure 2.2-6). Ancillary use of material would include the creation of a small salt marsh (approximately 3 to 5 acres) for the purpose of providing public educational and interpretive values. In addition, coarse sand from the dredged material would be used for the creation of public beaches (approximately 4 to 12 acres) and several small islands would be created to provide bird resting sites. An existing bird roosting site on the shoreline near the southeast end of the harbor will be retained. Another habitat component within the Middle Harbor site would be the surface of a rock jetty which would protect the site. A deep hole has been designed into the MHEA near the mouth of the site to serve as a sediment trap.

The sediment analysis performed indicated that there is some soft bay mud materials to be dredged from the channel that would be better placed in the bottom layer of the basin, covered by several feet of clean material. This material can be found primarily within the first several feet of the channel deepening both in the Outer and the Inner Harbor channels. The material underneath this sediment is suitable for placement in the MHEA as the top clean layer over the muds. The underlying material is comprised primarily of fine-grained sands and heavily consolidated Old Bay Mud. Following placement of the soft muds, care will be taken to place the sands over the muds in order to reduce resuspension of these soft sediments as a result of displacement caused by placement of the sands. Careful spreading of the sands would occur with either moving the discharge from a hydraulic dredge (with a diffuser to spread the material and facilitate low energy settling of the slurry) around the site or the careful placement from bottom-dump scows in thin passes.

Use of this site is expected to require a multi-year phasing program to excavate, place, and subsequently sculpt the final grades for the site. Following site construction, a habitat revegetation planting effort for the eelgrass habitat and salt marsh would be necessary to promote development of target resources. There are several ways to propagate and plant eelgrass, including plugs (ties, with fertilizer and without; anchors, etc.), seeding, and combinations of these methods. The planting scheme will be developed during the final design of this site, in concert with interested agency participants. Monitoring and maintenance of the site would be performed for several years following construction to ensure habitat and site stability expectations are being met and to establish a maintenance schedule and budget to address area needs. Long-term future maintenance of the MHEA would be focused on removal of collected sediment from the deep hole sediment basin, maintenance of navigation aids, beach grooming, trash collection

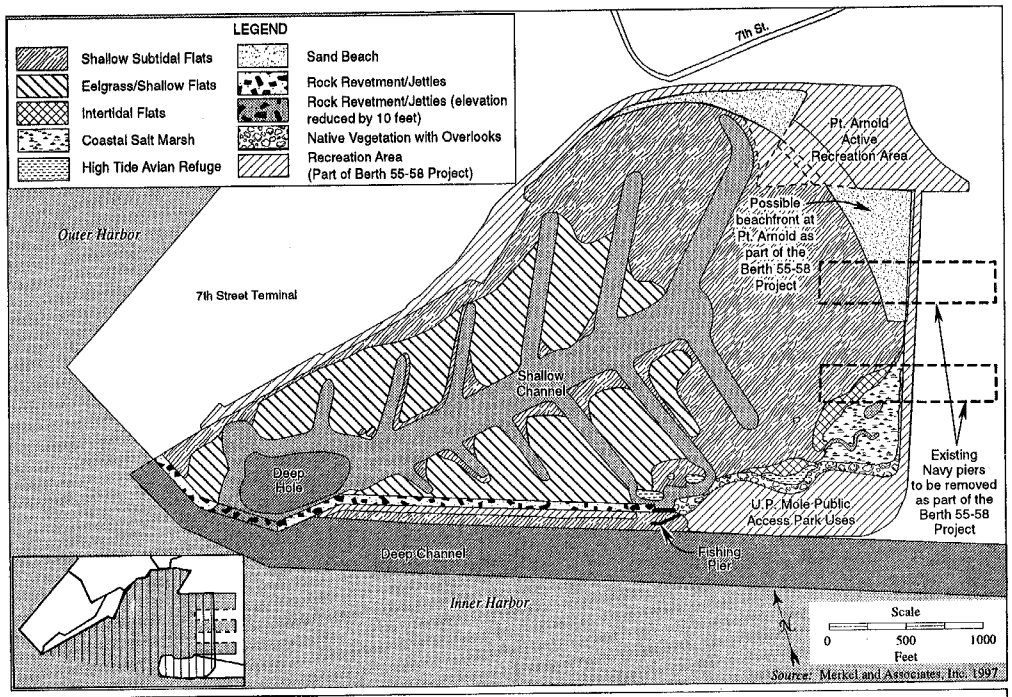



**Figure 2.2-6**

**PRELIMINARY HABITAT DESIGN CONCEPT FOR THE MIDDLE HARBOR ENHANCEMENT AREA**

along the shoreline, and controlling exotic plant growth. Public access elements (which would be implemented as part of the Port's Berth 55-58 project) would require additional management and maintenance obligations.

The MHEA is related to part of other elements of the Vision 2000 Maritime Development Program. These other elements which will be implemented as part of the Berth 55-58 project include shoreline public access facilities for recreational and informal educational uses, as well as the demolition of existing finger piers and shoreline reconfiguration for marine terminal uses (Figure 2.2-6). The public access improvements would be designed to minimize conflicts with the wildlife use of the habitat:

- Active uses such as ball fields, assembly points would occur near Pt. Arnold, only "passive" recreational uses will be planned for the U.P. Mole,
- A vegetated buffer would be provided on the U.P. Mole between the shoreline and the public access areas with designated overlooks which would be designed to restrict public and pet access to sensitive areas,
- Only non-motorized vessels would be allowed in the Middle Harbor, and
- All vessel access would be prohibited in the southeastern corner of the habitat near the marsh and shorebird roosting areas/islands.

The MHEA option includes two variations for the configuration of Pt. Arnold (Figure 2.2-6). One variation would keep Pt. Arnold intact and create two beaches. The other variation would reconfigure Pt. Arnold and create one continuous crescent-shaped beach in front of the remainder of Pt. Arnold; this variation would also include a groin along the eastern shore to prevent sand from migrating into the newly created marsh. The final design will depend upon the stability of the structure underlying Pt. Arnold and permitting requirements.

The MHEA would involve changes to the current navigation uses within Middle Harbor. At present, the eastern portion of the site is predominately restricted access Naval Reserve waters, while the western portion of the site is open navigation. Under the proposed plan, the outer jetty would define the limits of waters reserved for non-motorized small craft use. Within the eastern end of the site, an ecological study area (about 15 to 25 acres) would be posted as no-vessel access. The middle harbor habitat area would be dedicated in perpetuity for the protection of fish and wildlife, and would be managed by an agency or organization with the expertise and authority to permanently manage the area for this purpose. Management of the area would be consistent with the McAteer-Petris Act and the San Francisco Bay Plan.

***Former NAS Alameda Material Stockpile***

Under this reuse option, the 50-foot project would provide a maximum of 750,000 cy of clean material that would be pumped to the site to be used as future construction material in the reuse of former NAS Alameda. Over an approximate 117-acre site, a 21-acre "dewatering cell" and a 24-acre stockpile site would be developed using native (on-site) material (Figure 2.2-7).

Approximately 10 feet of fill would be placed in the dewatering cell and would mound to approximately 6 feet above the adjacent runway elevation. Once dewatered, this material would be moved by bulldozer or tractor to the adjacent stockpile site. When dewatering is completed,

the dewatering cell and the stockpile would be graded to an average height of 10 feet. However, as both sites are currently depressions (i.e., below grade), the apparent height would be only about 6 feet above the adjacent runway. At the northwest end of the dewatering cell there would be a weir structure with a pipe to discharge return slurry water into the Inner Harbor channel. The return water, would have to meet water quality standards.

The Port plans to sublease this site during sediment placement activities, deliver the sediment to the site, spread the sediment around to even it out on the site, and then would turn the site over to the Alameda Reuse and Redevelopment Authority (ARRA) for future redevelopment. The impact analysis of this site thus includes the impacts of delivering the sediment there, offloading it, and drying the sediment on site for future use.

*San Francisco Deep Ocean Disposal Site (SF-DODS)*

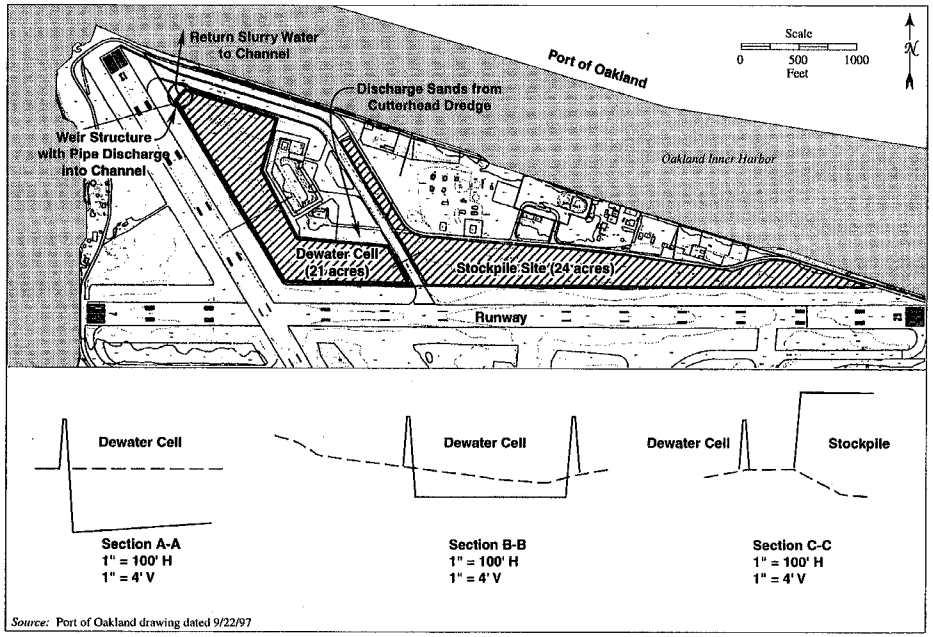
Under this disposal option, dredged material would be dumped at a deep ocean disposal site, the San Francisco Deep Ocean Disposal Site (SF-DODS). SF-DODS is located approximately 50 nautical miles west of the Golden Gate Bridge in over 8,000 feet of water (Figure 2.2-8). The distance from the dredge area to SF-DODS is about 58 nautical miles. The site has characteristics of a continental slope deep benthic habitat.

This disposal site was designated under Section 102 of the Marine Protection, Research, and Sanctuaries Act (MPRSA). EPA's proposed rule on the site designation was published in the *Federal Register* on February 17, 1994 (EPA 1994a). In August 1994, EPA published its Final Rule, designating SF-DODS a Section 102 deep ocean disposal site. The 1994 rule included an interim disposal volume limit of 6.0 mcy, good for 2 years only, with a permanent annual limit to be set thereafter. In 1996 rulemaking, EPA chose to set another interim (2-year) limit (of 4.8 mcy per year), to allow the LTMS EIS/R to be finalized first. EPA expects to establish a permanent disposal volume limit by the end of 1998. This site can thus accept a maximum of 4.8 mcy per year; with that annual cap, SF-DODS could accept all material (8.4 to 10.9 mcy) suitable for unconfined aquatic disposal (SUAD) that would be dredged from the 50-foot project over the approximate 46-month construction period. The majority of the sediment to be disposed at the site would occur in the last 3 years of the 50-foot project. Sediments would be released by bottom dump barge.

The Marine Protection, Research, and Sanctuaries Act requires project sponsors to consider feasible, practicable, and environmentally superior alternatives to ocean disposal if they are available. This site would, therefore, be used only to the extent necessary.

*Hamilton Wetlands Restoration*

Under this reuse/disposal option, 2.7 to 5.2 mcy of dredged material from the 50-foot project would be delivered and used as part of a project to restore a mix of seasonal and tidal wetlands on 950 acres of subsided diked baylands at the former Hamilton Army Air Field, adjacent Navy ballfields, and decommissioned Hamilton Army antenna field (Figure 2.2-9); the Navy ballfields are located in the southwestern portion of the area shown as the former airfield on Figure 2.2-9. The Hamilton restoration site, comprised of the three properties, is located in or adjacent to the City of Novato in the County of Marin, and is bounded on the east by San Pablo Bay; on the west by U.S. Highway 101 and facilities associated with the former Hamilton Army Airbase, on the north by the Bel Marin Keys Unit V property, on the south by the St. Vincent's Catholic Youth Organization property (Figure 2.2-9).




*Source:* Port of Oakland drawing dated 9/22/97

**Figure 2.2-7**

**PLACEMENT OF MATERIAL STOCKPILE AT THE FORMER NAS ALAMEDA**

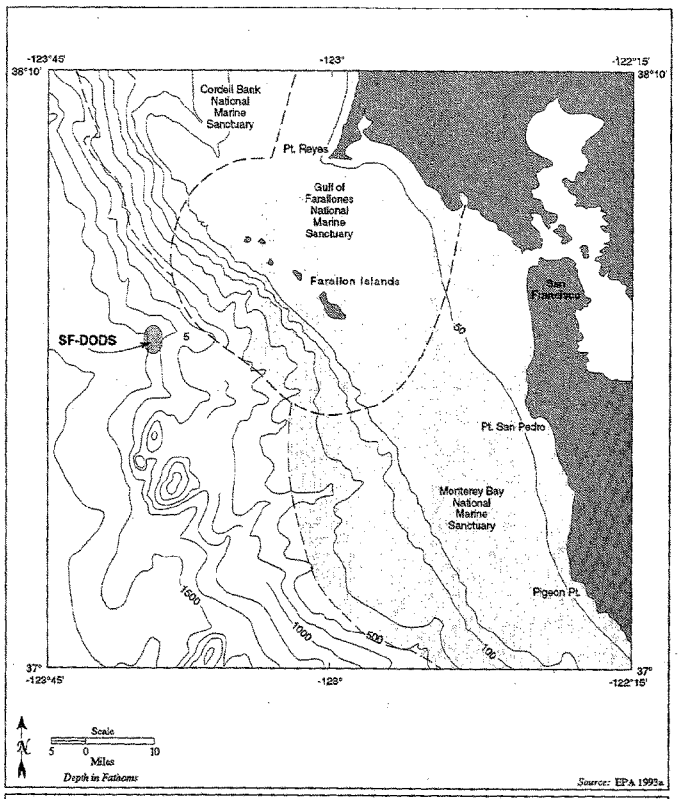



**Figure 2.2-8**

**SAN FRANCISCO DEEP OCEAN DISPOSAL SITE (SF-DODS)**

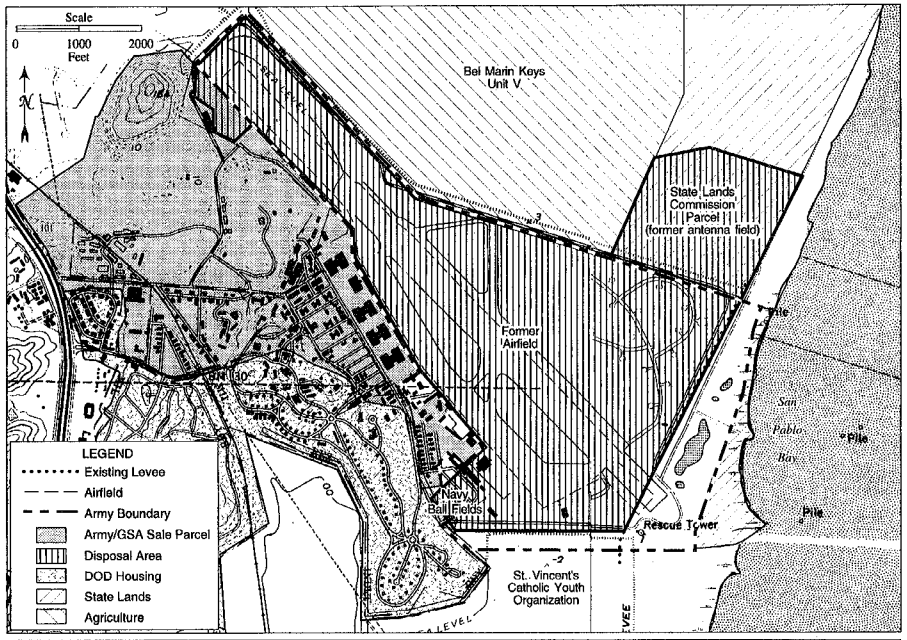



**Figure 2.2-9**

**HAMILTON AIRFIELD SITE PROPOSED FOR WETLAND RESTORATION**

The state of California is the project sponsor for the Hamilton Wetlands Restoration project and is considering use of dredged material from a variety of sources, including the Port of Oakland. The impacts attributable to the Port of Oakland project would be those associated with transporting dredged material to the Hamilton restoration site. The use of dredged material at the Hamilton site would require certain activities, such as site preparation, and off-loading and placing dredged material; however, the impacts associated with these activities would result regardless of which particular dredging project generates the material ultimately used at the site. The specific impacts associated with using dredged material for wetland restoration at the Hamilton site will be the subject of a separate CEQA/NEPA process prepared by the state of California and the U. S. Army Corps of Engineers.

The Hamilton restoration project is managed by the California Coastal Conservancy (Conservancy) and the San Francisco Bay Conservation and Development Commission (Commission), with the close coordination of the City of Novato, which is managing the contracts for preparation of the conceptual restoration plan, and the Hamilton Restoration Group, which is comprised of representatives of government, business, and environmental communities. The Conservancy and the Commission are also considering acquisition and restoration of the adjacent 1,600-acre Bel Marin Keys Unit V property which, if incorporated into the 950-acre Hamilton project, would result in a total of 2,500 acres of wetland habitat. Dredged material from the Port of Oakland's deepening project, however, is not being considered for use at the Bel Marin Keys Unit V site, and restoration of the Hamilton site using dredged material will proceed regardless of the future status of the Bel Marin Keys property.

The Hamilton restoration site was historically within the tidal zone of San Pablo Bay until levees were constructed around the turn of the century. Beginning in the 1930s, the site was used for military purposes until the early 1970s, when the federal government decided to close the site and make it available for reuse. Currently, the site is being prepared for transfer and reuse per the Base Realignment and Closure Act (BRAC) of 1988. Remediation of contaminants related to historical activities at both the airfield and antenna field is necessary, and will be completed prior to transfer of the properties. Remediation of the airfield is scheduled to be completed by mid-1999. The Conservancy has requested the federal government to transfer the airfield to the state at no cost through a public benefit discount conveyance for wildlife habitat purposes. The antenna field, which is owned by the State Lands Commission, is a formerly used defense site and is being merged with the airfield remediation project. The State Lands Commission has granted permission to incorporate the antenna field into the restoration planning. The Navy ballfields are currently available for transfer. In sum, all three properties are available for transfer from willing owners.

The conceptual restoration plan for the Hamilton site is currently being prepared under the auspices of the Hamilton Restoration Group. As a part of this effort, a preliminary investigation has indicated that most of the restoration alternatives would involve using dredged material. The Hamilton site includes low elevation areas that were once marshland and are now protected from inundation by a series of levees and pumps. The average elevation at the Hamilton restoration site is approximately 0.4 foot MLLW. The re-establishment of tidal wetlands would require higher elevations (approximately 5.0 feet MLLW for inter-tidal marsh plain) to allow the growth of wetland vegetation. These higher elevations could probably be achieved by simply breaching the existing outboard levee and allowing tidal activity to deposit sediments. However, placement of clean dredged material at the site in order to raise elevations closer to the eventual marsh plain will likely be used to hasten the colonization of the site by wetland plants and animals. The

Hamilton restoration plan also includes some features (e.g., constructed seasonal wetlands, upland wildlife corridors, and a tidal salt panne) that would likely not be created through a natural sedimentation alternative.

The placement of dredged material at the Hamilton restoration site would be achieved by pumping a slurry of dredged material across the site from barges moored in San Pablo Bay. To allow the natural formation of marsh channels and to prevent over-filling of the site, dredged material would be placed below the target elevation of the tidal marsh plain. Interior berms may also be constructed to break up wave fetch and/or to phase the placement of dredged material. (These berms would be placed at sufficiently low elevations to allow settlement over time into the marsh plain and minimize their use by predators such as the red fox.) Following consolidation of the dredged material, the bayward levee would be breached or removed to restore tidal action to the site. (A channel may be excavated through the outboard marsh and tidal mudflats to enhance tidal circulation at the restoration site. Technical studies currently underway will determine whether this component of the restoration design will be necessary; if so, its potential impacts will be examined through the separate CEQA/NEPA process to be prepared by the State of California and the U. S. Army Corps of Engineers.) The restoration project would not involve planting in tidal areas, instead vegetation would establish naturally over time.

Dredged material would also be used to restore seasonal wetland and upland transitional habitat at the Hamilton site. This would be accomplished by placing dredged material in certain areas to raise elevations above the tidal marsh plain. The material would be placed so that winter rains and sheet flow would allow shallow ponds to form in areas above tidal inundation. The site may also be designed to foster the formation of backponds and salt pannes that are hydrologically-affected by infrequent tidal flooding during extremely high tides and storm events. Finally, dredged material may also be used to construct perimeter levees and internal berms at the site. This would be accomplished by placing dredged material, allowing it to dewater and consolidate, and then re-positioning it with construction equipment. The Long-Term Management Strategy (LTMS) studies estimated that approximately 10 mcy of dredged material could be used to restore tidal wetlands at the Hamilton Airfield and the former antenna field. If dredged material is used to construct seasonal wetlands, transition uplands, and/or levees and berms, a significantly larger volume of dredged material could be used.

Under this reuse option, up to 5.2 mcy of dredged material from the Port of Oakland would be used to restore wetlands at the site. Dredged material from other Bay Area projects would likely be used to provide the balance of material needed to construct the project. Although detailed restoration strategies for the Hamilton site are not yet complete, the state and the Hamilton Restoration Group have developed two preliminary alternatives for restoring wetlands using dredged material. Under the first alternative, dredged material could be used to establish an elevation gradient across the site with freshwater non-tidal wetlands at the higher elevations, a lower transitional wetland area, and tidal wetlands along the shoreline. Under the second alternative, a levee would be constructed (possibly using dredged material) at the southeastern end of the airfield's panhandle, effectively dividing the site in two; dredged material would be used to raise existing elevations east of the levee thereby creating two distinct areas of non-tidal freshwater and tidal wetlands. Under either alternative, dredged material could also be used to construct restoration project features such as interior and perimeter levees.

Dredged material would be transported from the Port of Oakland to the vicinity of the Hamilton site by barge. The sediment would be slurried and pumped from the barges to the site through a

pipeline from a barge pumpout located approximately 5 miles offshore (at the 16-foot depth contour) in San Pablo Bay.

The restoration of the Hamilton properties would create a diverse array of tidal and seasonal wetland habitat that would benefit fish, endangered species, and other migratory and resident animal species. An upland transition area would also be restored to create buffer zones adjacent to residential areas, and provide upland refugia and wildlife corridors. In addition, the restored site would contain a public access component. Perimeter flood protection levees would be constructed to protect adjacent properties. Fresh water storm flows from the adjacent properties would also be incorporated into the project design, facilitating the development of a diverse array of habitat types while providing flood control benefits for adjacent lands.

Technical studies analyzing the various restoration alternatives and issues necessary to assess their feasibility are currently underway and are scheduled for completion in March, 1998. A NEPA/CEQA analysis and a final restoration design plan for the Hamilton project are scheduled for completion prior to commencement of the Port of Oakland's dredging project.

Because neither the conceptual restoration plan for the Hamilton site nor the technical studies have been completed, the setting discussion and impact analysis of this disposal option for this document borrow heavily from existing documents prepared by various sources. The major sources used include:

- The Draft EIR/S for the San Francisco Bay to Stockton Phase III Navigation Channel Project (COE and Contra Costa County 1997);
- The Draft EIR/S for the Montezuma Wetlands Project (COE and Solano County 1994),
- Various studies regarding remediation of contaminants at the Hamilton Air Force Base (COE 1997a,b).

***Montezuma Wetlands Restoration***

Montezuma Wetlands is the proposed site of a separate, privately-sponsored proposal (independent of the 50-foot project), referred to as the Montezuma Wetlands Project (MWP). The MWP would use dredged materials to restore approximately 1,800 acres of historic tidal wetlands, providing habitat for a variety of sensitive species that inhabit brackish tidal marshes and shallow-water habitats. The MWP is currently being considered by the appropriate federal, state, and local agencies. A Draft EIR/S on the MWP was released for public review in October 1994 (COE and Solano County 1994). This site could be used for sediment disposal from the Oakland project only after receiving all necessary permits. The following description of this site and how sediments would be deposited at the site is based on the MWP EIR/S. Since the details of the MWP are under development, the discussion of this site in this EIS/R/FS should be regarded as conceptual. Details of the proposed MWP will be evaluated in depth in the MWP EIR/S currently in process. Also, since the MWP would have to be fully approved, permitted, and constructed before this site could accept Oakland sediment, the site description below focuses on the activities that would occur during operation of the MWP, not construction. The impact assessment in Chapter 5 summarizes operational impacts from use of this site, based on the analysis in the MWP Draft EIR/S. These impacts would occur whether or not the site was used for Oakland sediments, because it would be used for other projects as well. Therefore, impacts associated with transporting dredged material to this site are attributable to the Oakland project, whereas impacts associated with disposal are not, since they have been

evaluated under separate environmental reviews and would occur independently of the 50-foot project.

The Montezuma Wetlands site is situated near Collinsville in the Suisun Marsh in Solano County (see Figure 2.2-10). The distance from the Oakland Harbor dredge area to this site is about 52 miles. The MWP applicant proposes to restore tidal wetlands by placing approximately 20 mcy of dredged materials over approximately 1,822 acres of the 2,394-acre site. The MWP is proposed to be constructed in four phases in order to minimize temporary losses of wetlands during construction and to facilitate engineered placement of dredged materials. The MWP would be divided into four phase areas, separated by engineered levees that would also serve as access roads. Each completed phase would be hydrologically independent, and each would have a single connection to Montezuma Slough or the Sacramento River. Phases would range in size from about 240 to 600 acres. Oakland sediment would be deposited only in the Phase I area (Figure 2.2-10). Between about 3.5 and 5.2 mcy of sediment could go to Montezuma, depending on the alternative selected.

The Montezuma site could accept a total of 14 mcy of sediment from the proposed project (personal communication, D. Lipton 1997). This estimate is based on 10 to 12 mcy going into Phases I and II of the MWP, plus an additional 20 percent (20 percent of the 10 to 12 mcy = 2 to 2.4 mcy) going to the sediment rehandling facility that is proposed as part of the MWP. Up to 20 percent of the dredged material received could be non-cover material and the remaining 80 percent would need to be classified as wetland cover material or better.

Dredging would be performed by two clamshell dredges. Disposal would require two 5,000-cy bottom dump scows and two 3,000-horsepower hauling tugs. Scows would moor at the off-loading facility while sediments are being unloaded, a process that takes about 3 hours. The dredged sediment would be unloaded at the MWP site by sediment pumps which pump the material out through a pipeline to the designated disposal area. Because the sediments may be too stiff, too dense, or too high in solids for pumping through a pipeline when they reach the site, groundwater or water from holding ponds would be pumped into the scows to make a mud and water mixture called slurry.

The sediment would be pumped through the transport pipeline to the cells and deposited in layers known as "lifts." Non-cover material would be covered by a minimum 3-foot-thick layer of cover material. The sediment in the slurry would settle over time. Sand and larger-grained material would settle first, and the finer-grained material would settle last. Water would be decanted off the cells into holding ponds and channels before a subsequent lift of sediment would be placed. The placement and draining operation in each cell would continue until a target elevation is reached. Several cells would be operated simultaneously to allow for disposal of a large quantity of sediments at the same time and for flexibility in receiving and placing cover and non-cover sediments.

The maximum rate of acceptance of the dredged materials, assuming 24 hours/day offloading, would be approximately 60,000 cy per day. This rate could not be achieved for an extended period, given that the slurry would need time to settle before new slurry could be added. A more average rate of acceptance would be 20,000 to 30,000 cy per day.

The analysis of the Montezuma site in this EIS/R/FS is drawn from the analysis of this site in the *John F. Baldwin Navigation Channel Project Draft EIR/S* (COE and Contra Costa County 1997).

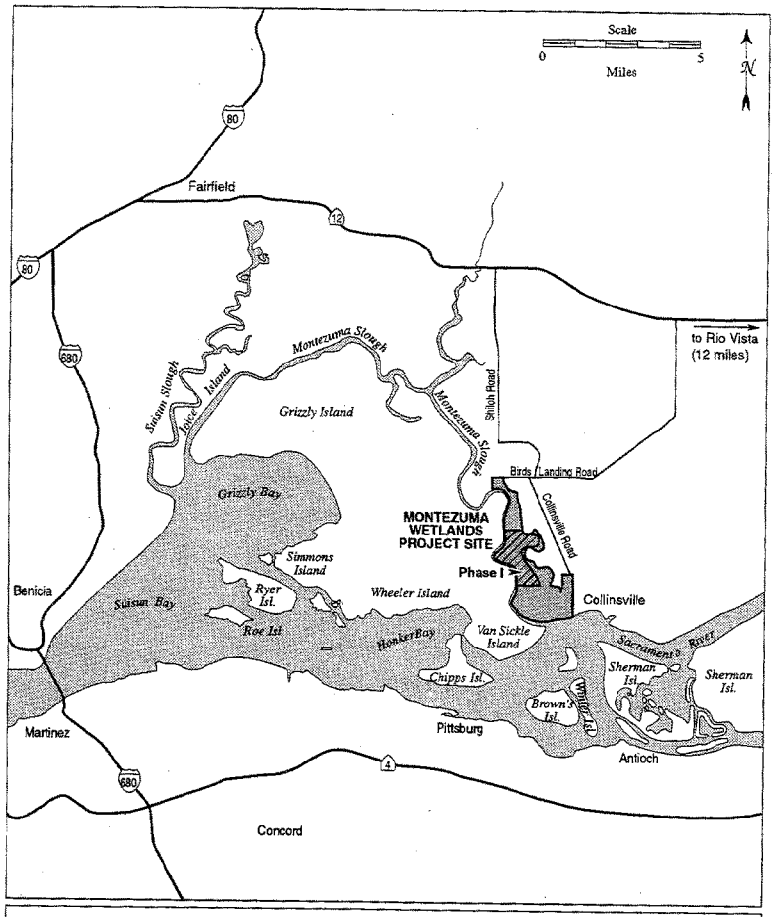



**Figure 2.2-10**

**MONTEZUMA WETLANDS SITE**

*Various Landfills*

This disposal option could be used for the most contaminated sediments and debris, up to 100,000 cy, combined. This option involves first drying the sediment at a rehandling facility. The rehandling facility could be located at one of five possible locations in the Vision 2000 area (Figure 2.2-3) for disposal or use as daily cover. Once dry, the contaminated sediments would be transported to an appropriate landfill. This rehandling facility would be the same rehandling facility described above under the Vision 2000 Upland reuse option. The most likely landfills in the Bay Area are Altamont Landfill, Redwood Landfill, or Vasco Landfill. Up to 20,000 cy of dredged material classified as hazardous waste could be sent via rail to the East Carbon Development Corporation (ECDC) facility in Utah. The ECDC accepts highly contaminated federally non-hazardous wastes (per 40 CFR 261.4 [b]). It is located 140 miles southeast of Salt Lake City in East Carbon City. Waste can be transported to the site via truck or train directly to dumpsites within the facility. At the landfill, the sediment would be put in confined disposal or could possibly be used as daily cover material.

As a worst-case situation, the impact analysis assumes that all 100,000 cy combined of sediment and debris would be trucked to a landfill in small (12-cy capacity) dump trucks. Since it is not know which of the three identified landfills would be used or whether material may go to more than one of the landfills (e.g., to both a Class II and Class III landfill), the impact analysis in Chapter 5 is based on all 100,000 cy of sediment and debris going to each of the three possible landfills. To be acceptable at any of the three landfills, the dredged material must meet a less than 50 percent moisture limit criterion and have no free liquids.

An alternative to landfilling some of the sediments would be to treat them on site or haul them to an off-site treatment facility. The sediment could be treated with Portland cement, lime, or some other treatment to improve the structural qualities of the sediments for use as construction material, and to fix the contaminants to the dredged material to inhibit migration toward the groundwater.

*Altamont Landfill*

The Altamont Landfill and Resource Recovery Facility is a Class II and Class III facility in northern Alameda County. The landfill is owned by Waste Management Company. It is located on Altamont Pass Road approximately 35 miles from Oakland northeast of the City of Livermore (Figure 2.2-11).

*Redwood Landfill*

Redwood Landfill is a Class III facility in northeastern Marin County northeast of the City of Novato (Figure 2.2-12). It is located on Redwood Highway on the east side of U.S. Highway 101, about 3 miles north of where San Marin Drive and Atherton Avenue cross the highway, and about 1 mile north of Gnoss Field Airport.

*Vasco Road Landfill*

Vasco Road Sanitary Landfill is a Class III facility in northern Alameda County located on Vasco Road northeast of the City of Livermore, just west of Altamont Landfill (Figure 2.2-11).

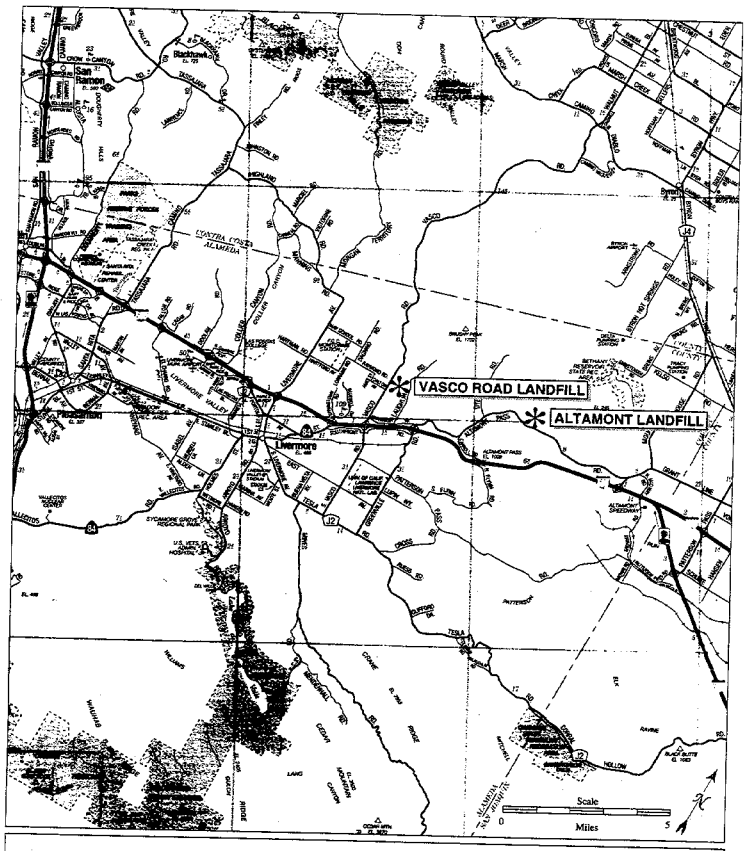



**Figure 2.2-11**

**LOCATION OF ALTAMONT LANDFILL AND VASCO ROAD LANDFILL**

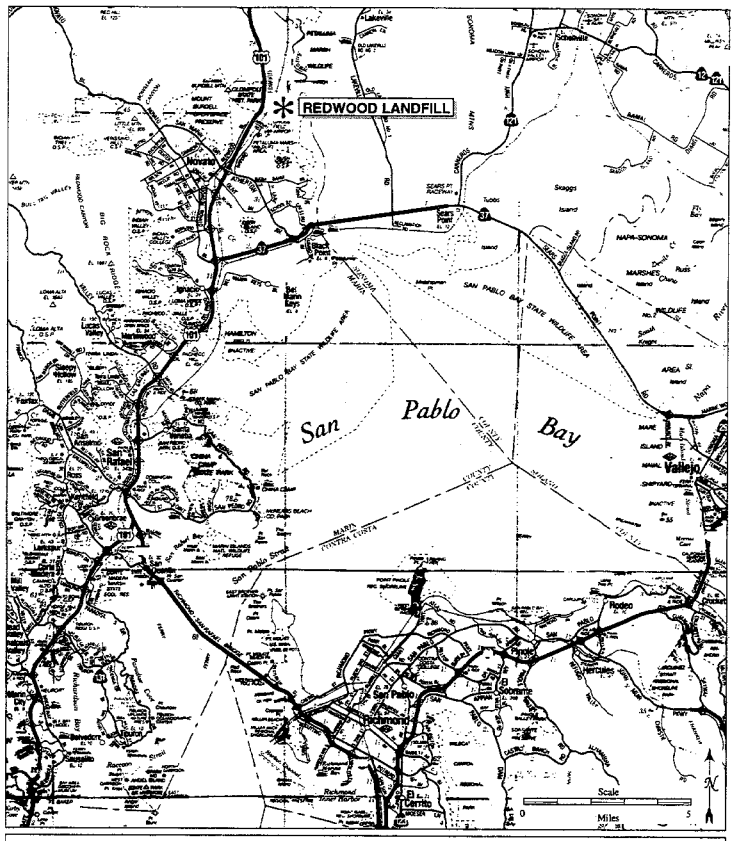



**Figure 2.2-12**

**LOCATION OF REDWOOD LANDFILL**

## 2.3 PROJECT ALTERNATIVES

Table 2.3-1 shows the distribution of dredged material to the reuse/disposal sites for each dredging option that is still considered viable. The combinations of dredging options and reuse/disposal options are further developed in Chapter 8.

**Table 2.3-1. Distribution of Dredged Volume by Dredging Option and Reuse/Disposal Option**

| | DREDGING OPTION | | |
|---|---|---|---|
| *Reuse/Disposal Option* | *A (No Project)* | *B (Maximum)* | *F (Minimum)* |
| Vision 2000 Upland | 0 | 0.5 | 0-2.5 |
| New Berth 21 | 0 | 0-2.5 | 0-2.5 |
| MHEA | 0 | 7.0 | 7.0 |
| Former NAS Alameda | 0 | 0-0.75 | 0-0.75 |
| SF-DODS | 0 | 0-6.9 | 0-5.2 |
| Hamilton Wetlands Restoration | 0 | 0-4.4 | 0-5.2 |
| Montezuma Wetlands Restoration | 0 | 0-3.65 | 0-5.2 |
| Various Landfills | 0 | 0.1 | 0.1 |
| Total Dredged Material Volume [1] | 0 | 14.5 | 12.8 |

*Note:* 1. Since not every reuse/disposal site would be used under either dredging option B or F, the sediment volumes in these two columns do not add to the indicated total volume.

### 2.3.1 No-Project Alternative

Under the no-project alternative, the proposed dredging of Oakland Harbor channels to 50 feet MLLW would not occur, and the larger ships would have to operate with less cargo than optimal or only enter the harbor at high tides. As of the end of 1996, the Port of Oakland's channels were considered to be dredged to a depth of 38 feet MLLW, even though the 42-foot deepening project had commenced in 1994 and considerable dredging had occurred in the Outer Harbor channels. During 1996, there were 1,675 vessel calls at the Port, of which approximately 50 percent were by vessels with design drafts (as defined by Lloyd's register of ships as "summer draft amidship") exceeding the channel depth of 38 feet. By 1998, the Port expects that approximately 50 percent of the deep-draft vessels calling will require channels exceeding 42 feet.

The Port of Oakland estimates that with the implementation of the proposed project, vessel calls will increase by one to two per week. The analysis of the no-project alternative performed by the Port indicates that continuation of transportation inefficiencies would result in no increase in the number of vessel calls. The volume and percentage of discretionary cargo (cargo that is subject to the water carrier's discretion regarding choice of port used) has declined as intermodal cargo is diverted to other West Coast ports because of the inability to bring the new generation of larger deep-draft vessels into the shallow channels. This could have adverse economic repercussions to the area as the Port could become more of a regional port, handling cargo to/from a defined area shrinking in size. Currently, cargo destined to or from Fresno and possibly Bakersfield is handled at the Port of Oakland and is considered within the Port's local and intermodal cargo "circle of influence." (The cargo circle of influence is the geographic area — shown as a circle with the Port at the center — that the Port ships cargo to and receives cargo from.) If the Port's intermodal cargo decreases further, the cost-benefits resulting from high volume totals may not be sufficient to prevent that cargo circle of influence (Figure 2.3-1) from shrinking and the diversion of even local

cargo to the Southern California ports. Local cargo from the outer circle of the Port's circle of influence would become more sensitive to price differentials and would shift to ports in Southern California. The Port could be reduced in size to a level that would support only the local population within the smaller circle of influence.

The no-project alternative does not necessarily mean no change from current conditions for the possible dredged material reuse/disposal sites, as described below for each of the reuse/disposal options that were not eliminated during the site screening process described in section 2.2.2. As noted below, it is likely that some of the sites (e.g., SF-DODS, Hamilton, and Montezuma Wetlands) would still eventually be used for dredged material even if the proposed Oakland Harbor deepening project did not go forward.

- **Vision 2000 Upland.** This area would receive dredged material from the Berth 55-58 project instead of the 50-foot project. Grades would still be raised and the facility would still be redeveloped under the Port's Vision 2000 Program.

- **New Berth 21.** It is likely that this berth would be constructed much later if the proposed project did not go forward. With a slower cargo growth, there would be less need for this new berth.

- **Middle Harbor Enhancement Area.** It is likely that this site would not be constructed if the proposed project did not go forward. The Port would be unable to generate sufficient sediment for the aquatic fill that is considered for this site under the proposed project.

- **Former NAS Alameda.** It is likely that redevelopment of this area would occur in accordance with Alameda redevelopment plans over an unknown timeframe. Fill would be obtained from a different source, as this redevelopment is independent of the 50-foot project.

- **SF-DODS.** Since this site has been designated by EPA as an ocean disposal site under Section 102 of the Marine Protection, Research, and Sanctuaries Act, it is likely that it would be used for some dredging projects even without the Oakland Harbor deepening project.

- **Hamilton Wetlands Restoration.** Wetland restoration is being promoted at this site independently of the Oakland project by the Corps and Coastal Conservancy, regardless of whether dredged material from San Francisco Bay would be used to facilitate the restoration. It is possible that Hamilton would be used as a sediment reuse/disposal site (e.g., for operation and maintenance [O&M] dredging under WRDA Section 204 authority) even if the Oakland Harbor project did not go forward. It is also possible that this site could be restored to a wetland over 20 or more years even without dredged material by breaching the existing bay-side levees and relying on natural sedimentation processes.

- **Montezuma Wetlands Restoration.** Wetland restoration at this site, using dredged material from San Francisco Bay, is being proposed by Levine-Fricke-Recon independently of the proposed 50-foot deepening project. If permits are issued for the Montezuma Wetlands Project, it would likely be used as a sediment reuse/disposal site even if the Oakland Harbor project did not go forward.

**Circle of Influence**

**The Port of Oakland's "Circle of Influence" is the area within which local and/or intermodal cargoes can be induced to use the Port for transfer to or from waterborne transportation.**

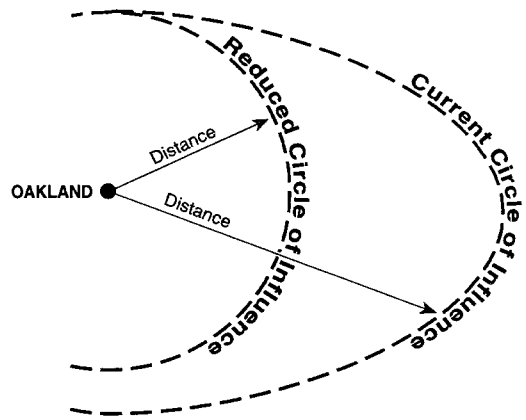



Figure 2.3-1

POTENTIAL DECREASE IN PORT OF OAKLAND'S LOCAL CARGO CIRCLE OF INFLUENCE UNDER THE NO-PROJECT ALTERNATIVE

- **Various Landfills.** Without the project, the three landfills considered under this disposal option would continue to operate as landfills. Any sediment treatment facilities that might be used by the project would likely continue to operate using sediment from other sources.

## 2.4 CONSTRUCTION PROCESS

As part of the related Port maritime development project (Berth 55-58) the northern bank of the Inner Harbor channel will be excavated and dredged to a depth of 44 feet (plus 2 feet overdepth) and the area between the new berths and the existing channel will be excavated to a depth of 42 feet (plus 2 feet overdepth). The material from the channel widening will be reused in the maritime development program as either fill for the project (both aquatic fill and upland fill). This creates the opportunity for contaminated sediments (e.g. the Inner Harbor turning basin) to be contained within this construction fill.

Therefore, the first item of work expected for the 50-foot project will be the construction of the Inner Harbor turning basin. A clamshell or excavator-type dredge will be used to construct the basin. Following demolition of the obstructing wharves and construction of the necessary bulkheads, the material will be dredged and excavated. The dredged material will be transported via scow to the Port's Vision 2000 construction site and offloaded there with a second clamshell rig.

The second item of work would involve the construction of the MHEA. An appropriate containment structure (e.g., a rock dike) along the edge of the new channel at the mouth of the Middle Harbor would be constructed. This would likely be constructed by bottom dumping and/or using a flat barge and pushing off with a bulldozer to deliver material for the structure. Since portions of the structure will be constructed to elevations above mean sea level, the final phase of construction will require a crane-mounted barge to place the top surface rock. The first phase of dredging of the MHEA would involve using a clamshell, excavator, or hopper dredge to remove the softer Young Bay Muds (YBM) which have determined to be suitable for placement as wetland non-cover (WNC). The WNC material would be transported via scow (or the hopper would transit to the site) and bottom dumped into the MHEA to create sub-bottom contours to support the MHEA creation (including internal containment structures). A detailed plan for placement will be designed to provide the correct contours to accomplish the design of the MHEA. Two clamshell rigs could operate in different areas of the channel to simultaneously dredge during this phase with a total production estimated at 10,000 cy per day.

Upon completion of the dredging for the WNC material, a cutterhead dredge would be utilized to dredge the channels (starting with the Inner Harbor) with direct discharge into the MHEA. Following placement of the soft muds, care will be taken to place the sands over the muds in order to reduce resuspension of these soft sediments as a result of displacement caused by placement of the sands. Sands would be spread carefully by either moving the discharge from a hydraulic dredge (with a diffuser to spread the material and facilitate low energy settling of the slurry) around the site or with the careful placement from bottom-dump scows in thin passes. If an insufficient volume of material can be dredged from the Inner Harbor to complete the MHEA, a portion of the Outer Harbor channel would also be dredged and placed in this manner.

The balance of the channel dredging will be done with clamshell or excavator dredges placing the material into scows for transport to the Hamilton wetland restoration site. If Hamilton is unavailable, the material will be taken to the Montezuma site, and if Montezuma is unavailable, the material will be taken to SF-DODS. Disposal at Hamilton or Montezuma will be accomplished

with the use of an unloading pump operation similar to the operation used at the Sonoma-Baylands site. Disposal at SF-DODS will be done by bottom dumping. Two to three dredges could operate simultaneously, with the number of available scows being the limiting factor. A fleet of three scows per dredge is considered to be most efficient for this type of operation.

A small volume of material from the berths to be dredged was found to be not suitable for unconfined aquatic disposal and will have to be contained together with the turning basin material in the Port's construction site. This is estimated to be 70,000 cy. The remainder of the berth dredging will utilize clamshell or excavator dredges with placement at either Hamilton, Montezuma, or SF-DODS, as indicated above.

A construction scenario was developed to assist in analyzing impacts. The scenario included phasing and equipment workforce estimates. Tables providing this information are located in Appendix T.

# 3.0 DREDGED MATERIAL EVALUATION

## 3.1 TESTING REQUIREMENTS FOR DREDGED MATERIAL

### 3.1.1 Testing Requirements for Aquatic Disposal

Dredged material proposed for disposal at aquatic sites must undergo testing to determine its potential effects on the disposal site environment, and whether it is suitable for unconfined aquatic disposal (SUAD). For ocean disposal sites, these testing requirements are defined in 40 CFR 227.6. Guidance on implementing these regulations is provided in *Evaluation of Dredged Material Proposed for Ocean Disposal – Testing Manual* (USEPA/USACE 1991), better known as the Green Book, promulgated under the Marine Protection, Research and Sanctuaries Act (MPRSA) of 1972. For disposal sites in or potentially affecting inland waters, such as San Francisco Bay, Section 404 of the Federal Water Pollution Control Act (FWPCA) of 1972 as amended by the Clean Water Act (CWA) of 1977 defines the testing requirements. The State of California has parallel legislation, and has the authority to regulate CWA dischargers in state waters under the Porter-Cologne Act. Guidance for suitability decisions for inland water is provided in *Evaluation of Dredged Material for Discharge in Inland and Near Coastal Waters – Testing Manual* (USEPA/USACE 1995), commonly called the Inland Testing Manual (ITM). The testing paradigm and evaluation procedures in the ITM are essentially the same as those in the Green Book.

Some of the tests performed on material proposed for aquatic disposal are designed to evaluate whether the proposed disposal action complies with applicable water quality requirements. For ocean disposal, these tests and related analyses determine whether the dredged material, upon disposal, will meet the limiting permissible concentration (LPC) for water column impacts. The LPC for water column impacts is defined in the Green Book as the concentration of any dissolved dredged-material constituent that will not exceed applicable marine acute water quality criteria (WQC) after initial mixing. For constituents lacking WQC, or where synergistic effects between constituents are suspected, the LPC is defined as 1 percent of the acutely toxic concentrations of dredged material. The acutely toxic concentration is defined as the concentration of dredged material that results in the mortality of 50 percent of the most sensitive test organisms in the suspended particulate phase bioassays (LC50). For ocean disposal under the MPRSA, this LPC applies within the disposal site after the 4-hour initial mixing period, and outside the boundaries of the disposal site at all times.

The procedures for assessing compliance with water quality requirements specified in the ITM are similar to those found in the Green Book. Sediment-borne chemicals of concern are first evaluated against the applicable acute water quality standards (WQSs) at the edge of a defined mixing zone. In accordance with Section 401 of the CWA, the State defines both the allowable mixing zone boundary and the applicable WQSs. In 1994, a State court overturned California's water quality control plans, which contained WQSs for priority toxic pollutants. To fill the gap in criteria created by this action, USEPA recently proposed WQSs for inland surface water, enclosed bays, and estuaries (62 FR 2160). Even if available WQSs are met for all contaminants, water column impacts must also be evaluated by toxicity testing when there are contaminants for which WQSs are not available. If the concentrations of dissolved and suspended chemicals of concern do not exceed 1 percent of the LC50s or the EC50s (concentrations resulting in sublethal effects in 50 percent of the test organisms) beyond the boundaries of the mixing zone, the material is not predicted to be acutely toxic. If the dredged material is predicted to result in acute water column

toxicity at any point outside the mixing zone, or within the mixing zone after the initial mixing period, the material is considered not suitable for open-water disposal.

*Ocean Disposal*

Section 103 of the MPRSA specifies that material dredged and transported to a designated ocean disposal site must be evaluated to determine its potential impact to the site and its environs. Criteria for the evaluation are contained in 40 CFR 227.27, and the evaluation is implemented as described in the Green Book. The objective of the testing program is to determine whether disposal in designated ocean disposal sites can occur without causing unreasonable degradation or endangerment of the environment. The regulations and criteria allow some temporary effects within the boundaries of the disposal site. The parameters for these acceptable impacts are defined in the environmental documents that permitted the use of these disposal sites. The acceptable range of effects is based on water quality criteria and LPCs; concentrations of chemicals of concern in material to be disposed must be lower than concentrations believed to cause significant impacts.

The Green Book (USEPA/USACE 1991) describes a tiered testing approach to implement the MPRSA (Section 103) regulations. This approach involves four tiers, any of which may allow determination of suitability. The tiered tests and evaluation guidelines are summarized in Table 3.1-1. Tier I uses existing information only. For dredged materials for which there is information indicating either a potential for significant environmental impact or the likelihood of no impact, Tier I evaluation may provide an adequate basis for a suitability decision. Tier II consists of mathematical modeling to predict whether disposal will result in toxicity within the water column or benthic bioaccumulation of contaminants. Tiers III and IV involve more extensive evaluation, and are appropriate when the potential for impact is less clear, or when no compelling historical data are available. Testing at each tier is not required for many situations. Testing for more than one tier may be conducted simultaneously when time is constrained. The program is intended to be as flexible as possible, and considers dredging projects on a case-by-case basis.

The protocol for determining the suitability of dredged material for ocean disposal (40 CFR 227.13) is shown in Figure 3.1-1. Such material that meets the requirements of paragraph 40 CFR 227.13(b) is eligible for Tier I evaluation and may be excluded from the technical evaluations required by Section 40 CFR 227.13, and be evaluated only in terms of its compatibility with the disposal site and the considerations of 40 CFR Subparts C, D, and E, and the appropriate sections of 40 CFR 228.

Dredged material that does not meet the conditions for exclusion according to 40 CFR 227.13(b) must receive a full technical evaluation of its potential for environmental impact. The evaluative procedures emphasize biological effects, rather than the presence of chemical contaminants. Dredged material is separated for evaluation into solid, liquid, and suspended particulate phases [40 CFR 227.32(b)(1)]. All three phases must be evaluated. When complete, evaluation of these three phases satisfies the requirement to evaluate environmental impact from constituents prohibited from dumping except as trace contaminants.

*In-Bay Disposal*

As specified in Section 404 of the CWA, any dredging proponent who wishes to dispose of dredged or fill material within State waters must apply for a permit following 404(b)(1)

**Table 3.1-1. Implementation Manual's Tiered Testing Approach**
(page 1 of 2)

| *Tier* | *Objective* | *Test* | *Interpretive Guideline* | *Action Item (when exceedances noted)* |
|---|---|---|---|---|
| Tier I | Evaluate existing information. | Review data. | Compare data to exclusionary criteria. | If exclusionary criteria are not met and information cannot determine compliance with LPCs, enter Tiers II, III, or IV. |
| | Identify contaminants of concern. | Review data. | Tiers II, III, or IV-type prior data are reviewed to determine compliance with LPCs. | If exclusionary criteria are not met and information cannot determine compliance with LPCs, enter Tiers II, III, or IV. |
| Tier II Water Column | Evaluate marine water-quality criteria (WQC) compliance using numerical mixing model. | Model. | WQC, bulk analysis screen, or elutriate do not exceed criteria. | If WQC are exceeded, LPC is not met. |
| Tier II Benthos | Evaluate potential benthic impact using calculations of theoretical bioaccumulation potential (TBP) of nonpolar organics. | Model. | TBP > TBP of reference. | Determine compliance with bioaccumulation aspects of benthic criteria. |
| Tier III Water Column | Evaluate toxicity of suspended and dissolved portions of contaminants and dredged material (after initial mixing). | Elutriate bioassays (one species each representative of phytoplankton or zooplankton, crustacean or mollusk, and fish). | Model: Concentration of dissolved plus suspended contaminants > 1 percent of the LC50 beyond the boundaries of the disposal site at any time, or anywhere after the 4-h initial mixing period. | Exceeds LPC for water column toxicity. |
| Tier III Benthos | Evaluate acute and chronic toxicity for benthos using bioassays. | Whole-sediment bioassays (filter-feeding, deposit-feeding, and burrowing species). | Mortality is statistically greater than in the reference sediment and exceeds mortality in the reference by at least 10% (20% for amphipod bioassays). | Exceeds LPC for benthic bioassay criteria (in rare cases, Tier IV). |

**Table 3.1-1. Implementation Manual's Tiered Testing Approach**
(page 2 of 2)

| *Tier* | *Objective* | *Test* | *Interpretive Guideline* | *Action Item (when exceedances noted)* |
|---|---|---|---|---|
| Tier III<br>Benthos (cont.) | Evaluate the benthic bioaccumulation of chemicals of concern. | Bioaccumulation tests (filter-feeding, deposit-feeding, and burrowing species). | Compare tissue chemistry results to FDA Action Levels:<br>a) If one or more contaminants of concern are statistically greater than FDA Action Levels, LPC is exceeded.<br>b) If all contaminants of concern are not statistically greater than FDA Action Levels or there are no FDA levels for all contaminants, determine if tissue concentrations statistically exceed those of organisms exposed to the reference sediment. | a) Exceeds LPC for bioaccumulation.<br>b) Further evaluation is required on Tier III.<br>Case-specific evaluative criteria determined by EPA/COE (see interpretive guideline). |
| Tier IV<br>Benthos | Evaluate long-term effects of exposure to dredged material | Bioassays using infaunal organisms. | Case-specific. | Case-specific evaluative criteria determined by EPA/COE. |
| | Evaluate benthic bioaccumulation. | Steady-state bioaccumulation tests. | Compare tissue chemistry results to FDA Action Levels:<br>a) If one or more contaminants of concern are statistically greater than FDA Action Levels, LPC is exceeded.<br>b) If all contaminants of concern are not statistically greater than FDA Action Levels or there are no FDA levels for all contaminants, determine if tissue concentration statistically exceed those of organisms exposed to the reference sediment. | Case-specific evaluative criteria determined by EPA/COE.<br>a) Exceeds LPC for bioaccumulation.<br>b) Further evaluation is required in Tier IV. |
| | | Use results of Tier IV bioaccumulation tests. | Tissue concentration statistically exceed those of field-collected organisms. | Case-specific evaluative criteria determined by EPA/COE. |
| | | Collect field benthic organisms. | | Determine LPC compliance. |

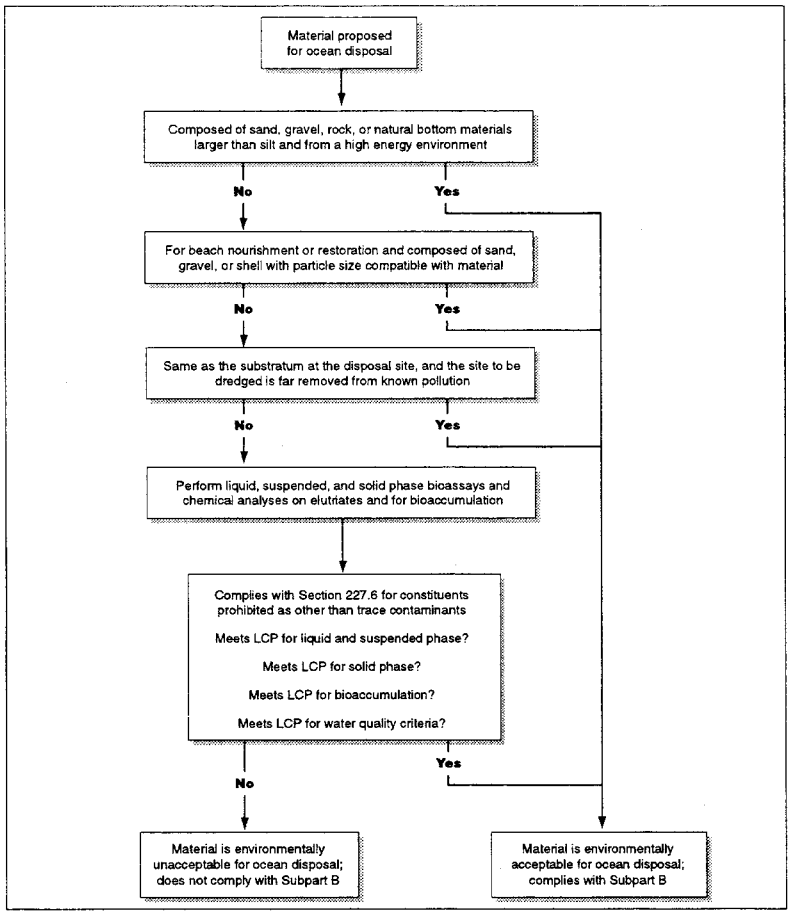



**Figure 3.1-1**

**PROTOCOL FOR DETERMINING SUITABILITY OF DREDGED MATERIAL FOR OCEAN DISPOSAL (40 CFR 227.13)**

guidelines. A Section 404 permit is required when dredged material is disposed of in either aquatic or nearshore environments, including beach nourishment and wetland fills. In California, the State has authority through the Porter-Cologne Act to permit 404 Projects, including dredging and disposal. Additionally, in cases where dredged material will be hydraulically placed in an upland environment and effluent from the disposal will be returned to navigable waters, the State has regulatory authority, typically exercised through Waste Discharge Requirements.

The Section 404 guidelines evaluate potential disposal sites based on potential impacts to the physical, chemical, and biological characteristics of the aquatic environment. The guidelines specify the following four conditions for any permit:

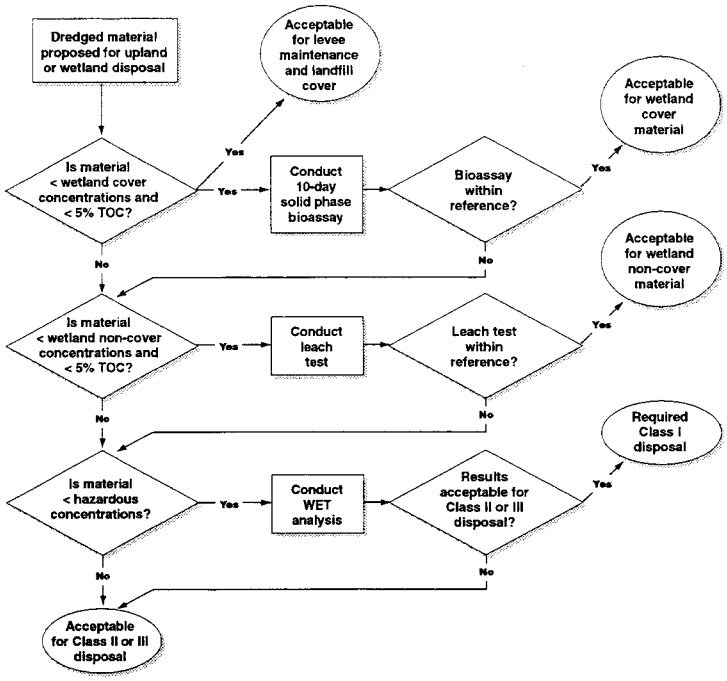
- There must be no other practicable alternatives that would have less adverse impacts on the aquatic environment (Section 404[b][1] analysis)
- The disposal must not result in violations of applicable state water quality standards, toxic effluent standards, or marine sanctuary requirements
- The disposal must not cause or contribute to significant degradation of the waters of the United States
- The permit applicant must show that all appropriate and practicable steps have been taken to minimize potential adverse impacts of the discharge on the aquatic environment

The proposal in the ITM for suitability decisions for inland open-water disposal of dredged material is essentially the same as MPRSA 103 testing (Figure 3.1-1). The tiered testing procedures are essentially the same as those in the Green Book; see Table 3.1-1. One difference, as noted previously, is that the LPC is applied at the physical boundaries of the disposal site under MPRSA 103, whereas water quality and biological criteria (1 percent of the LC50/EC50) are applied at the boundary of a state-specified mixing zone under CWA 404(b)(1).

Public Notice 93-2 from the San Francisco District Corps of Engineers provides regional guidance for disposing of dredged material in San Francisco Bay. This notice provides guidance regarding the number of samples to be tested, specific chemicals of concern, test organisms to be used for biological tests, test report format, and use of the Alcatraz environs as a reference for test evaluation.

### 3.1.2 Testing Requirements for Wetland/Upland Disposal

As with aquatic disposal, dredged material considered for disposal at upland or wetland sites must be tested to determine its suitability for such disposal. Under Section 401 of the CWA, the State (in this case, the authority is exercised by the San Francisco Regional Water Quality Control Board [SF-RWQCB]) is responsible for determining whether dredging and disposal will meet State water quality standards. The SF-RWQCB has defined its testing guidelines for wetland and upland beneficial reuse of dredged material in *Interim Sediment Screening Criteria and Testing Requirements for Wetland Creation and Upland Beneficial Use* (Wolfenden and Carlin 1992). This document's procedures for evaluating dredged material for wetland or upland disposal/use are summarized in Figure 3.1-2. These procedures include conducting chemical testing, leach testing, and bioassays.




*Source:* Wolfenden and Carlin (1992)

**Figure 3.1-2**

**UPLAND OR WETLAND DISPOSAL OPTIONS – SF-RWQCB DECISION FLOW CHART**

Testing must also be conducted for disposal options other than wetlands creation and restoration. Testing requirements for reuse of dredged material as fill, either in shallow water or for upland construction projects, are not as clearly defined by SF-RWQCB as for wetlands (Figure 3.1-2). Instead, suitability determinations are typically made on a case-by-case basis, using specific information regarding the design and location of the disposal/reuse site, and the concentrations and potential bioavailability of contaminants.

*Wetlands Creation*

For wetlands creation or restoration, the SF-RWQCB defined two types of material, "cover" and "non-cover," based on testing results.

- Cover material may be used for wetland creation and restoration areas, levee construction, and covering non-cover material. Cover sediments are those that pass leaching and bioassay tests, and contain priority pollutants at concentrations less than those specified in the SF-RWQCB's interim screening criteria (Table 3.1-2). The leaching test recommended is the modified Waste Extraction Test (mWET), and the bioassay is a 10-day solid-phase amphipod bioassay.

- Non-cover material must be covered on the top and sides by a minimum of 3 feet of cover material or native site material. Non-cover sediments are those that pass leaching tests and have chemical concentrations that exceed the criteria for cover material, but do not exceed the criteria for non-cover material (Table 3.1-2).

**Table 3.1-2. SF-RWQCB Interim Sediment Screening Criteria for Wetland/Upland Reuse**

| *Parameter (mg/kg)* | *RWQCB SSC Wetlands Creation Noncover* | *RWQCB SSC Wetlands Cover/Levee Restoration/Landfill Daily Cover* |
|---|---|---|
| Cadmium | 5-9 | <5 |
| Chromium | 220-300 | <220 |
| Copper | 90-390 | <90 |
| Lead | 50-110 | <50 |
| Mercury | 0.35-1.3 | <0.35 |
| Nickel | 140-200 | <140 |
| Silver | 1.0-2.2 | <1.0 |
| Selenium | 0.7-1.4 | <0.7 |
| Zinc | 160-270 | <160 |
| Arsenic | 33-85 | <33 |
| PCBs | 0.05-0.4 | <0.05 |
| tDDT | 0.003-0.1 | <0.003 |
| tPAHs | 4-35 | <4 |

*Notes:* mg/kg – milligrams per kilogram.
PCBs – polychlorinated biphenyls
RWQCB – California Regional Water Quality Control Board
SSC – sediment screening criteria
tDDT – sum of 4,4'-DDT; 4,4'-DDD; and 4,4'-DDE
tPAH – sum of polycyclic aromatic hydrocarbon
*Source:* Wolfenden and Carlin 1992.

*Nearshore Confined Disposal (Fill)*

The reuse of material that is not suitable for unconfined aquatic disposal (NUAD) to create new land is commonly called Nearshore Confined Disposal. Site-specific sediment chemical and engineering design information is required to determine the environmental risks of this type of reuse. The factors with direct bearing on risks which must be evaluated include depth of placement, groundwater elevation, redox potential, and potential exposure pathways. Dredged material that is not suitable for non-cover may be suitable for confined fill. Evaluative questions in these cases include the following:

1. Will fill be placed in a marine-influenced environment similar to the dredging site?
2. Will fill be placed completely upland or will it be located in or near groundwater?
3. Are there any soluble contaminants, and if so, at what concentrations?
4. Is there a need to perform modeling to predict the potential for contaminant movement from the site?
5. Does the fill design adequately confine contaminants in place?

Soluble contaminants are assessed using mWET analyses. If the mWET results indicate (1) that contaminants will not leach into the interstitial water under the conditions that will exist in the fill material at the placement site, or (2) that contaminants will leach into the interstitial water, but will not result in violation of Bay water quality standards, the material may be suitable for reuse as fill, subject to evaluation of the other site-specific factors described above.

*Upland Construction*

The issues related to the chemical suitability of dredged material for reuse in upland construction are similar to the issues for its reuse as fill to create new land, but there may be additional factors to consider. Dredged material from the marine environment that is placed into a fresh or brackish water environment may undergo complex chemical processes, making contaminants in the material more available than if the material were used as fill in a marine environment. Material placed as upland fill may need to be covered with asphalt or concrete, isolating it from the surrounding environment. However, depending on the depth of placement, workers conducting subsurface construction or maintenance on the site may be exposed to the material. A human health risk assessment should be conducted to determine risk to construction workers. If the contaminants in the material have the potential for migration into groundwater or pose a health risk to construction workers, treatment may be an option. Standard soil treatments, such as amendment with lime, NaSi, fly ash, or Portland cement may be useful in reducing the potential for contaminant transport or exposure.

Since there are no criteria for construction reuse, the risks of contaminants leaching from the fill into groundwater or back into the Bay should be assessed. Further, the Port must determine that the reuse of the material for construction on Port property poses an acceptable, minimal, or manageable risk to construction workers, and a minimal risk to Marine Terminal employees. The material is suitable for construction reuse if:

1. mWET results indicate that contaminants will not leach into the interstitial water under the conditions that will exist in the placement environment, or, if leaching may occur but at a rate insufficient to result in violation of Bay water quality standards;

2. The Port determines through a risk assessment that the material poses an acceptable risk for construction and terminal workers.

*Landfill Disposal*

Material that is considered a hazardous waste because it exceeds the chemical criteria listed in Title 22, Section 66261.24 of the California Code of Regulations must be disposed of in a Class I landfill. Other material may be disposed of in a Class II or Class III landfill, depending on the results of the mWET analysis (Figure 3.1-2). Once adequately characterized, most material is suitable for disposal in landfills. However, due to the cost and logistical problems associated with landfill disposal, only hazardous materials, materials with highly soluble contaminants that cannot be appropriately managed on site, or materials determined by the Port to be unacceptable as construction materials will be placed in landfills.

The concentration of contaminants acceptable for disposal in a landfill depends on the design and classification of the landfill. In California, Class I landfills can accept any material, including hazardous wastes. Class II landfills are similar in design to Class I landfills, but will only accept waste below hazardous waste criteria concentrations. Some Class III landfills can accept some contaminated material, depending on the landfill design and location. Typically, Class III landfills only accept material containing low concentrations of contaminants. Currently, California landfills are being designed and upgraded to standards in Subtitle D of the California Code of Regulations. Subtitle D landfills can accept materials with contaminant concentrations similar to those in materials currently accepted by Class II landfills. Each landfill determines its own waste acceptance criteria and testing requirements, in accordance with applicable regulations. Specific landfills will be targeted for dredged material disposal depending on the concentrations of contaminants in the sediments.

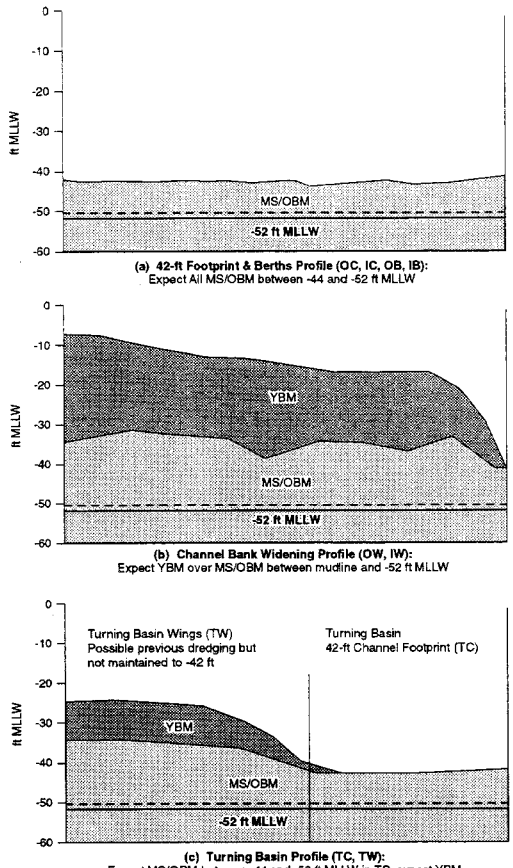
## 3.2 SUMMARY OF RESULTS OF DREDGED MATERIAL TESTING

### 3.2.1 Sampling Design

The DMMO reviewed the draft sampling and analysis plan (SAP), and the resulting comments were incorporated into the final SAP. The DMMO approved the final version of the SAP that was used for the field program.

The sampling, compositing, and testing strategy for the 50-foot project reflected regulatory guidelines and existing data on stratigraphy, as well as the known physical, chemical, and toxicological characteristics of Oakland Harbor sediments. The key factor on which this strategy was based is the geology of the area. The three stratigraphic units of interest in Oakland Harbor are the surface sediments (Younger Bay Mud, or YBM) and the underlying material, which includes Merritt and Posey Sands (MS) and Older Bay Mud (OBM). For the purposes of this sediment characterization, underlying materials have been treated as one unit (MS/OBM). Figure 3.2-1 shows a hypothetical sediment cross-section of these units.

Data from the previous 42-foot project showed that MS/OBM sediments were relatively free of contaminants and posed no environmental risks; these sediments were approved for unconfined




**(a) 42-ft Footprint & Berths Profile (OC, IC, OB, IB):**
Expect All MS/OBM between -44 and -52 ft MLLW

**(b) Channel Bank Widening Profile (OW, IW):**
Expect YBM over MS/OBM between mudline and -52 ft MLLW

**(c) Turning Basin Profile (TC, TW):**
Expect MS/OBM between -44 and -52 ft MLLW in TC, expect YBM over MS/OBM between mudline and -52 ft MLLW in TW

**Figure 3.2-1**

**HYPOTHETICAL SEDIMENT PROFILES FOR (a) 42-FOOT CHANNEL AND BERTHS, (b) BANK WIDENING AREAS, AND (c) TURNING BASIN EXPANSION**

aquatic disposal (COE and Port of Oakland 1994). These data were summarized in a Tier I evaluation performed for the 50-foot project (EVS 1997c). The major purpose of the Tier I evaluation was to confirm, based on available recent and historical information, that the sediments proposed for dredging conclusively meet one or more of the three the exclusionary criteria listed in 40 CFR 227.13(b), and could be disposed of at unconfined, offshore disposal sites without further analyses. The existing data on MS/OBM sediments show that these formations generally meet the third exclusionary criterion:

> When - (i) the material proposed for dumping is substantially the same as the substrate at the proposed disposal site; *and* (ii) the site from which the material proposed for dumping is to be taken is far removed from known existing *and* historical sources of pollution so as to provide reasonable assurance that such material has not been contaminated by such pollution.

The results of the Tier I evaluation provided the basis for the sampling and compositing frequency for the 50-foot project, as well as the rationale for performing only confirmatory chemical analyses of MS/OBM sediments to verify their suitability for unconfined aquatic disposal. The Tier I evaluation document was reviewed by the DMMO.

Data from the 42-foot project also showed that while some YBM was suitable for unconfined aquatic disposal, the surface YBM generally had higher concentrations of anthropogenic compounds and that some YBM caused adverse biological effects. To achieve the most accurate characterization of surface sediments in the 50-foot project, YBM sediments were separated into the following three depth layers:

- Surface YBM, or YS, the top 4 feet of YBM below the mudline
- Middle YBM, or YM, from 4 feet below the mudline to 8 feet below the mudline
- Bottom YBM, or YB, from 8 feet below the mudline to contact with MS/OBM

Previous studies have typically found the contact between YBM and MS/OBM to be at an average elevation of approximately -40 feet MLLW in most of the proposed dredging area. Dredging for the 42-foot project removed much of the YBM down to MS/OBM in the Outer and Inner Harbor channels.

The proposed dredging footprint for the 50-foot project was divided into areas that accounted for the anticipated sediment stratigraphy to facilitate tracking of sample collection and compositing. Different sediment types were assigned screening factors (SF1, SF2, or SF3) that specified sampling frequency and sample compositing requirements, depending on location. These screening factors were developed by the Port based on findings of the 42-foot project; they reflected considerations of sediment type and the potential for adverse effects from chemical characteristics of the sediment. Sediments believed, as a result of Tier I evaluation, to be suitable for unconfined aquatic disposal were assigned a screening factor of SF1, while those believed not suitable for unconfined aquatic disposal were assigned a screening factor of SF3. A designation of SF2 indicated a lack of information about the sediment, and thus a potential for adverse environmental effects. Areas which were primarily MS/OBM (the 42-foot project footprint) were designated SF1, while areas with large amounts of YBM were designated SF2 or SF3, depending on their location and the associated likelihood of contamination.

SF1 sediments areas were tested at a frequency of one 4-sample composite per 400,000 cubic yards; SF2 sediments were tested by one 4-sample composite per 100,000 cubic yards; and SF3 sediments were tested by one 4-sample composite per 50,000 cubic yards. Geographically, most of the 42-foot project footprint was designated SF1; the bank widening areas, berths, and the turning basin within the 42-foot project footprint were designated SF2; and the widening area on the south side of the turning basin (turning wings) plus two suspected drydock pits near Berths 60 and 61 were designated SF3. MS/OBM was tested at the SF1 frequency except for MS/OBM taken from the Outer and Inner Harbor berths and the turning basin, which was tested at the SF2 frequency. YBM from the bank widening areas and the channel footprint area within the turning basin was tested at the SF2 frequency, while YBM from the turning basin wings and drydock pits was tested at the SF3 frequency.

Sediment cores were collected at 207 locations in Outer and Inner harbors using a barge-mounted vibratory-hammer coring apparatus. Target depth for coring was 52 feet MLLW. Further details regarding core sample collection are contained in Appendix H; all cores met the requirements of the Marine Sampling and Analysis Plan (SAP). In summary, 92 of the 105 composite samples identified in the Marine SAP were collected. Three composite samples were formed with less than the full complement of planned cores, and 13 individual samples were obtained from the marine sediment cores. Individual samples from each core were collected and archived in case additional testing was required.

After the completion of the primary field sampling effort in summer 1997, the Port conducted two additional sampling programs, one in January 1998 and one in April 1998, to further characterize the YBM layer in the Outer and Inner Harbor channels and a portion of the Inner Harbor widening area. YBM sediment that met criteria for use as non-cover material, but did not meet criteria for use as cover material was further delineated. The DUs which exhibited YBM sediment of this nature were characterized with additional cores in order to isolate the localized area of sediments contributing to the overall toxicity of each DU. In addition, the January field effort was initiated due to the unanticipated presence of a thicker YBM layer in two Outer Harbor Channel and one Inner Harbor Channel composite cells, which resulted in the respective composite samples representing much larger volumes than originally estimated.

For these additional field efforts, the DMMO requested a higher sampling frequency for each DU. Therefore, to accommodate the increased frequency for theses areas and to further delineate potential areas of concern, additional smaller DUs were created. The increased number of DUs or composite samples within both the January and April field efforts provided the means to characterize YBM at a higher spatial resolution and thereby distinguish subareas of concern. The benefit to this strategy was in the potential reduction of the volume of YBM that might need to be disposed of as non-cover material. Figures 3.2-2 through 3.2-5 and the various tables in this chapter include details of the high-resolution sampling effort. Results of the January sampling and testing are included, but results of the April effort are not yet available for inclusion.

The chemical analyses and toxicity tests that were performed on the composite samples followed guidance provided in PN 93-2 and the Green Book, as described in Appendix H. Review of the results of the initial chemical analysis of composite sediment samples led to the selection of a subset of these samples that were submitted for additional analysis using the mWET procedure. Selection was performed in accordance with guidelines contained in Wolfenden and Carlin (1992). According to these guidelines, sediments with chemical concentrations that exceed cover criteria

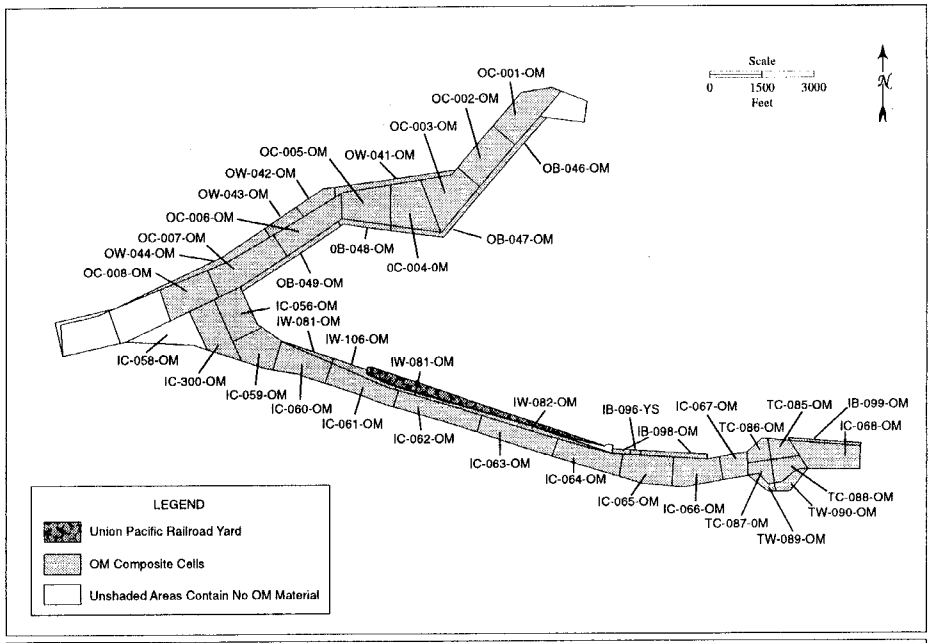



**Figure 3.2-2**

**COMPOSITE CELLS FOR THE MS/OBM SEDIMENT LAYER (OM)**

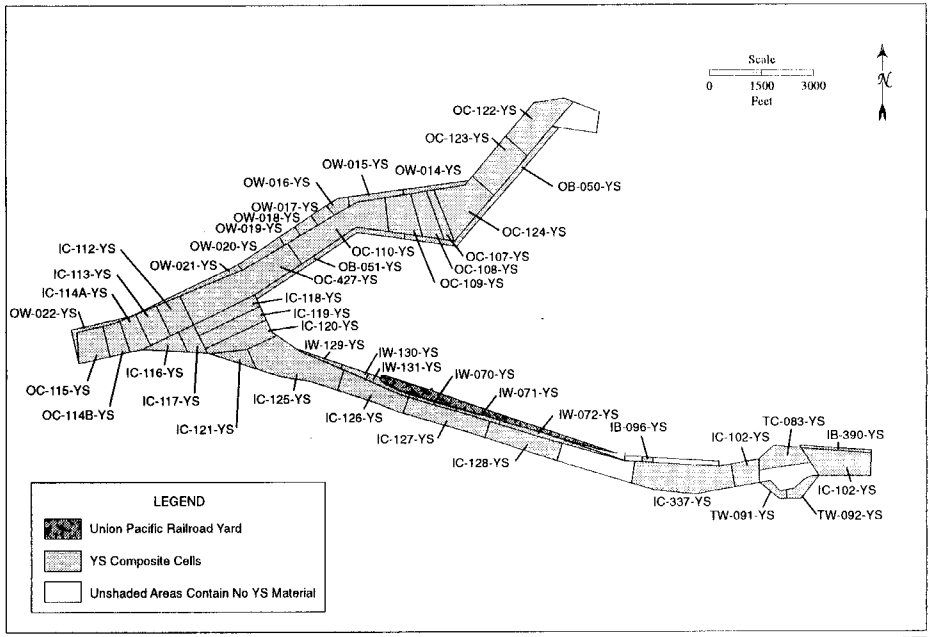



**Figure 3.2-3**

**COMPOSITE CELLS FOR THE UPPER 4-FOOT INTERVAL OF YBM (YS)**

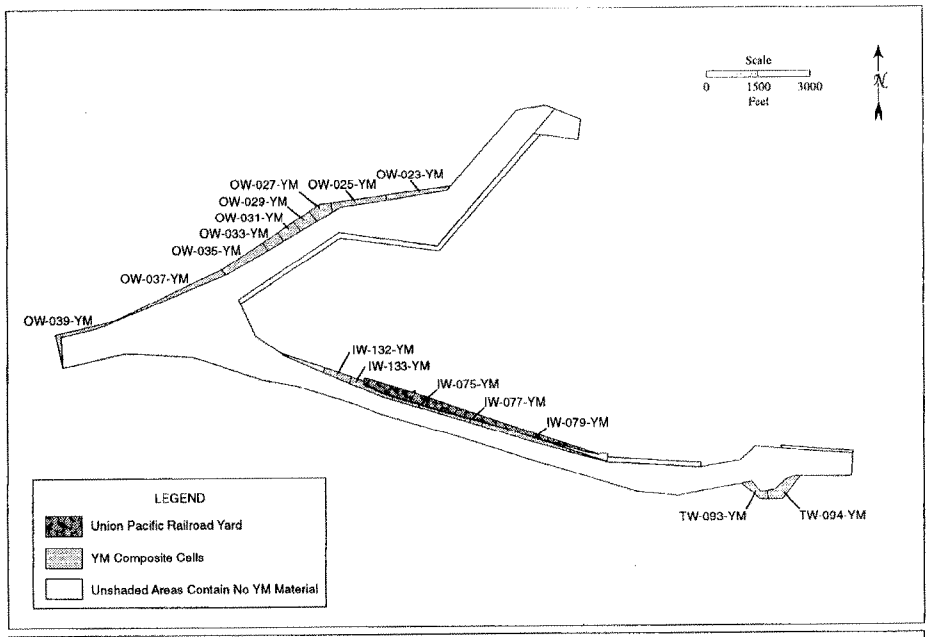



**Figure 3.2-4**

**COMPOSITE CELLS FOR THE 4-FOOT TO 8-FOOT INTERVAL OF YBM (YM)**

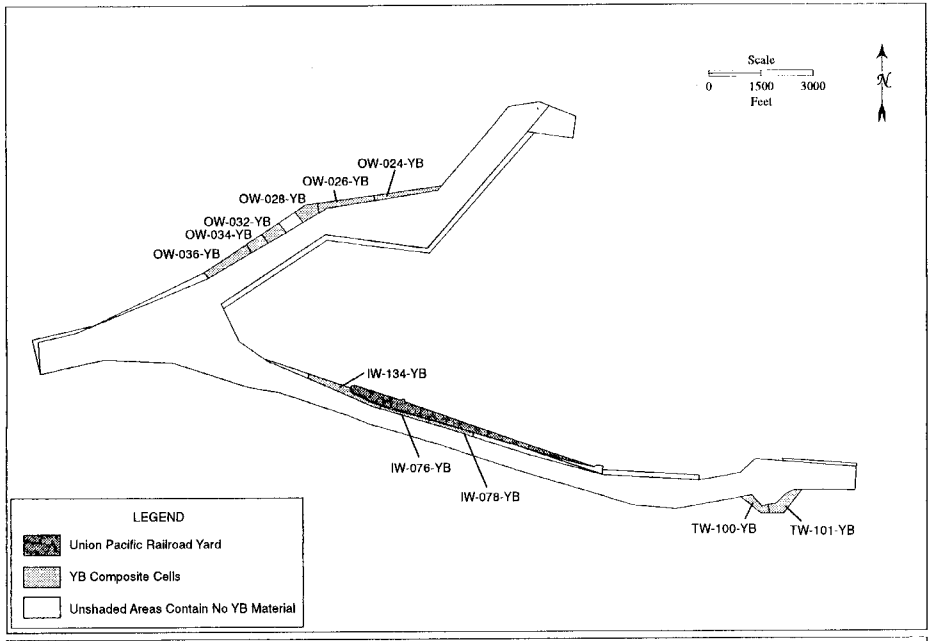



**Figure 3.2-5**

**COMPOSITE CELLS FOR THE 8-FOOT TO MS/OBM CONTACT YBM LEVEL (YB)**

but are less than non-cover criteria require additional analysis to evaluate the potential for contaminants to leach back into the environment.

Toxicity Characteristic Leaching Procedure (TCLP) analysis was also performed on a limited number of the most contaminated samples. TCLP analysis is used to determine if material is a Federal hazardous waste.

A discussion of the mWET procedure and details of the method of selecting samples for mWET and TCLP analysis are presented in a technical memorandum in Attachment 12 of Appendix H. Results of mWET and TCLP analysis are presented in section 3.2.4 of this chapter. Archived material was used for the tests.

### 3.2.2 Summary of Sediment Chemistry Test Results

The chemical and physical parameters that were measured were selected to provide data on potential contaminants of concern, or to address testing requirements for specific disposal options. The categories of chemical analytes included metals (which as used here includes metalloids), pesticides, polycyclic aromatic hydrocarbons (PAHs), tributyltin, and polychlorinated biphenyls (PCBs). Conventional parameters included total organic carbon, total sulfides, water soluble sulfides, grain size, total volatile solids, and total solids. The sediment chemistry results are briefly summarized here, and presented in detail in Appendix H. The results are summarized both by location and sediment stratum. The number of samples analyzed for each location/ stratum combination are given in Table 3.2-1.

*Merritt Sands/Older Bay Mud*

Table 3.2-2 summarizes mean concentrations in each of the eight areas or dredging units (DUs); the mean concentrations were relatively similar in all areas, with the lowest and highest mean concentrations generally within a factor of two of each other.

The MS/OBM from the DUs had chromium concentrations greater than 220 ppm, the wetland cover criterion, but less than 300 ppm, the noncover criterion. Observed concentrations of chromium cause concern due to the hexavalent form of chromium, which is much more toxic and biologically active than the more commonly found forms. Previous studies by the Port of Oakland have indicated that the chromium concentrations in the East Bay are naturally elevated and do not include the more toxic hexavalent form of chromium (Ward et al. 1990a,b; Ward et al. 1992a, b). Based on these findings, it is believed that slight exceedances in the chromium cover standard up to 300 ppm are acceptable. A full discussion of these results is presented in the intensive studies for the 38-foot and 42-foot projects (Ward et al. 1990a,b; Word et al. 1992a,b).

Organic compounds were detected less frequently than metals in the MS/OBM samples. Low-molecular weight PAHs (LPAHs) were detected in only 6 of 42 samples, and high-molecular weight PAHs (HPAHs) in 21 of 42 samples. Other organic compounds (total DDT, total PCBs, and tributyltin) were detected in no more than 2 of the 42 samples of MS/OBM (Table 3.2-2).

**Table 3.2-1. Summary of Sediment Samples and Analyses Conducted [a]**

| Area | Number for Sediment Chemistry | | | | Number for Acute Toxicity [b] | | | |
|---|---|---|---|---|---|---|---|---|
| | *Surface YBM (YS)* | *Subsurface YBM (YM)* | *Subsurface YBM (YB)* | *MS or OBM* | *Surface YBM (YS)* | *Subsurface YBM (YM)* | *Subsurface YBM (YB)* | *MS or OBM* |
| Outer Harbor channel | 13 | 0 | 0 | 8 | 12 | 0 | 0 | 0 |
| Outer Harbor bank widening | 9 | 9 | 6 | 4 | 9 | 8 | 6 | 0 |
| Outer Harbor berths | 2 | 0 | 0 | 4 | 0 | 0 | 0 | 0 |
| Inner Harbor channel | 12 | 0 | 0 | 12 | 11 | 0 | 0 | 0 |
| Inner Harbor bank widening | 6 | 5 | 3 | 3 | 6 | 5 | 3 | 0 |
| Inner Harbor berths | 2 | 0 | 0 | 2 | 0 | 0 | 0 | 0 |
| Turning basin (channel) | 2 | 0 | 0 | 4 | 0 | 0 | 0 | 0 |
| Turning basin wings | 5 | 5 | 6 | 5 | 0 | 0 | 0 | 0 |
| **Total for Sediment Type** | **51** | **19** | **15** | **42** | **38** | **13** | **9** | **0** |
| **Grand Total for Analysis** | 127 | | | | 60 | | | |

*Notes*: a. Totals include all samples collected in summer 1997 and during high-resolution characterization during January 1998 and April 1998. Results for April 1998 samples will be available in late May 1998.

b. Acute toxicity testing consists of a solid-phase test with the amphipod, *Ampelisca abdita*, and a suspended particle phase water-column test with larvae of either the mussel, *Mytilus galloprovincialis* or the sea urchin, *Strongylocentrotus purpuratus*.

## Table 3.2-2. Oakland Sediment Concentration Ranges for MS/OBM

(page 1 of 2)

| | *Arsenic (mg/kg)* | *Cadmium (mg/kg)* | *Chromium (mg/kg)* | *Copper (mg/kg)* | *Lead (mg/kg)* | *Mercury (mg/kg)* | *Nickel (mg/kg)* | *Selenium (mg/kg)* | *Silver (mg/kg)* | *Zinc (mg/kg)* |
|---|---|---|---|---|---|---|---|---|---|---|
| **Inner Harbor Berths (OBM)** | | | | | | | | | | |
| # detected/total | 2/2 | 2/2 | 2/2 | 2/2 | 2/2 | 2/2 | 2/2 | 1/2 | 2/2 | 2/2 |
| Min. detected conc. | 3.03 | 0.0710 | 86.4 | 12.4 | 8.94 | 0.0330 | 55.2 | 0.170 | 0.0300 | 50.5 |
| Max. detected conc. | 4.56 | 0.124 | 189 | 18.8 | 14.1 | 0.0400 | 66.9 | 0.170 | 0.0750 | 52.1 |
| Mean detected conc. | 3.80 | 0.0975 | 138 | 15.6 | 11.5 | 0.0365 | 61.1 | na | 0.0525 | 51.3 |
| **Inner Harbor Channel (OBM)** | | | | | | | | | | |
| # detected/total | 12/12 | 12/12 | 12/12 | 12/12 | 12/12 | 12/12 | 12/12 | 8/12 | 10/12 | 12/12 |
| Min. detected conc. | 2.29 | 0.0610 | 116 | 6.51 | 6.06 | 0.00500 | 35.1 | 0.0300 | 0.0200 | 32.8 |
| Max. detected conc. | 7.27 | 0.269 | 248 | 36.4 | 12.6 | 0.0620 | 112 | 0.110 | 0.147 | 93.1 |
| Mean detected conc. | 3.66 | 0.112 | 169 | 12.1 | 7.91 | 0.0200 | 54.4 | 0.0558 | 0.0540 | 46.9 |
| **Inner Harbor Widening Area (OBM)** | | | | | | | | | | |
| # detected/total | 3/3 | 2/3 | 3/3 | 3/3 | 3/3 | 3/3 | 3/3 | 2/3 | 3/3 | 3/3 |
| Min. detected conc. | 2.24 | 0.0220 | 203 | 8.03 | 5.83 | 0.00700 | 48.3 | 0.110 | 0.0180 | 31.6 |
| Max. detected conc. | 3.63 | 0.0780 | 206 | 15.5 | 7.30 | 0.0130 | 68.0 | 0.110 | 0.0290 | 59.7 |
| Mean detected conc. | 3.02 | 0.0500 | 204 | 10.8 | 6.71 | 0.00930 | 55.5 | 0.110 | 0.0250 | 47.0 |
| **Turning Basin Wings (OBM)** | | | | | | | | | | |
| # detected/total | 5/5 | 1/5 | 5/5 | 5/5 | 5/5 | 4/5 | 5/5 | 0/5 | 1/5 | 5/5 |
| Min. detected conc. | 2.33 | 0.179 | 92.2 | 6.78 | 6.20 | 0.00400 | 37.5 | na | 0.0320 | 32.2 |
| Max. detected conc. | 10.2 | 0.179 | 239 | 15.2 | 7.22 | 0.0620 | 71.6 | na | 0.0320 | 55.9 |
| Mean detected conc. | 4.14 | na | 142 | 10.3 | 6.71 | 0.0263 | 52.5 | na | na | 38.8 |
| **Turning Basin (channel) (OBM)** | | | | | | | | | | |
| # detected/total | 4/4 | 4/4 | 4/4 | 4/4 | 4/4 | 4/4 | 4/4 | 1/4 | 4/4 | 4/4 |
| Min. detected conc. | 3.50 | 0.0930 | 123 | 10.8 | 6.69 | 0.0210 | 52.9 | 0.130 | 0.0640 | 49.3 |
| Max. detected conc. | 8.14 | 0.212 | 194 | 35.0 | 10.7 | 0.0670 | 92.9 | 0.130 | 0.132 | 83.4 |
| Mean detected conc. | 4.91 | 0.141 | 173 | 19.6 | 8.54 | 0.0470 | 70.3 | na | 0.0875 | 65.1 |
| **Outer Harbor Widening Area (OBM)** | | | | | | | | | | |
| # detected/total | 4/4 | 2/4 | 4/4 | 4/4 | 4/4 | 4/4 | 4/4 | 3/4 | 4/4 | 4/4 |
| Min. detected conc. | 3.48 | 0.0630 | 171 | 8.49 | 5.94 | 0.00800 | 49.0 | 0.0700 | 0.0150 | 41.4 |
| Max. detected conc. | 5.92 | 0.0860 | 183 | 10.7 | 7.15 | 0.0150 | 57.5 | 0.420 | 0.0620 | 50.8 |
| Mean detected conc. | 4.17 | 0.0745 | 178 | 9.72 | 6.58 | 0.0120 | 53.6 | 0.200 | 0.0383 | 45.5 |
| **Outer Harbor Channel (OBM)** | | | | | | | | | | |
| # detected/total | 8/8 | 6/8 | 8/8 | 8/8 | 8/8 | 8/8 | 8/8 | 6/8 | 6/8 | 8/8 |
| Min. detected conc. | 2.46 | 0.0490 | 176 | 7.15 | 5.54 | 0.00400 | 54.9 | 0.0800 | 0.0140 | 37.1 |
| Max. detected conc. | 6.51 | 0.594 | 297 | 19.2 | 13.0 | 0.0350 | 73.0 | 0.640 | 0.0630 | 130 |
| Mean detected conc. | 4.01 | 0.176 | 243 | 12.2 | 7.38 | 0.0135 | 65.2 | 0.285 | 0.0408 | 62.8 |
| **Outer Harbor Berths (OBM)** | | | | | | | | | | |
| # detected/total | 4/4 | 3/4 | 4/4 | 4/4 | 4/4 | 4/4 | 4/4 | 2/4 | 4/4 | 4/4 |
| Min. detected conc. | 2.47 | 0.0660 | 155 | 7.02 | 6.74 | 0.00400 | 49.0 | 0.110 | 0.0210 | 37.0 |
| Max. detected conc. | 5.02 | 0.564 | 288 | 20.4 | 12.0 | 0.0840 | 78.7 | 0.240 | 0.0400 | 72.0 |
| Mean detected conc. | 3.51 | 0.236 | 214 | 11.2 | 8.55 | 0.0305 | 60.4 | 0.175 | 0.0348 | 52.1 |

Table 3.2-2. Oakland Sediment Concentration Ranges for MS/OBM
(page 2 of 2)

| | *Total LPAHs (µg/kg)* | *Total HPAHs (µg/kg)* | *Total PAHs (µg/kg)* | *Total DDD,DDE and DDT (µg/kg)* | *Total PCBs (µg/kg)* | *Tributyltin (µg/kg)* |
|---|---|---|---|---|---|---|
| **Inner Harbor Berths (OBM)** | | | | | | |
| # detected/total | 0/2 | 2/2 | 1/2 | 0/2 | 0/2 | 0/2 |
| Min. detected conc. | na | 3.84 | 13.0 | na | na | na |
| Max. detected conc. | na | 13.0 | 13.0 | na | na | na |
| Mean detected conc. | na | 8.42 | na | na | na | na |
| **Inner Harbor Channel (OBM)** | | | | | | |
| # detected/total | 1/12 | 1/12 | 1/12 | 0/12 | 1/12 | 1/12 |
| Min. detected conc. | 8.31 | 80.1 | 88.4 | na | 5.32 | 1.63 |
| Max. detected conc. | 8.31 | 80.1 | 88.4 | na | 5.32 | 1.63 |
| Mean detected conc. | na | na | na | na | na | na |
| **Inner Harbor Widening Area (OBM)** | | | | | | |
| # detected/total | 0/3 | 3/3 | 3/3 | 0/3 | 0/3 | 0/3 |
| Min. detected conc. | na | 4.62 | 4.62 | na | na | na |
| Max. detected conc. | na | 16.1 | 16.1 | na | na | na |
| Mean detected conc. | na | 9.60 | 9.60 | na | na | na |
| **Turning Basin Wings (OBM)** | | | | | | |
| # detected/total | 2/5 | 3/5 | 3/5 | 0/5 | 0/5 | 0/5 |
| Min. detected conc. | 23.0 | 5.18 | 9.48 | na | na | na |
| Max. detected conc. | 425 | 141 | 430 | na | na | na |
| Mean detected conc. | 224 | 51.9 | 201 | na | na | na |
| **Turning Basin (channel) (OBM)** | | | | | | |
| # detected/total | 1/4 | 3/4 | 3/4 | 0/4 | 1/4 | 1/4 |
| Min. detected conc. | 71.5 | 7.50 | 7.50 | na | 8.80 | 0.500 |
| Max. detected conc. | 71.5 | 852 | 924 | na | 8.80 | 0.500 |
| Mean detected conc. | na | 293 | 317 | na | na | na |
| **Outer Harbor Widening Area (OBM)** | | | | | | |
| # detected/total | 0/4 | 3/4 | 3/4 | 0/4 | 0/4 | 0/4 |
| Min. detected conc. | na | 7.31 | 7.31 | na | na | na |
| Max. detected conc. | na | 20.7 | 20.7 | na | na | na |
| Mean detected conc. | na | 12.8 | 12.8 | na | na | na |
| **Outer Harbor Channel (OBM)** | | | | | | |
| # detected/total | 1/8 | 5/8 | 4/8 | 0/8 | 0/8 | 0/8 |
| Min. detected conc. | 5.40 | 3.85 | 4.92 | na | na | na |
| Max. detected conc. | 5.40 | 24.8 | 24.8 | na | na | na |
| Mean detected conc. | na | 11.5 | 14.8 | na | na | na |
| **Outer Harbor Berths (OBM)** | | | | | | |
| # detected/total | 1/4 | 2/4 | 1/4 | 0/4 | 0/4 | 0/4 |
| Min. detected conc. | 5.45 | 2.84 | 26.6 | na | na | na |
| Max. detected conc. | 5.45 | 21.2 | 26.6 | na | na | na |
| Mean detected conc. | na | 12.0 | na | na | na | na |

*Younger Bay Mud (Outer Harbor Areas)*

All of the metals analyzed were detected in 34 of 36 samples of YBM from the Outer Harbor Area (Table 3.2-3). Selenium was the only metal undetected in the other two samples. With the exception of chromium, nickel, and selenium, mean concentrations of metals in samples from the Outer Harbor areas were higher than the mean concentrations in MS/OBM by factors ranging from 2 to 10. For chromium, nickel, and selenium, the mean concentrations in Outer Harbor YBM were similar to those in MS/OBM.

PAHs were detected in all 36 samples (Table 3.2-3). The mean concentrations of total PAHs were approximately 2 orders of magnitude higher in YBM from Outer Harbor areas than in MS/OBM. Other organic compounds (DDT and PCBs) were detected in approximately one third of the samples (Table 3.2-3).

*Younger Bay Mud (Inner Harbor Areas)*

All of the metals analyzed were detected in 41 of 42 samples of YBM from the Inner Harbor Area (Table 3.2-4). Selenium was the only metal undetected in the other sample. Mean concentrations in YBM from Inner Harbor samples collected in the berth, channel, and widening areas were slightly higher than the mean concentrations in YBM from Outer Harbor areas.

PAHs were detected in all 42 Inner Harbor YBM samples (Table 3.2-4). YBM from the turning basin had the highest concentrations of PAHs in the entire project area. The maximum total PAH concentration from this area was 259,000 µg/kg (Table 3.2-4). With the exception of the turning basin area, the concentrations of other organic compounds in Inner Harbor YBM were generally similar to those in Outer Harbor YBM.

### 3.2.3 Summary of Sediment Toxicity Test Results

Toxicity tests were conducted on all subsurface YBM composites and selected surface YBM composites (Table 3.2-1). Both solid-phase (SP; whole sediment) and suspended-particulate phase (SPP; water column) tests were conducted following guidance in PN 93-2. For samples collected in summer 1997 and January 1998, results are available for the 47 solid-phase tests using the amphipod *Ampelisca abdita*, and 46 SPP tests using larvae of the mussel *Mytilus galloprovincialis*. Thirteen SP tests using *A. abdita* and 13 SPP tests using larvae of the sea urchin *Strongylocentrotus purpuratus* were initiated for samples collected during April 1998, and the results will be available in late May 1998.

The toxicity test data presented for samples collected in summer 1997 and January 1998 in Table 3.2-5 are summarized both by geographical area (42-foot channel and widening area) and depth layer of YBM (YS, YM, and YB). For amphipods, the mean percent survival ranged from 33 to 99 percent. Sixteen of the 47 samples tested demonstrated elevated toxicity to *A. abdita* according to PN 93-2 guidelines (Table 3.2-5).

In 13 of the 46 SPP bioassays using *M. Galloprovincialis*, there was no statistical difference between the percent of normal larvae in sample preparations and percent normal larvae in bioassay control preparations (Table 3.2-5). According to PN 93-2, the dredged material associated with these 13 samples is not predicted to be acutely toxic.

**Table 3.2-3. Oakland Sediment Concentration Ranges for YBM from Outer Harbor Areas**
(page 1 of 2)

| | *Arsenic (mg/kg)* | *Cadmium (mg/kg)* | *Chromium (mg/kg)* | *Copper (mg/kg)* | *Lead (mg/kg)* | *Mercury (mg/kg)* | *Nickel (mg/kg)* | *Selenium (mg/kg)* | *Silver (mg/kg)* | *Zinc (mg/kg)* |
|---|---|---|---|---|---|---|---|---|---|---|
| **Outer Harbor Berths (YS)** | | | | | | | | | | |
| # detected/total | 2/2 | 2/2 | 2/2 | 2/2 | 2/2 | 2/2 | 2/2 | 2/2 | 2/2 | 2/2 |
| Min. detected conc. | 4.45 | 0.073 | 176 | 21.7 | 10.8 | 0.075 | 71.4 | 0.11 | 0.092 | 102 |
| Max. detected conc. | 11.2 | 0.176 | 303 | 46.5 | 21.5 | 0.216 | 101 | 0.17 | 0.188 | 112 |
| Mean detected conc. | 7.83 | 0.125 | 240 | 34.1 | 16.2 | 0.146 | 86.2 | 0.14 | 0.14 | 107 |
| **Outer Harbor Channel (YS)** | | | | | | | | | | |
| # detected/total | 10/10 | 10/10 | 10/10 | 10/10 | 10/10 | 10/10 | 10/10 | 8/10 | 10/10 | 10/10 |
| Min. detected conc. | 7.67 | 0.130 | 76.3 | 26.2 | 10.4 | 0.053 | 66 | 0.14 | 0.059 | 42.4 |
| Max. detected conc. | 17.6 | 0.686 | 168 | 65.4 | 44.2 | 0.53 | 128 | 0.54 | 0.591 | 129 |
| Mean detected conc. | 12.6 | 0.339 | 132 | 56.7 | 23.1 | 0.221 | 113 | 0.30 | 0.258 | 95.3 |
| **Outer Harbor Widening Area (YS)** | | | | | | | | | | |
| # detected/total | 9/9 | 9/9 | 9/9 | 9/9 | 9/9 | 9/9 | 9/9 | 9/9 | 9/9 | 9/9 |
| Min. detected conc. | 10.4 | 0.2 | 154 | 38.4 | 14.4 | 0.132 | 78.4 | 0.08 | 0.16 | 97.2 |
| Max. detected conc. | 14.6 | 0.377 | 182 | 63.2 | 46.4 | 0.505 | 110 | 0.41 | 0.602 | 160 |
| Mean detected conc. | 12 | 0.278 | 167 | 47 | 30.7 | 0.351 | 93.3 | 0.274 | 0.353 | 124 |
| **Outer Harbor Widening Area (YM)** | | | | | | | | | | |
| # detected/total | 9/9 | 9/9 | 9/9 | 9/9 | 9/9 | 9/9 | 9/9 | 9/9 | 9/9 | 9/9 |
| Min. detected conc. | 6.82 | 0.164 | 149 | 22.4 | 10.6 | 0.069 | 59.7 | 0.15 | 0.075 | 64 |
| Max. detected conc. | 15.3 | 0.592 | 214 | 69.4 | 61.6 | 0.617 | 112 | 0.31 | 0.758 | 176 |
| Mean detected conc. | 11.8 | 0.291 | 175 | 44.1 | 28.8 | 0.329 | 89.3 | 0.211 | 0.313 | 117 |
| **Outer Harbor Widening Area (YB)** | | | | | | | | | | |
| # detected/total | 6/6 | 6/6 | 6/6 | 6/6 | 6/6 | 6/6 | 6/6 | 6/6 | 6/6 | 6/6 |
| Min. detected conc. | 5.99 | 0.107 | 140 | 16.7 | 8.57 | 0.034 | 55.8 | 0.07 | 0.046 | 52.8 |
| Max. detected conc. | 13.7 | 0.638 | 185 | 49.5 | 43.1 | 0.576 | 91.7 | 0.3 | 0.67 | 140 |
| Mean detected conc. | 10.2 | 0.319 | 158 | 32.9 | 25.2 | 0.345 | 71.6 | 0.208 | 0.305 | 95.3 |

**Table 3.2-3. Oakland Sediment Concentration Ranges for YBM from Outer Harbor Areas**
(page 2 of 2)

| | *Total LPAHs (µg/kg)* | *Total HPAHs (µg/kg)* | *Total PAHs (µg/kg)* | *Total DDD,DDE and DDT (µg/kg)* | *Total PCBs (µg/kg)* | *Tributyltin (µg/kg)* |
|---|---|---|---|---|---|---|
| **Outer Harbor Berths (YS)** | | | | | | |
| # detected/total | 2/2 | 2/2 | 2/2 | 2/2 | 0/2 | 2/2 |
| Min. detected conc. | 359 | 1670 | 2030 | 1.58 | na | 4.14 |
| Max. detected conc. | 1360 | 2920 | 4280 | 2.48 | na | 17.4 |
| Mean detected conc. | 860 | 2300 | 3160 | 2.03 | na | 10.8 |
| **Outer Harbor Channel (YS)** | | | | | | |
| # detected/total | 9/10 | 10/10 | 10/10 | 3/10 | 3/10 | 5/10 |
| Min. detected conc. | 10.5 | 41.7 | 42 | 3.84 | 41.3 | 0.56 |
| Max. detected conc. | 125 | 1274 | 1396 | 3.94 | 48.8 | 2.74 |
| Mean detected conc. | 53 | 449 | 497 | 3.89 | 45.27 | 1.65 |
| **Outer Harbor Widening Area (YS)** | | | | | | |
| # detected/total | 9/9 | 9/9 | 9/9 | 9/9 | 7/9 | 6/9 |
| Min. detected conc. | 67.4 | 1210 | 1280 | 0.91 | 25.5 | 0.83 |
| Max. detected conc. | 1940 | 7750 | 9690 | 9.66 | 170 | 3.66 |
| Mean detected conc. | 387 | 2530 | 2920 | 3.67 | 68.4 | 2.03 |
| **Outer Harbor Widening Area (YM)** | | | | | | |
| # detected/total | 8/9 | 9/9 | 9/9 | 4/9 | 4/9 | 2/9 |
| Min. detected conc. | 44.2 | 14.9 | 14.9 | 1.3 | 9.12 | 1.01 |
| Max. detected conc. | 445 | 6580 | 7030 | 16.5 | 155 | 5.04 |
| Mean detected conc. | 190 | 2190 | 2360 | 8.33 | 81.2 | 3.03 |
| **Outer Harbor Widening Area (YB)** | | | | | | |
| # detected/total | 6/6 | 6/6 | 6/6 | 2/6 | 3/6 | 0/6 |
| Min. detected conc. | 7.04 | 73.7 | 80.8 | 27 | 15.3 | na |
| Max. detected conc. | 583 | 5590 | 6170 | 32.6 | 164 | na |
| Mean detected conc. | 234 | 2620 | 2850 | 29.8 | 97.8 | na |

YB = Younger Bay Mud -- Deep (>8 feet below mudline)
YM = Younger Bay Mud -- Mid-depth (4-8 feet below mudline)
YS = Younger Bay Mud -- Surface (0-4 feet below mudline)

**Table 3.2-4. Oakland Sediment Concentration Ranges for YBM from Inner Harbor Areas**

(page 1 of 2)

| | *Arsenic (mg/kg)* | *Cadmium (mg/kg)* | *Chromium (mg/kg)* | *Copper (mg/kg)* | *Lead (mg/kg)* | *Mercury (mg/kg)* | *Nickel (mg/kg)* | *Selenium (mg/kg)* | *Silver (mg/kg)* | *Zinc (mg/kg)* |
|---|---|---|---|---|---|---|---|---|---|---|
| **Inner Harbor Berths (YS)** | | | | | | | | | | |
| # detected/total | 2/2 | 2/2 | 2/2 | 2/2 | 2/2 | 2/2 | 2/2 | 2/2 | 2/2 | 2/2 |
| Min. detected conc. | 10.3 | 0.309 | 144 | 52.8 | 33.4 | 0.500 | 74.6 | 0.100 | 0.327 | 126 |
| Max. detected conc. | 11.1 | 0.618 | 160 | 57.6 | 49.5 | 0.812 | 88.2 | 0.240 | 0.437 | 151 |
| Mean detected conc. | 10.7 | 0.464 | 152 | 55.2 | 41.5 | 0.656 | 81.4 | 0.170 | 0.382 | 139 |
| **Inner Harbor Channel (YS)** | | | | | | | | | | |
| # detected/total | 10/10 | 10/10 | 10/10 | 10/10 | 10/10 | 10/10 | 10/10 | 9/10 | 10/10 | 10/10 |
| Min. detected conc. | 8.53 | 0.228 | 129 | 42 | 12.1 | 0.082 | 78.7 | 0.1 | 0.095 | 71.1 |
| Max. detected conc. | 16.2 | 0.670 | 246 | 126 | 63.9 | 0.680 | 242 | 0.540 | 0.684 | 188 |
| Mean detected conc. | 12.0 | 0.364 | 173 | 68.0 | 28.0 | 0.293 | 128 | 0.230 | 0.275 | 115 |
| **Inner Harbor Widening Area (YS)** | | | | | | | | | | |
| # detected/total | 5/5 | 5/5 | 5/5 | 5/5 | 5/5 | 5/5 | 5/5 | 5/5 | 5/5 | 5/5 |
| Min. detected conc. | 10.6 | 0.188 | 172 | 45.1 | 24.1 | 0.294 | 88.8 | 0.240 | 0.279 | 111 |
| Max. detected conc. | 13.1 | 0.467 | 190 | 61.4 | 42.3 | 0.553 | 100 | 0.320 | 0.555 | 146 |
| Mean detected conc. | 11.3 | 0.312 | 179 | 49.8 | 32.4 | 0.417 | 92.5 | 0.296 | 0.367 | 128 |
| **Inner Harbor Widening Area (YM)** | | | | | | | | | | |
| # detected/total | 4/4 | 4/4 | 4/4 | 4/4 | 4/4 | 4/4 | 4/4 | 4/4 | 4/4 | 4/4 |
| Min. detected conc. | 11.4 | 0.447 | 193 | 45.9 | 35.2 | 0.652 | 85.6 | 0.170 | 0.416 | 123 |
| Max. detected conc. | 14.6 | 0.658 | 236 | 63.2 | 47.2 | 0.924 | 109 | 0.420 | 0.706 | 185 |
| Mean detected conc. | 13.1 | 0.521 | 210 | 53.0 | 41.2 | 0.752 | 94.2 | 0.275 | 0.507 | 149 |
| **Inner Harbor Widening Area (YB)** | | | | | | | | | | |
| # detected/total | 3/3 | 3/3 | 3/3 | 3/3 | 3/3 | 3/3 | 3/3 | 3/3 | 3/3 | 3/3 |
| Min. detected conc. | 7.78 | 0.195 | 170 | 27.5 | 20.4 | 0.303 | 62.7 | 0.170 | 0.189 | 73.7 |
| Max. detected conc. | 15.1 | 0.678 | 190 | 60.9 | 47.2 | 0.717 | 105 | 0.340 | 0.670 | 160 |
| Mean detected conc. | 11.0 | 0.381 | 180 | 41.1 | 31.5 | 0.474 | 82.2 | 0.270 | 0.378 | 110 |
| **Turning Basin (channel) (YS)** | | | | | | | | | | |
| # detected/total | 2/2 | 2/2 | 2/2 | 2/2 | 2/2 | 2/2 | 2/2 | 2/2 | 2/2 | 2/2 |
| Min. detected conc. | 5.65 | 0.387 | 163 | 44.7 | 46.3 | 0.481 | 57.6 | 0.110 | 0.202 | 138 |
| Max. detected conc. | 11.3 | 0.389 | 169 | 60.8 | 51.1 | 0.813 | 96.1 | 0.200 | 0.404 | 149 |
| Mean detected conc. | 8.48 | 0.388 | 166 | 52.8 | 48.7 | 0.647 | 76.9 | 0.155 | 0.303 | 144 |
| **Turning Basin Wings (YS)** | | | | | | | | | | |
| # detected/total | 5/5 | 5/5 | 5/5 | 5/5 | 5/5 | 5/5 | 5/5 | 5/5 | 5/5 | 5/5 |
| Min. detected conc. | 12.5 | 0.289 | 179 | 86.3 | 47.5 | 0.599 | 107 | 0.280 | 0.442 | 174 |
| Max. detected conc. | 14.7 | 0.546 | 232 | 154 | 86.4 | 1.21 | 116 | 0.560 | 0.671 | 253 |
| Mean detected conc. | 13.4 | 0.399 | 199 | 114 | 63.6 | 0.800 | 112 | 0.468 | 0.531 | 203 |
| **Turning Basin Wings (YM)** | | | | | | | | | | |
| # detected/total | 5/5 | 5/5 | 5/5 | 5/5 | 5/5 | 5/5 | 5/5 | 5/5 | 5/5 | 5/5 |
| Min. detected conc. | 14.1 | 0.422 | 183 | 80.4 | 59.0 | 0.800 | 97.0 | 0.190 | 0.361 | 194 |
| Max. detected conc. | 20.7 | 1.48 | 314 | 432 | 209 | 7.93 | 137 | 0.990 | 0.776 | 820 |
| Mean detected conc. | 16.3 | 0.819 | 235 | 176 | 110 | 2.60 | 119 | 0.592 | 0.573 | 409 |
| **Turning Basin Wings (YB)** | | | | | | | | | | |
| # detected/total | 6/6 | 6/6 | 6/6 | 6/6 | 6/6 | 6/6 | 6/6 | 6/6 | 6/6 | 6/6 |
| Min. detected conc. | 7.98 | 0.223 | 287 | 179 | 47.4 | 0.500 | 132 | 0.190 | 0.293 | 218 |
| Max. detected conc. | 26.7 | 1.69 | 1,760 | 919 | 322 | 18.3 | 653 | 0.890 | 1.10 | 1,120 |
| Mean detected conc. | 17.2 | 0.939 | 634 | 577 | 194 | 6.35 | 288 | 0.615 | 0.769 | 501 |

YB = Younger Bay Mud -- Deep (>8 feet below mudline)
YM = Younger Bay Mud -- Mid-depth (4-8 feet below mudline)
YS = Younger Bay Mud -- Surface (0-4 feet below mudline)

**Table 3.2-4. Oakland Sediment Concentration Ranges for YBM from Inner Harbor Areas**
(page 2 of 2)

| | *Total LPAHs (µg/kg)* | *Total HPAHs (µg/kg)* | *Total PAHs (µg/kg)* | *Total DDD,DDE and DDT (µg/kg)* | *Total PCBs (µg/kg)* | *Tributyltin (µg/kg)* |
|---|---|---|---|---|---|---|
| **Inner Harbor Berths (YS)** | | | | | | |
| # detected/total | 2/2 | 2/2 | 2/2 | 2/2 | 2/2 | 2/2 |
| Min. detected conc. | 204 | 3,690 | 3,900 | 4.97 | 64.1 | 1.48 |
| Max. detected conc. | 430 | 4,230 | 4,660 | 8.47 | 113 | 8.19 |
| Mean detected conc. | 317 | 3,960 | 4,280 | 6.72 | 88.6 | 4.84 |
| **Inner Harbor Channel (YS)** | | | | | | |
| # detected/total | 9/10 | 10/10 | 10/10 | 4/10 | 4/10 | 7/10 |
| Min. detected conc. | 7.44 | 35.2 | 35.2 | 5.79 | 59.5 | 0.68 |
| Max. detected conc. | 600 | 7,830 | 8,430 | 19.9 | 403 | 344 |
| Mean detected conc. | 176 | 1994 | 2151 | 9.83 | 195 | 103 |
| **Inner Harbor Widening Area (YS)** | | | | | | |
| # detected/total | 5/5 | 5/5 | 5/5 | 5/5 | 5/5 | 5/5 |
| Min. detected conc. | 120 | 1,320 | 1,440 | 3.53 | 12.1 | 1.47 |
| Max. detected conc. | 291 | 3,880 | 4,170 | 20.3 | 163 | 27.8 |
| Mean detected conc. | 227 | 2,210 | 2,440 | 8.21 | 80.9 | 8.95 |
| **Inner Harbor Widening Area (YM)** | | | | | | |
| # detected/total | 4/4 | 4/4 | 4/4 | 3/4 | 4/4 | 3/4 |
| Min. detected conc. | 371 | 3,350 | 3,730 | 4.80 | 48.1 | 0.860 |
| Max. detected conc. | 486 | 9,040 | 9,530 | 12.2 | 176 | 2.33 |
| Mean detected conc. | 425 | 6,050 | 6,480 | 9.33 | 91.3 | 1.47 |
| **Inner Harbor Widening Area (YB)** | | | | | | |
| # detected/total | 3/3 | 3/3 | 3/3 | 3/3 | 3/3 | 0/3 |
| Min. detected conc. | 424 | 5,140 | 5,750 | 0.870 | 10.7 | na |
| Max. detected conc. | 2,270 | 19,200 | 21,500 | 11.7 | 123 | na |
| Mean detected conc. | 1,100 | 11,800 | 12,900 | 4.61 | 64.0 | na |
| **Turning Basin (channel) (YS)** | | | | | | |
| # detected/total | 2/2 | 2/2 | 2/2 | 2/2 | 2/2 | 2/2 |
| Min. detected conc. | 303 | 3,540 | 3,850 | 4.22 | 84.1 | 14.0 |
| Max. detected conc. | 448 | 5,380 | 5,830 | 8.11 | 916 | 32.2 |
| Mean detected conc. | 376 | 4,460 | 4,840 | 6.17 | 500 | 23.1 |
| **Turning Basin Wings (YS)** | | | | | | |
| # detected/total | 5/5 | 5/5 | 5/5 | 5/5 | 5/5 | 5/5 |
| Min. detected conc. | 354 | 5,210 | 5,560 | 8.11 | 126 | 28.7 |
| Max. detected conc. | 3,810 | 49,900 | 53,700 | 17.8 | 533 | 706 |
| Mean detected conc. | 1,400 | 19,900 | 21,300 | 13.5 | 276 | 241 |
| **Turning Basin Wings (YM)** | | | | | | |
| # detected/total | 5/5 | 5/5 | 5/5 | 5/5 | 5/5 | 5/5 |
| Min. detected conc. | 912 | 13,400 | 14,300 | 8.42 | 129 | 44.4 |
| Max. detected conc. | 8,850 | 79,400 | 88,200 | 57.7 | 1,500 | 555 |
| Mean detected conc. | 3,770 | 34,300 | 38,000 | 24.4 | 550 | 247 |
| **Turning Basin Wings (YB)** | | | | | | |
| # detected/total | 6/6 | 6/6 | 6/6 | 6/6 | 6/6 | 6/6 |
| Min. detected conc. | 1,830 | 17,400 | 19,200 | 11.7 | 183 | 141 |
| Max. detected conc. | 60,700 | 198000 | 259000 | 339 | 5,420 | 2,890 |
| Mean detected conc. | 15,500 | 65,000 | 80,500 | 87.2 | 1,830 | 1,400 |

YB = Younger Bay Mud — Deep (>8 feet below mudline)
YM = Younger Bay Mud — Mid-depth (4-8 feet below mudline)
YS = Younger Bay Mud — Surface (0-4 feet below mudline)

**Table 3.2-5. Summary of Toxicity Test Results**
(page 1 of 2)

| *Sample Number* | *Amphipod (Ampelisca abdita) Mean percent survival* | *Bivalve Larvae (Mytilus galloprovincialis) EC50* |
|---|---|---|
| **Inner Harbor Channel (YBM-Surface)** | | |
| IC-102-YS | 33* | not tested |
| IC-116-YS | 0.97 | 38.9%** |
| IC-117-YS | 0.98 | 41.6%** |
| IC-118-YS | 0.98 | 69.2%** |
| IC-119-YS | 0.97 | 31.6%** |
| IC-120-YS | 0.97 | 48.6%** |
| IC-121-YS | 0.97 | 30.7%** |
| IC-125-YS | TBD | TBD*** |
| IC-126-YS | TBD | TBD*** |
| IC-127-YS | TBD | TBD*** |
| IC-128-YS | TBD | TBD*** |
| **Inner Harbor Widening (YBM-Surface)** | | |
| IW-70-YS | 86 | >100% |
| IW-71-YS | 56* | >100%** |
| IW-72-YS | 63* | >100%** |
| IW-129-YS | TBD | TBD*** |
| IW-130-YS | TBD | TBD*** |
| IW-131-YS | TBD | TBD*** |
| **Inner Harbor Widening (YBM-Middepth)** | | |
| IW-75-YM | 66* | >100% |
| IW-77-YM | 71* | >100%** |
| IW-79-YM | 76 | >100%** |
| IW-132-YM | TBD | TBD*** |
| IW-133-YM | TBD | TBD*** |
| **Inner Harbor Widening (YBM-Bottom)** | | |
| IW-76-YB | 77 | >100% |
| IW-78-YB | 59* | 90.3%** |
| IW-134-YB | TBD | TBD*** |
| **Outer Harbor Channel (YBM-Surface)** | | |
| OC-107-YS | 0.97 | 43.3%** |
| OC-108-YS | 0.96 | 68.9%** |
| OC-109-YS | 0.97 | 45.8%** |
| OC-110-YS | 0.98 | 61.3%** |
| OC-112-YS | 0.98 | 29.3%** |
| OC-113-YS | 0.95 | 36.2%** |
| OC-114A-YS | 0.97 | 37.0%** |
| OC-114B-YS | 0.95 | 25.1%** |
| OC-115-YS | 0.99 | 66.4%** |
| OC-122-YS | TBD | TBD*** |
| OC-123-YS | TBD | TBD*** |
| OC-124-YS | TBD | TBD*** |
| **Outer Harbor Widening (YBM-Surface)** | | |
| OW-14-YS | 35* | >100% |
| OW-15-YS | 79 | >100% |
| OW-16-YS | 87 | >100% |
| OW-17-YS | 67* | >100%** |
| OW-18-YS | 68* | >100%** |
| OW-19-YS | 80 | >100%** |
| OW-20-YS | 82 | 71.6%** |
| OW-21-YS | 76 | >100%** |
| OW-22-YS | 56* | >100% |

**Table 3.2-5. Summary of Toxicity Test Results**
(page 2 of 2)

| *Sample Number* | *Amphipod (Ampelisca abdita) Mean percent survival* | *Bivalve Larvae (Mytilus galloprovincialis) EC50* |
|---|---|---|
| **Outer Harbor Widening (YBM-Middepth)** | | |
| OW-23-YM | 73 | >100% |
| OW-25-YM | 49* | >100% |
| OW-27-YM | 71* | >100%** |
| OW-31-YM | 67* | >100% |
| OW-33-YM | 85 | >100%** |
| OW-35-YM | 75 | >100%** |
| OW-37-YM | 73 | >100%** |
| OW-39-YM | 47* | >100%** |
| **Outer Harbor Widening (YBM-Bottom)** | | |
| OW-24-YB | 64* | >100% |
| OW-26-YB | 47* | >100%** |
| OW-28-YB | 63* | >100% |
| OW-32-YB | 80 | >100% |
| OW-34-YB | 84 | >100%** |
| OW-36-YB | 72 | >100%** |

*Note:* * Survival was less than 72%, which corresponds to PN 93-2 guidelines that acute toxicity is indicated if mean survival in test sediment is > 20% less than mean survival in reference sediment (92% in this case)

** Percentage of normal larvae in 100% SPP significantly less than percentage of normal larvae in 0% SPP

*** *Strongylocentrotus purpuratus* was substituted because *M. galloprovincialis* could not be induced to spawn

EC50 = SPP concentration at which 50 percent of larvae are expected to be normal

TBD To be determined. Test results will be available late May 1998.

For the remaining 33 SPP bioassays, the percentage normal larvae was statistically different from that of the control preparations, and the evaluation of potential toxicity was made by using a numerical mixing model as described in section 3.1.1. In accordance with guidance presented in the Green Book and PN 93-2, modeling of larval bioassay data to determine suitability for ocean and in-Bay disposal was conducted using the lowest LC50 value of 58.9 percent determined from the larval mortality data. Modeled concentrations were much less than both the LPC for ocean disposal and the LPC for in-Bay disposal. To make a more conservative evaluation of potential effects, the model results were compared against the lowest EC50 value of 25.1 percent. In this case, modeled concentrations were 2 orders of magnitude below the LPC for ocean disposal and 50 percent of the LPC for in-Bay disposal. Thus, for samples collected during summer 1997 and during high-resolution characterization in January 1998, results of the bivalve larvae bioassays, in conjunction with modeling per Green Book and PN 93-2 guidance, indicate that material represented by the samples would be suitable for ocean or in-Bay disposal. Results for bivalve larvae bioassays for sediment samples collected during high-resolution characterization in April 1998 will be available in late May 1998.

### 3.2.4 Summary of Leachate Test Results

The SF-RWQCB approved a procedure for testing the potential for contaminant mobility from material placed as non-cover material in habitat restoration project, or in confined nearshore disposal areas, using the mWET. WET is required by Title 22 of the California Code of Regulations (CCR) to determine leachability of contaminants in acidic landfill conditions. Because the material was being evaluated as non-cover fill in marine waters and will remain in marine-influenced environment, which acts as a buffer, the SF-RWQCB approved use of the mWET. The mWET procedure uses distilled deionized water as the extractant rather than citric acid. The tests were conducted in a reducing environment to mimic the conditions in the potential fill sites.

Results of mWET procedure were compared to State of California drinking water standards and to CCR Title 22 soluble threshold limit concentrations (STLCs). Table 3.2-6 lists the IDs of the 17 sediment samples chosen for mWET and presents the results of comparison against drinking water criteria. There were no exceedances of STLCs. Concentrations of arsenic in two samples equaled the drinking water criterion of 0.05 mg/L. There were several organic compounds that were not detected, but for which the detection limits either equaled or exceeded drinking water criteria (see Table 3.2-6). Technically, non-detection at the standard is considered an exceedance of the standard.

Results of mWET analysis indicate that leaching from sediments placed as non-cover material in nearshore areas is not a significant means of mobilizing metals and organic compounds into the environment. Leaching would not result in concentrations that exceeded drinking water criteria.

Results of TCLP testing were compared to federal regulatory concentrations. The samples selected for TCLP testing were TW-101-YB and TW-402-YB. Bulk concentrations of pollutants of concern, even in sediment samples identified as having the most elevated concentrations, were not indicative of hazardous waste. However, TCLP analysis was conducted to verify that there is no hazardous waste characteristic material in the 50-foot project. There were no exceedances of TCLP comparison criteria, which confirms that no dredged material from the 50-foot project would be classified as hazardous material.

**Table 3.2-6. Comparisons of Modified Waste Extraction Test Procedure Analytical Results with State of California Drinking Water Standards**

| | *Arsenic* *µg/L* | *Benza(a)anthracene* *µg/L* | *Benzo(a)pyrene* *µg/L* | *Benzo(b)fluoranthene* *µg/L* | *Aldrin* *µg/L* | *Dieldrin* *µg/L* | *Heptachlor epoxide* *µg/L* | *Heptachlor* *µg/L* | *Total PCBs* *µg/L* |
|---|---|---|---|---|---|---|---|---|---|
| California Drinking Water MCL | 0.05 | 0.1** | 0.2 | 0.2** | 0.05* | 0.05* | 0.01 | 0.01 | 0.5 |
| IC-102-YS | | | | | 0.05 | 0.05 | 0.05 | 0.05 | 0.5 |
| IW-072-YS | | 0.11 | | | 0.066 | 0.066 | 0.066 | 0.066 | 0.66 |
| IW-075-YM | | | | | 0.059 | 0.059 | 0.059 | 0.059 | 0.59 |
| IW-076-YB | | | | | 0.055 | 0.055 | 0.055 | 0.055 | 0.55 |
| IW-077-YM | | | | | 0.061 | 0.061 | 0.061 | 0.061 | 0.61 |
| IW-105-YB | 0.052 | 0.11 | | | 0.069 | 0.069 | 0.069 | 0.069 | 0.69 |
| OW-016-YS | | | | | 0.06 | 0.06 | 0.06 | 0.06 | 0.6 |
| OW-023-YM | 0.05 | 0.11 | | | 0.069 | 0.069 | 0.069 | 0.069 | 0.69 |
| OW-025-YM | | | | | 0.061 | 0.061 | 0.061 | 0.061 | 0.61 |
| TC-083-YS | | | | | 0.058 | 0.058 | 0.058 | 0.058 | 0.58 |
| TW-091-YS | | | | | 0.059 | 0.059 | 0.059 | 0.059 | 0.59 |
| TW-092-YS | | | | | 0.056 | 0.056 | 0.056 | 0.056 | 0.56 |
| TW-093-YM | | 0.1 | | | 0.064 | 0.064 | 0.064 | 0.064 | 0.64 |
| TW-093-YM AEROBIC | | | | | 0.056 | 0.056 | 0.056 | 0.056 | 0.56 |
| TW-094-YM | | 0.12 | | | 0.073 | 0.073 | 0.073 | 0.073 | 0.73 |
| TW-094-YM AEROBIC | | | | | 0.054 | 0.054 | 0.054 | 0.054 | 0.54 |
| TW-100-YB | | 0.1 | | | 0.05 | 0.05 | 0.05 | 0.05 | 0.5 |
| TW-100-YB AEROBIC | | | | | 0.05 | 0.05 | 0.05 | 0.05 | 0.5 |
| TW-101-YB | | | | | 0.053 | 0.053 | 0.053 | 0.053 | 0.53 |
| TW-402-YB | | 0.8 | 0.5 | 0.2 | 0.05 | 0.05 | 0.05 | 0.05 | 0.5 |

*Notes:* U - Not detected
* California action level LOQ
** Proposed EPA MCL

## 3.3 SUITABILITY OF DREDGED MATERIAL FOR DIFFERENT TYPES OF REUSE/DISPOSAL

Sediment analyses described in section 3.2 were designed to evaluate materials for four broad classes of reuse and disposal: ocean disposal, wetland creation, construction, and landfill disposal. Several of these broad classes of disposal can be further divided into more specific classifications such as wetland cover and wetland non-cover. Further, each of the broad categories encompasses disposal at several types of locations. For example, material determined to be chemically suitable for wetland non-cover should also be chemically suitable for creation of subtidal habitat.

The rationale for determining suitability depends on several factors, including the type of material, the extent of contamination, the potential for biological effects, exposure at the proposed reuse or disposal site, and conditions at the site. Guidelines have been developed to help determine the suitability of the material generated from the 50-foot project for each of the types of reuse/disposal options. These guidelines are presented below in separate sections for ocean disposal, wetland creation (both in-water and upland), and upland disposal (construction and landfill).

### 3.3.1 Suitability for Ocean Disposal

The suitability of dredged material for disposal at the San Francisco-Deep Ocean Disposal Site (SF-DODS) was determined following guidelines presented in the Green Book (USEPA/USACE 1991). Under Tier I guidelines, existing information was reviewed to determine whether the MS and OBM formations comply with the LPC criterion (EVS 1997a). Data generated during the Oakland 38-foot and 42-foot projects supported a preliminary conclusion that the OBM and MS formations comply with LPC determinations by meeting specific exclusionary criteria.[1]

Although the Tier I process does not require any testing, the Port elected to collect 39 composite sediment samples of MS/OBM from the 50-foot project area to (1) verify the lack of contaminants in the material, (2) confirm the sediment's physical properties to evaluate suitability for potential reuse options, and (3) determine at what depth these MS/OBM layers were located in the different areas to be dredged.

The YBM sediments were not evaluated for ocean disposal. However, because the Port wanted to maximize the amount of material available for beneficial use, and the YBM could not be clearly characterized by a Tier I evaluation, guidance in PN 93-2 was followed. Suitability determinations for other disposal options for YBM are made in sections 3.3.2 and 3.3.3.

### 3.3.2 Suitability for Wetland Creation (Tidal/Subtidal)

Chemical concentrations of YBM were compared to regional criteria for the creation of wetlands using dredged material (Wolfenden and Carlin 1992; Table 3.1-2). Both cover material and non-cover material may be used in creating wetlands. The minimum thickness of cover material that can be placed on the surface of the wetland is 3 feet. Cover material has the highest amount of exposure to biota and the environment and therefore the strictest numeric criteria. Non-cover

---

1 The compaction and low moisture content of OBM and MS formations preclude the penetration of chemicals from overlying sources, leaving these formations free from bioavailable, persistent chemicals at greater-than-trace quantities that could cause adverse biological effects (EVS 1997a).

material is covered with at least 3 feet of cover material or native site material. Once placed, this non-cover material will have reduced exposure to biota and the environment, so numeric criteria are less stringent than those for cover material (Table 3.1-2).

Dredged material was evaluated for reuse in two tidal wetland sites, Hamilton AAF Wetland Restoration Project (HAAF) and the Montezuma Wetland Restoration Project, and one subtidal wetland site, the Middle Harbor Enhancement Area (MHEA). Although disposal of dredged material from this project is not currently permitted at any of these sites, it is anticipated that some or all of these sites may become available during the course of the 50-foot project.

The sponsors of the HAAF have stated that they are not interested in and will not be evaluating reusing non-cover material. The sponsors of the Montezuma Wetland Restoration Project are evaluating reuse of both cover and non-cover materials. However, it is the Port's understanding that 4 cubic yards of cover material need to be supplied for each yard of non-cover material. The Port presently favors the alternative of using non-cover and cover material for wetland habitat creation in the MHEA. A preliminary design has been produced that addresses the hydrodynamic regime for sustaining the wetland habitat and the access and land use requirements for public utilization of the area. The Port estimates that 2 to 3 mcy of non-cover and 6 to 7 mcy of cover material might be used in creating the MHEA. The discussion in this section on suitability of dredged material for reuse in the MHEA is on the basis of bulk chemical results. The suitability was also evaluated in light of toxicity test data (section 3.2.3) and mWET data (section 3.2.4.).

All the dredging units (DUs) suitable for ocean disposal (see section 3.3.1) are also suitable for wetland creation, either as cover or non-cover material. These DUs will not be discussed further in this section. Suitability determinations are presented in Table 3.3-1 and below in separate sections for each geographical area.

***Inner Harbor Berths***

YBM material in the berth area of the Inner Harbor exceeded cover criteria, but did not exceed non-cover criteria; therefore this material is suitable for wetland non-cover use, but not suitable for use as cover.

***Inner Harbor Channel***

Samples of YBM from DUs IC-053-YS and IC-054-YS at the southwestern edge of the Inner Harbor channel (Figure 3.2-3) did not exceed cover chemical criteria, but failed toxicity requirements for cover material as presented in PN93-2. DU IC-052-YS was partitioned into smaller cells (IC-116-YS through IC-121-YS) and tested at a higher resolution in January 1998, and the YBM met both chemical and biological criteria for use as cover material. DUs IC-053-YS and IC-054-YS were resampled and tested at a higher resolution in early April 1998.

The two DUs closest to the turning basin had exceedances of chemical criteria. The DU represented by Composite Sample IC-337-YS met non-cover criteria but not cover criteria. The DU represented by Composite Sample IC-102-YS is not suitable for cover or non-cover use because it exceeded the PCB non-cover criterion (Table 3.3-1). Disposal options for this DU are discussed in section 3.3.3.

**Table 3.3-1. Suitability of Dredging Units for Various Disposal Options**
(page 1 of 5)

| | Disposal Options[1] | | | | | | | Characterization Results | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Chemistry | | Bioassays |
| *Station ID* | *Ocean Disposal* | *Wetland Cover* | *In-Bay* | *Wetland Non-Cover* | *Con-struction* | *Fill (New Land)* | *Landfill* | *Cover Criteria Exceedances* | *Non-Cover Criteria Exceedances* | *Bioassay Exceedances* |
| **Inner Berth** | | | | | | | | | | |
| IB-096-YS | | | | X | X | X | | Hg, DDT, PAH, PCB | none | not tested |
| IB-390-YS | | | | X | X | X | | Hg, DDT, PCB | none | not tested |
| IB-098-OM | X | X | X | X | X | X | | none | none | not tested |
| IB-099-OM | X | X | X | X | X | X | | none | none | not tested |
| **Inner Channel** | | | | | | | | | | |
| IC-116-YS | | X | X | X | X | X | X | none | none | none |
| IC-117-YS | | X | X | X | X | X | X | none | none | none |
| IC-118-YS | | X | X | X | X | X | X | none | none | none |
| IC-119-YS | | X | X | X | X | X | X | none | none | none |
| IC-120-YS | | X | X | X | X | X | X | none | none | none |
| IC-121-YS | | X | X | X | X | X | X | none | none | none |
| IC-125-YS | | | | | | | | AR | AR | AR |
| IC-126-YS | | | | | | | | AR | AR | AR |
| IC-127-YS | | | | | | | | AR | AR | AR |
| IC-128-YS | | | | | | | | AR | AR | AR |
| IC-337-YS | | | | X | X | X | | DDT, PCB | none | not tested |
| IC-102-YS | | | | | X | X | X | Cu, Pb, Hg, Zn, DDT, PAH | PCB | Amph |
| IC-056-OM | X | X | X | X | X | X | | none | none | not tested |
| IC-300-OM | X | X | X | X | X | X | | none | none | not tested |
| IC-059-OM | X | X | X | X | X | X | | none | none | not tested |
| IC-060-OM | X | X | X | X | X | X | | none | none | not tested |
| IC-061-OM | X | X | X | X | X | X | | none | none | not tested |
| IC-062-OM | X | X | X | X | X | X | | none | none | not tested |
| IC-063-OM | X | X | X | X | X | X | | none | none | not tested |
| IC-064-OM | X | X | X | X | X | X | | none | none | not tested |

**Table 3.3-1. Suitability of Dredging Units for Various Disposal Options**
(page 2 of 5)

| | Disposal Options[1] | | | | | | | Characterization Results | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Chemistry | | Bioassays |
| *Station ID* | *Ocean Disposal* | *Wetland Cover* | *In-Bay* | *Wetland Non-Cover* | *Con-struction* | *Fill (New Land)* | *Landfill* | *Cover Criteria Exceedances* | *Non-Cover Criteria Exceedances* | *Bioassay Exceedances* |
| IC-065-OM | X | X | X | X | X | X | | none | none | not tested |
| IC-066-OM | X | X | X | X | X | X | | Cr | none | not tested |
| IC-067-OM | X | X | X | X | X | X | | none | none | not tested |
| IC-068-OM | X | X | X | X | X | X | | none | none | not tested |
| **Inner Widening** | | | | | | | | | | |
| IW-129-YS | | | | | | | | AR | AR | AR |
| IW-130-YS | | | | | | | | AR | AR | AR |
| IW-131-YS | | | | | | | | AR | AR | AR |
| IW-070-YS | | | X | X | X | X | | DDT | none | none |
| IW-071-YS | | | | X | X | X | | Hg, DDT, PAH, PCB | none | Amph |
| IW-072-YS | | | | X | X | X | | Hg, DDT, PCB | none | Amph |
| IW-132-YM | | | | | | | | AR | AR | AR |
| IW-133-YM | | | | | | | | AR | AR | AR |
| IW-075-YM | | | | X | X | X | | Hg, DDT, PAH, PCB | none | Amph |
| IW-077-YM | | | | X | X | X | | Hg, Zn, DDT, PAH | none | Amph |
| IW-079-YM | | | X | X | X | X | | Cr, Hg, PAH, PCB | none | none |
| IW-134-YB | | | | | | | | AR | AR | AR |
| IW-076-YB | | | X | X | X | X | | Hg, PAH, PCB | none | none |
| IW-078-YB | | | | X | X | X | | PAH | none | Amph |
| IW-081-OM | X | X | X | X | X | X | | none | none | not tested |
| IW-106-OM | X | X | X | X | X | X | | none | none | not tested |
| IW-082-OM | X | X | X | X | X | X | | none | none | not tested |
| **Outer Berth** | | | | | | | | | | |
| OB-050-YS | | | | X | X | X | | PAH | none | not tested |
| OB-051-YS | | | | | X | X | | none | Cr | not tested |
| OB-046-OM | X | X | X | X | X | X | | Cr | none | not tested |
| OB-047-OM | X | X | X | X | X | X | | none | none | not tested |

**Table 3.3-1. Suitability of Dredging Units for Various Disposal Options**
(page 3 of 5)

| | DISPOSAL OPTIONS[1] | | | | | | | CHARACTERIZATION RESULTS | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Chemistry | | Bioassays |
| *Station ID* | *Ocean Disposal* | *Wetland Cover* | *In-Bay* | *Wetland Non-Cover* | *Con-struction* | *Fill (New Land)* | *Landfill* | *Cover Criteria Exceedances* | *Non-Cover Criteria Exceedances* | *Bioassay Exceedances* |
| OB-048-OM | X | X | X | X | X | X | | none | none | not tested |
| OB-049-OM | X | X | X | X | X | X | | Cr | none | not tested |
| **Outer Channel** | | | | | | | | | | |
| OC-122-YS | | | | | | | | AR | AR | AR |
| OC-123-YS | | | | | | | | AR | AR | AR |
| OC-124-YS | | | | | | | | AR | AR | AR |
| OC-107-YS | | | X | X | X | X | | Hg, DDT | none | none |
| OC-108-YS | | | X | X | X | X | | Hg, DDT | none | none |
| OC-109-YS | | | X | X | X | X | | Hg, DDT | none | none |
| OC-110-YS | | | X | X | X | X | | Hg | none | none |
| OC-427-YS | | | | X | X | X | | none | none | not tested |
| OC-112- YS | | X | X | X | X | X | | none | none | none |
| OC-113- YS | | X | X | X | X | X | | none | none | none |
| OC-114A- YS | | X | X | X | X | X | | none | none | none |
| OC-114B- YS | | X | X | X | X | X | | none | none | none |
| OC-115- YS | | X | X | X | X | X | | none | none | none |
| OC-001-OM | X | X | X | X | X | X | | none | none | not tested |
| OC-002-OM | X | X | X | X | X | X | | Cr | none | not tested |
| OC-003-OM | X | X | X | X | X | X | | Cr | none | not tested |
| OC-004-OM | X | X | X | X | X | X | | Cr | none | not tested |
| OC-005-OM | X | X | X | X | X | X | | none | none | not tested |
| OC-006-OM | X | X | X | X | X | X | | Cr | none | not tested |
| OC-007-OM | X | X | X | X | X | X | | Cr | none | not tested |
| OC-008-OM | X | X | X | X | X | X | | Cr | none | not tested |
| **Outer Widening** | | | | | | | | | | |
| OW-014-YS | | | | X | X | X | | Hg, Zn, DDT, PCB | none | Amph |
| OW-015-YS | | | X | X | X | X | | Hg, DDT, PCB | none | none |
| OW-016-YS | | | X | X | X | X | | Hg, DDT, PCB | none | none |
| OW-017-YS | | | | X | X | X | | none | none | Amph |

**Table 3.3-1. Suitability of Dredging Units for Various Disposal Options**
(page 4 of 5)

| | Disposal Options[1] | | | | | | | Characterization Results | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Chemistry | | Bioassays |
| *Station ID* | *Ocean Disposal* | *Wetland Cover* | *In-Bay* | *Wetland Non-Cover* | *Con-struction* | *Fill (New Land)* | *Landfill* | *Cover Criteria Exceedances* | *Non-Cover Criteria Exceedances* | *Bioassay Exceedances* |
| OW-018-YS | | | | X | X | X | | Hg, DDT | none | Amph |
| OW-019-YS | | | X | X | X | X | | Hg, PAH, PCB | none | none |
| OW-020-YS | | | X | X | X | X | | Hg | none | none |
| OW-021-YS | | X | X | X | X | X | | none | none | none |
| OW-022-YS | | | | X | X | X | | none | none | Amph |
| OW-023-YM | | | X | X | X | X | | Pb, Hg, Zn, DDT, PCB | none | none |
| OW-025-YM | | | | X | X | X | | Pb, Hg, Zn, DDT, PCB | none | Amph |
| OW-027-YM | | | | X | X | X | | Hg, DDT, PAH | none | Amph |
| OW-029-YM | | | | X | X | X | | Hg, PAH | none | not tested |
| OW-031-YM | | | | X | X | X | | none | none | Amph |
| OW-033-YM | | X | X | X | X | X | | none | none | none |
| OW-035-YM | | X | X | X | X | X | | none | none | none |
| OW-037-YM | | X | X | X | X | X | | none | none | none |
| OW-039-YM | | | | X | X | X | | none | none | Amph |
| OW-024-YB | | | | X | X | X | | Hg, DDT, PCB | none | Amph |
| OW-026-YB | | | | X | X | X | | Hg, DDT, PCB | none | Amph |
| OW-028-YB | | | | X | X | X | | none | none | Amph |
| OW-032-YB | | X | X | X | X | X | | none | none | none |
| OW-034-YB | | X | X | X | X | X | | none | none | none |
| OW-036-YB | | | X | X | X | X | | PAH | none | none |
| OW-041-OM | X | X | X | X | X | X | | none | none | not tested |
| OW-042-OM | X | X | X | X | X | X | | none | none | not tested |
| OW-043-OM | X | X | X | X | X | X | | none | none | not tested |
| OW-044-OM | X | X | X | X | X | X | | none | none | not tested |
| **Turning Circle** | | | | | | | | | | |
| TC-083-YS | | | | X | X | X | | Pb, Hg, DDT, PAH, PCB | none | not tested |
| TC-085-OM | X | X | X | X | X | X | | none | none | not tested |

**Table 3.3-1. Suitability of Dredging Units for Various Disposal Options**
(page 5 of 5)

| | DISPOSAL OPTIONS[1] | | | | | | | CHARACTERIZATION RESULTS | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Chemistry | | Bioassays |
| *Station ID* | *Ocean Disposal* | *Wetland Cover* | *In-Bay* | *Wetland Non-Cover* | *Con-struction* | *Fill (New Land)* | *Landfill* | *Cover Criteria Exceedances* | *Non-Cover Criteria Exceedances* | *Bioassay Exceedances* |
| TC-086-OM | X | X | X | X | X | X | | none | none | not tested |
| TC-087-OM | X | X | X | X | X | X | | none | none | not tested |
| TC-088-OM | X | X | X | X | X | X | | none | none | not tested |
| **Turning Wing** | | | | | | | | | | |
| TW-091-YS | | | | X | X | X | | Cu, Hg, Zn, DDT, PAH, PCB | none | not tested |
| TW-092-YS | | | | | X | X | | Cr, Cu, Pb, Hg, Zn, DDT, PAH | PCB | not tested |
| TW-093-YM | | | | | X | X | | Cr, Cu, DDT, PAH | Pb, Hg, Zn, PCB | not tested |
| TW-094-YM | | | | | X | X | | Se, DDT | Cr, Cu, Pb, Hg, Zn, PAH, PCB | not tested |
| TW-100-YB | | | | | X | X | | Cr, Cu, Pb, Zn, DDT, PAH | Hg, PCB | not tested |
| TW-101-YB | | | | | X | X | | DDT | Cr, Cu, Pb, Hg, Zn, PAH, PCB | not tested |
| TW-089-OM | X | X | X | X | X | X | | none | none | not tested |
| TW-090-OM | X | X | X | X | X | X | | none | none | not tested |

*Note:* 1. X = material is suitable for that disposal option

*Inner Harbor Widening Area*

All three depth layers of YBM sediments from the Inner Harbor widening area, YS, YM, and YB, were evaluated. All the DUs exceeded at least one cover criterion, but met all the non-cover criteria. Therefore, all YBM sediments from this area are suitable for non-cover material. DUs IW-069-YS and IW-103-YS, which lie at the inlet to Middle Harbor, were repartitioned into smaller subcells and resampled during early April 1998 to provide higher resolution characterization of the YBM. Results will be available in May 1998. The remainder of the Inner Harbor Widening Area DUs farther eastward are to be included in the Berth 55-58 project.

*Outer Harbor Berths*

Two DUs of YBM sediment from the Outer Harbor berths were evaluated. Samples from neither met cover criteria. The DU represented by the composite sample from Berths 22, 23, and 24 (OB-050-YS) is suitable for non-cover material. The DU represented by the composite sample from Berths 32 and 33 (OB-051-YS) exceeded the non-cover criterion for chromium and is unsuitable for either cover or non-cover use (Table 3.3-1). Disposal/reuse options for this DU are discussed in section 3.3.3.

*Outer Harbor Channel*

Three DUs of YBM sediment from the Outer Harbor channel were evaluated. Two of the three composite samples exceeded cover criteria for total DDT. In addition, all these composite samples failed PN 93-2 criteria based on toxicity to amphipods.

*Outer Harbor Widening Area*

YBM sediments in the Outer Harbor widening area received the most extensive characterization of all the geographical areas. Twenty-four composite samples of YBM (nine YS samples, nine YM samples, and six YB samples) were analyzed. All 24 DUs met all non-cover criteria, so all sediments from this area can be used as non-cover material. At least one cover criterion was exceeded for six YS samples, four YM samples, and three YB samples (Table 3.3-1). Therefore, none of the DUs represented by these samples is suitable for cover material. Of the remaining samples which met all cover chemical criteria, five demonstrated toxicity to amphipods and are therefore unsuitable for cover material. Six samples are suitable for cover material based on lack of chemical exceedances and toxicity.

Due to the presence of more YBM than anticipated, DUs OC-012-YS and OC-013-YS were initially sampled and tested at a much lower frequency than planned, and were suitable for use as non-cover material. Both were sampled and tested at a higher resolution in January 1998. DU OC-012-YS was partitioned into four smaller cells (OC-107-YS through OC-110-YS), and DU OC-013-YS was partitioned into six smaller cells (OC-427-YS and OC-112-YS through OC-115-YS). Based on the results of higher resolution sampling and testing, the material from subcells in DU IC-012-YS is suitable for in-Bay disposal or use as non-cover material, and that from subcells in DU IC-013-YS is suitable for use as cover material.

*Turning Basin (Channel) and Turning Basin Wings*

Composite Sample TC-083-YS exceeded cover criteria for five chemicals, but is suitable for non-cover material because it did not exceed non-cover criteria. One core, TC-394-YS, represented the

south DU within the turning basin (channel), due to the absence of YBM in three of the four cores from this DU. Chemical concentrations from this sample exceeded non-cover criteria, and this material is therefore not suitable for wetland creation.

All but one of the six YBM composite samples analyzed from the turning basin wings exceeded one or more of the non-cover criteria, so these sediments are not suitable for wetland creation. Disposal/reuse options for these DUs are discussed in section 3.3.3. The DU represented by Composite Sample TW-091-YS (located within the turning basin wings) did not exceed any non-cover criteria, so these sediments are suitable for non-cover use (Table 3.3-1).

### 3.3.3 Suitability for Upland Disposal/Reuse

All the DUs suitable for either ocean disposal (see section 3.3.1) or for cover or non-cover use (see section 3.3.2) are also suitable for upland disposal/reuse as either construction or fill material. These DUs will not be discussed further in this section.

Based on the evaluation presented in section 3.3.2, very little of the sediment to be dredged is not suitable for either ocean disposal or wetland creation. The DUs evaluated in this section are represented by one composite sample from the inner channel (IC-102-YS), one composite sample from the outer berth area (OB-051-YS), and five composite samples from the turning basin (channel) and turning basin wings (see section 3.3.2.7).

### 3.3.4 Summary of Preferred Disposal Options

The Port has selected preferred disposal options based on the following considerations:

1. The results of the suitability determinations
2. The volume of dredged material associated with each DU
3. The feasibility from an engineering perspective of dredging a specific unit
4. Timelines for dredging associated with construction of Berth 55, New Berth 21, and other construction efforts for the Berth 55-58 development project
5. The capacity of each potential reuse location to accept dredged material

The preferred disposal options are given in Table 3.3-2.

**Table 3.3-2. Port Preferences and Associated Volume for Disposal of Each Dredging Unit**
(page 1 of 8)

| Station ID | Volume (cy) | Disposal Options | | | | | | | Port Preferences | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *Ocean Disposal* | *Wetland Cover* | *In-Bay* | *Wetland Non-Cover* | *Con-struction* | *Fill (New Land)* | *Landfill* | *1st* | *2nd* | *3rd* |
| **Inner Berth** | | | | | | | | | | | |
| IB-096-YS | 30,000 | | | | X | X | X | | NB21 | CNSTR | |
| IB-390-YS | 50,000 | | | | X | X | X | | NB21 | CNSTR | |
| Subtotal-YS | **80,000** | | | | | | | | | | |
| IB-098-OM | 100,000 | X | X | X | X | X | X | | ALL | | |
| IB-099-OM | 39,000 | X | X | X | X | X | X | | ALL | | |
| Subtotal-OM | **139,000** | | | | | | | | | | |
| Total | **219,000** | | | | | | | | | | |
| Total Ocean | | 139,000 | | | | | | | | | |
| Total Cover | | | 80,000 | | | | | | | | |
| **Inner Channel** | | | | | | | | | | | |
| IC-116-YS | 106,000 | | X | X | X | X | X | | MH/HM | | |
| IC-117-YS | 99,000 | | X | X | X | X | X | | MH/HM | | |
| IC-118-YS | 98,000 | | X | X | X | X | X | | MH/HM | | |
| IC-119-YS | 98,000 | | X | X | X | X | X | | MH/HM | | |
| IC-120-YS | 95,000 | | X | X | X | X | X | | MH/HM | | |
| IC-121-YS | 110,000 | | X | X | X | X | X | | MH/HM | | |
| IC-125-YS | 90,000 | | | | | | | | AR | AR | AR |
| IC-126-YS | 59,000 | | | | | | | | AR | AR | AR |
| IC-127-YS | 54,000 | | | | | | | | AR | AR | AR |
| IC-128-YS | 74,000 | | | | | | | | AR | AR | AR |
| IC-337-YS | 75,000 | | | | X | X | X | | MHNC | NB21 | |
| IC-102-YS | 102,000 | | | | | X | X | X | CNSTR | | |
| Subtotal-YS | 961,000 | | | | | | | | | | |
| IC-056-OM | 373,000 | X | X | X | X | X | X | | ALL | | |

**Table 3.3-2. Port Preferences and Associated Volume for Disposal of Each Dredging Unit**
(page 2 of 8)

| Station ID | Volume (cy) | Disposal Options | | | | | | | Port Preferences | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *Ocean Disposal* | *Wetland Cover* | *In-Bay* | *Wetland Non-Cover* | *Con-struction* | *Fill (New Land)* | *Landfill* | *1st* | *2nd* | *3rd* |
| IC-300-OM | 372,000 | X | X | X | X | X | X | | ALL | | |
| IC-059-OM | 331,000 | X | X | X | X | X | X | | ALL | | |
| IC-060-OM | 349,000 | X | X | X | X | X | X | | ALL | | |
| IC-061-OM | 352,000 | X | X | X | X | X | X | | ALL | | |
| IC-062-OM | 363,000 | X | X | X | X | X | X | | ALL | | |
| IC-063-OM | 349,000 | X | X | X | X | X | X | | ALL | | |
| IC-064-OM | 335,000 | X | X | X | X | X | X | | ALL | | |
| IC-065-OM | 358,000 | X | X | X | X | X | X | | ALL | | |
| IC-066-OM | 346,000 | X | X | X | X | X | X | | ALL | | |
| IC-067-OM | 200,000 | X | X | X | X | X | X | | ALL | | |
| IC-068-OM | 485,000 | X | X | X | X | X | X | | ALL | | |
| Subtotal-OM | **4,213,000** | | | | | | | | | | |
| Total | 5,174,000 | | | | | | | | | | |
| Total Ocean | | 4,213,000 | | | | | | | | | |
| Total Cover | | | 606,000 | | | | | | | | |
| Total Non-Cover | | | | | 352,000 | | | | | | |
| Total Construction | | | | | | 102,000 | | | | | |
| **Inner Widening** | | | | | | | | | | | |
| IW-129-YS | 24,000 | | | | | | | | AR | AR | AR |
| IW-130-YS | 26,000 | | | | | | | | AR | AR | AR |
| IW-131-YS | 26,000 | | | | | | | | AR | AR | AR |
| IW-070-YS | 16,000 | | | X | X | X | X | | FILL | | |
| IW-071-YS | 19,000 | | | | X | X | X | | FILL | | |
| IW-072-YS | 51,000 | | | | X | X | X | | FILL | | |
| Subtotal-YS | **162,000** | | | | | | | | | | |

**Table 3.3-2. Port Preferences and Associated Volume for Disposal of Each Dredging Unit**
(page 3 of 8)

| | | Disposal Options | | | | | | | Port Preferences | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Station ID* | *Volume (cy)* | *Ocean Disposal* | *Wetland Cover* | *In-Bay* | *Wetland Non-Cover* | *Con-struction* | *Fill (New Land)* | *Landfill* | *1st* | *2nd* | *3rd* |
| IW-132-YM | 26,000 | | | | | | | | AR | AR | AR |
| IW-133-YM | 26,000 | | | | | | | | AR | AR | AR |
| IW-075-YM | 14,000 | | | | X | X | X | | FILL | | |
| IW-077-YM | 19,000 | | | | X | X | X | | FILL | | |
| IW-079-YM | 141,000 | | | X | X | X | X | | FILL | | |
| Subtotal-YM | **226,000** | | | | | | | | | | |
| IW-134-YB | 25,000 | | | | | | | | AR | AR | AR |
| IW-076-YB | 54,000 | | | X | X | X | X | | FILL | | |
| IW-078-YB | 60,000 | | | | X | X | X | | FILL | | |
| Subtotal-YB | **139,000** | | | | | | | | | | |
| IW-081-OM | 100,000 | X | X | X | X | X | X | | ALL | | |
| IW-106-OM | 110,000 | X | X | X | X | X | X | | ALL | | |
| IW-082-OM | 113,000 | X | X | X | X | X | X | | ALL | | |
| Subtotal-OM | **323,000** | | | | | | | | | | |
| Total | 850,000 | | | | | | | | | | |
| Total Ocean | | 323,000 | | | | | | | | | |
| Total Non-Cover | | | | | 527,000 | | | | | | |
| **Outer Berth** | | | | | | | | | | | |
| OB-050-YS | 50,000 | | | | X | X | X | | MHNC | CNSTR | |
| OB-051-YS | 36,000 | | | | | X | X | | MHNC | CNSTR | |
| Subtotal-YS | 86,000 | | | | | | | | | | |
| OB-046-OM | 98,000 | X | X | X | X | X | X | | ALL | | |
| OB-047-OM | 110,000 | X | X | X | X | X | X | | ALL | | |

**Table 3.3-2. Port Preferences and Associated Volume for Disposal of Each Dredging Unit**
(page 4 of 8)

| | | Disposal Options | | | | | | | Port Preferences | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Station ID* | *Volume (cy)* | *Ocean Disposal* | *Wetland Cover* | *In-Bay* | *Wetland Non-Cover* | *Con-struction* | *Fill (New Land)* | *Landfill* | *1st* | *2nd* | *3rd* |
| OB-048-OM | 95,000 | X | X | X | X | X | X | | ALL | | |
| OB-049-OM | 110,000 | X | X | X | X | X | X | | ALL | | |
| Subtotal-OM | **413,000** | | | | | | | | | | |
| Total | **499,000** | | | | | | | | | | |
| Total Ocean | | 413,000 | | | | | | | | | |
| Total Non-Cover | | | | | 50,000 | | | | | | |
| Total Construction | | | | | | 36,000 | | | | | |
| **Outer Channel** | | | | | | | | | | | |
| OC-107-YS | 50,000 | | | X | X | X | X | | MH/HM | | |
| OC-108-YS | 150,000 | | | X | X | X | X | | MH/HM | | |
| OC-109-YS | 148,000 | | | X | X | X | X | | MH/HM | | |
| OC-110-YS | 150,000 | | | X | X | X | X | | MH/HM | | |
| OC-427-YS | 100,000 | | | | X | X | X | | MHNC | NB21 | |
| OC-112-YS | 148,000 | | X | X | X | X | X | | MH/HM | | |
| OC-113-YS | 168,000 | | X | X | X | X | X | | MH/HM | | |
| OC-114A-YS | 149,000 | | X | X | X | X | X | | MH/HM | | |
| OC-114B-YS | 148,000 | | X | X | X | X | X | | MH/HM | | |
| OC-115-YS | 185,000 | | X | X | X | X | X | | MH/HM | | |
| OC-122-YS | 79,000 | | | | | | | | AR | AR | AR |
| OC-123-YS | 80,000 | | | | | | | | AR | AR | AR |
| OC-124-YS | 79,000 | | | | | | | | AR | AR | AR |
| Subtotal-YS | **1,634,000** | | | | | | | | | | |

**Table 3.3-2. Port Preferences and Associated Volume for Disposal of Each Dredging Unit**
(page 5 of 8)

| | | Disposal Options | | | | | | | Port Preferences | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Station ID* | *Volume (cy)* | *Ocean Disposal* | *Wetland Cover* | *In-Bay* | *Wetland Non-Cover* | *Con-struction* | *Fill (New Land)* | *Landfill* | *1st* | *2nd* | *3rd* |
| OC-001-OM | 380,000 | X | X | X | X | X | X | | ALL | | |
| OC-002-OM | 380,000 | X | X | X | X | X | X | | ALL | | |
| OC-003-OM | 390,000 | X | X | X | X | X | X | | ALL | | |
| OC-004-OM | 208,000 | X | X | X | X | X | X | | ALL | | |
| OC-005-OM | 293,000 | X | X | X | X | X | X | | ALL | | |
| OC-006-OM | 395,000 | X | X | X | X | X | X | | ALL | | |
| OC-007-OM | 400,000 | X | X | X | X | X | X | | ALL | | |
| OC-008-OM | 395,000 | X | X | X | X | X | X | | ALL | | |
| Subtotal-OM | 2,841,000 | | | | | | | | | | |
| Total | 4,475,000 | | | | | | | | | | |
| Total Ocean | | 2,841,000 | | | | | | | | | |
| Total Cover | | | 798,000 | | | | | | | | |
| Total Non-cover | | | | | 836,000 | | | | | | |
| **Outer Widening** | | | | | | | | | | | |
| OW-014-YS | 29,000 | | | | X | X | X | | MHNC | CONSTR | |
| OW-015-YS | 41,000 | | | X | X | X | X | | MHNC | CONSTR | |
| OW-016-YS | 31,000 | | | X | X | X | X | | MHNC | CONSTR | |
| OW-017-YS | 26,000 | | | | X | X | X | | MHNC | CONSTR | |
| OW-018-YS | 27,000 | | | | X | X | X | | MHNC | CONSTR | |
| OW-019-YS | 22,000 | | | X | X | X | X | | MHNC | CONSTR | |
| OW-020-YS | 50,000 | | | X | X | X | X | | MHNC | NB21 | |
| OW-021-YS | 49,000 | | X | X | X | X | X | | MH/HM | MHNC | NB21 |
| OW-022-YS | 50,000 | | | | X | X | X | | MHNC | NB21 | |
| Subtotal-YS | 255,000 | | | | | | | | | | |

**Table 3.3-2. Port Preferences and Associated Volume for Disposal of Each Dredging Unit**
(page 6 of 8)

| | | Disposal Options | | | | | | | Port Preferences | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Station ID* | *Volume (cy)* | *Ocean Disposal* | *Wetland Cover* | *In-Bay* | *Wetland Non-Cover* | *Con-struction* | *Fill (New Land)* | *Landfill* | *1st* | *2nd* | *3rd* |
| OW-023-YM | 21,000 | | | X | X | X | X | | MHNC | NB21 | CNSTR |
| OW-025-YM | 35,000 | | | | X | X | X | | MHNC | NB21 | CNSTR |
| OW-027-YM | 27,000 | | | | X | X | X | | MHNC | NB21 | CNSTR |
| OW-029-YM | 43,000 | | | | X | X | X | | MHNC | NB21 | CNSTR |
| OW-031-YM | 25,000 | | | | X | X | X | | MHNC | NB21 | CNSTR |
| OW-033-YM | 20,000 | | X | X | X | X | X | | MH/HM | CNSTR | |
| OW-035-YM | 49,000 | | X | X | X | X | X | | MH/HM | CNSTR | |
| OW-037-YM | 51,000 | | X | X | X | X | X | | MH/HM | CNSTR | |
| OW-039-YM | 50,000 | | | | X | X | X | | MHNC | NB21 | CNSTR |
| Subtotal-YM | 321,000 | | | | | | | | | | |
| OW-024-YB | 101,000 | | | | X | X | X | | MHNC | CNSTR | |
| OW-026-YB | 117,000 | | | | X | X | X | | MHNC | CNSTR | |
| OW-028-YB | 87,000 | | | | X | X | X | | MHNC | CNSTR | |
| OW-032-YB | 14,000 | | X | X | X | X | X | | MH/HM | MHNC | CNSTR |
| OW-034-YB | 32,000 | | X | X | X | X | X | | MH/HM | MHNC | CNSTR |
| OW-036-YB | 68,000 | | | X | X | X | X | | MHNC | CNSTR | |
| Subtotal-YB | 419,000 | | | | | | | | | | |
| OW-041-OM | 70,000 | X | X | X | X | X | X | | ALL | | |
| OW-042-OM | 57,000 | X | X | X | X | X | X | | ALL | | |
| OW-043-OM | 49,000 | X | X | X | X | X | X | | ALL | | |
| OW-044-OM | 99,000 | X | X | X | X | X | X | | ALL | | |
| Subtotal-OM | 275,000 | | | | | | | | | | |
| Total | 1,270,000 | | | | | | | | | | |
| Total Ocean | | 275,000 | | | | | | | | | |
| Total Cover | | | 265,000 | | | | | | | | |
| Total Non-cover | | | | | 800,000 | | | | | | |

**Table 3.3-2. Port Preferences and Associated Volume for Disposal of Each Dredging Unit**
(page 7 of 8)

| Station ID | Volume (cy) | Disposal Options: Ocean Disposal | Wetland Cover | In-Bay | Wetland Non-Cover | Con-struction | Fill (New Land) | Landfill | Port Preferences: 1st | 2nd | 3rd |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Turning Basin** | | | | | | | | | | | |
| TC-083-YS | 39,000 | | | | X | X | X | | MHNC | NB21 | |
| Subtotal-YS | 39,000 | | | | | | | | | | |
| TC-085-OM | 89,000 | X | X | X | X | X | X | | ALL | | |
| TC-086-OM | 120,000 | X | X | X | X | X | X | | ALL | | |
| TC-087-OM | 103,000 | X | X | X | X | X | X | | ALL | | |
| TC-088-OM | 144,000 | X | X | X | X | X | X | | ALL | | |
| Subtotal-OM | 456,000 | | | | | | | | | | |
| Total | 495,000 | | | | | | | | | | |
| Total Ocean | | 456,000 | | | | | | | | | |
| Total Non- Cover | | | | | 39,000 | | | | | | |
| **Turning Wing** | | | | | | | | | | | |
| TW-091-YS | 24,000 | | | | X | X | X | | CNSTR | | |
| TW-092-YS | 36,000 | | | | | X | X | | CNSTR | | |
| Subtotal-YS | 60,000 | | | | | | | | | | |
| TW-093-YM | 23,000 | | | | | X | X | | CNSTR | | |
| TW-094-YM | 34,000 | | | | | X | X | | CNSTR | | |
| Subtotal-YS | 57,000 | | | | | | | | | | |
| TW-100-YB | 15,000 | | | | | X | X | | CNSTR | | |
| TW-101-YB | 103,000 | | | | | X | X | | CNSTR | | |
| Subtotal-YB | 118,000 | | | | | | | | | | |
| TW-089-OM | 106,000 | X | X | | X | X | X | | ALL | | |
| TW-090-OM | 151,000 | X | X | | X | X | X | | ALL | | |
| Subtotal-OM | 256,000 | | | | | | | | | | |
| Total | 491,000 | | | | | | | | | | |
| Total Ocean | | 257,000 | | | | | | | | | |

**Table 3.3-2. Port Preferences and Associated Volume for Disposal of Each Dredging Unit**
(page 8 of 8)

| | | Disposal Options | | | | | | | Port Preferences | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Station ID* | *Volume (cy)* | *Ocean Disposal* | *Wetland Cover* | *In-Bay* | *Wetland Non-Cover* | *Con-struction* | *Fill (New Land)* | *Landfill* | *1st* | *2nd* | *3rd* |
| Total Non-Cover | | | | | | | | | | | |
| Total Construction | | | | | | 235,000 | | | | | |
| **Project Volumes** | | | | | | | | | | | |
| Total Ocean | | 8,917,000 | | | | | | | | | |
| Total Cover | | | 1,669,000 | | | | | | | | |
| Total Non-cover | | | | | 2,684,000 | | | | | | |
| Construction | | | | | | 373,000 | | | | | |
| **Total** | 13,643,000 | | | | | | | | | | |

*Note:* AR - awaiting analytical results for high resolution cells
MH/HM - Middle Harbor or Hamilton
MHNC - Middle Harbor Non-Cover
NB21 - New Berth 21 Fill
FILL - Berth 55 Fill
CNSTR - Construction
ALL - Suitable for all disposal options
LAND - Landfill

# 4.0 AFFECTED ENVIRONMENT

## 4.1 AIR QUALITY

All construction and operation areas associated with the proposed projects and alternatives are located in the San Francisco Bay Area Air Basin (SFBAAB). The SFBAAB is composed of the counties of Santa Clara, San Mateo, San Francisco, Marin, Napa, Contra Costa, and Alameda, along with the southeast portion of Sonoma and the southwest portion of Solano counties. The SFBAAB covers an area of approximately 5,540 square miles. The boundary of the SFBAAB is shown in Figure 4.1-1. Air quality in the immediate project areas and surrounding regional environment of the SFBAAB would be affected by emissions from sources associated with the proposed construction and operation activities.

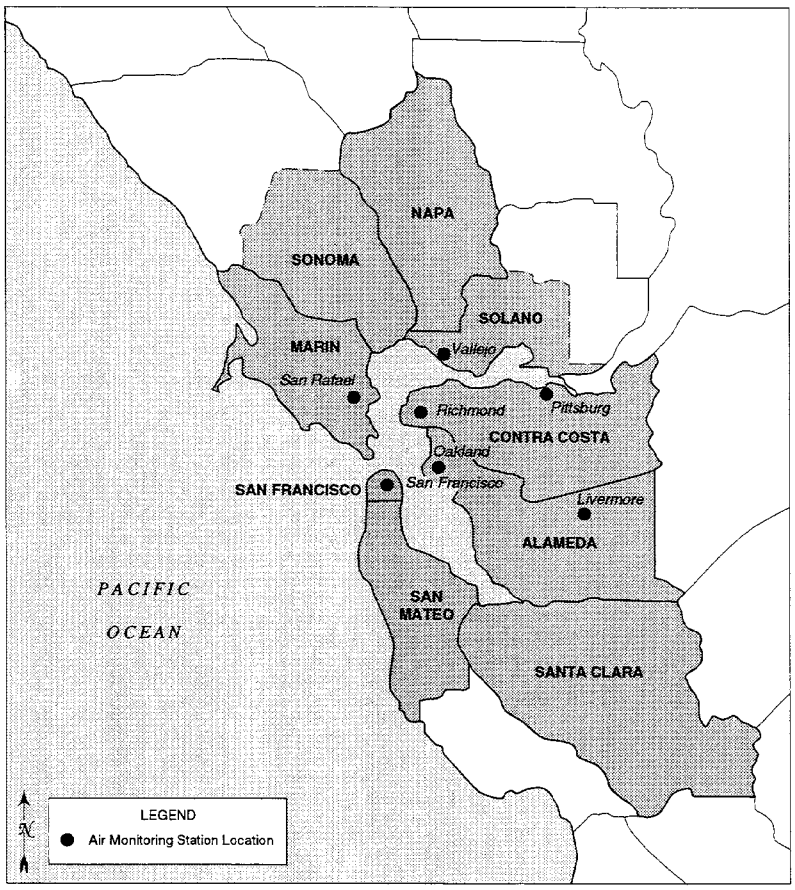
**Description of Resource**

Air quality at a given location can be described by the concentrations of various pollutants in the atmosphere. Units of concentration are generally expressed in parts per million (ppm) or micrograms per cubic meter ($\mu g/m^3$). The significance of a pollutant concentration is determined by comparing the concentration to an appropriate federal and/or state ambient air quality standard. The standards represent the allowable atmospheric concentrations at which the public health and welfare are protected and include a reasonable margin of safety to protect the more sensitive receptors in the population. Federal standards, established by the EPA, are termed the National Ambient Air Quality Standards (NAAQS). The NAAQS for all averaging periods other than annual are defined as the maximum acceptable concentrations that may not be exceeded more than once per year. The annual NAAQS may never be exceeded. The state standards, established by the California Air Resources Board (ARB), are termed the California Ambient Air Quality Standards (CAAQS). The CAAQS are defined as the maximum acceptable pollutant concentrations that are not to be equaled or exceeded, depending on the specific pollutant. The NAAQS and CAAQS are presented in Table G.2-1 (see Appendix G).

The state and federal standards have been adopted by the Bay Area Air Quality Management District (BAAQMD) for assessing local air quality impacts. The pollutants of main concern that are considered in this analysis include ozone ($O_3$), carbon monoxide (CO), nitrogen dioxide ($NO_2$), sulfur dioxide ($SO_2$), particulate matter smaller than 10 microns in diameter ($PM_{10}$), and particulate matter smaller than 2.5 microns in diameter ($PM_{2.5}$).

**Region of Influence**

Identifying the region of influence (ROI) for air quality requires knowledge of the types of pollutants being emitted, the emission rates and release parameters of the pollutant source (e.g., release temperature, area of release, release height), the proximity of the source to other pollutant sources, and local and regional meteorological conditions. The ROI for emissions of inert pollutants (all pollutants other than $O_3$ and its precursors) is generally limited to a few miles downwind from a source. Thus, for the emission of inert pollutants from project-related activities, the ROI is limited to the immediate waters, waterways, and coastal areas of the San Francisco Bay, San Pablo Bay, Delta area and Pacific Ocean where dredging, material transport and disposal




11/24/97.12:00p

**Figure 4.1-1**

**SAN FRANCISCO BAY AREA AIR BASIN**

activity, and operational phase activities would take place. For inland disposal, the ROI is limited to the transportation routes and disposal site(s).

The ROI for $O_3$ can extend much farther downwind than for inert pollutants. Ozone is a secondary pollutant formed in the atmosphere by photochemical reactions of previously emitted pollutants called "precursors." Ozone precursors are mainly the reactive organic gas (ROG) portion of volatile organic compounds (VOC) and oxides of nitrogen ($NO_x$). In the presence of solar radiation, the maximum effect of ROG and $NO_x$ emissions on $O_3$ levels usually occurs several hours after they are emitted and many miles from the source. Ozone and $O_3$ precursors transported from other regions can also combine with local emissions to increase local $O_3$ concentrations. Therefore, the ROI for $O_3$ may include much of the SFBAAB.

**Climate and Meteorology**

The climate of the project area is classified as Mediterranean, characterized by cool, dry summers and mild, wet winters. The major influence on the regional climate is the Eastern Pacific High, a strong persistent anticyclone. Seasonal variations in the position and strength of this system are a key factor in producing weather changes in the area.

The Eastern Pacific High attains its greatest strength and most northerly position during the summer, when it is centered west of northern California. In this location, the High effectively shelters California from the effects of polar storm systems from the North Pacific. Due to the large-scale atmospheric subsidence associated with the High, an elevated temperature inversion often occurs along the West Coast. The base of this inversion is usually located from 1,000 to 3,000 feet above mean sea level, depending on the intensity of subsidence and the prevailing weather condition. Vertical mixing is often limited to the base of the inversion, trapping air pollutants in the lower atmosphere. Marine air trapped below the base of the inversion is often condensed into fog and stratus clouds by the cool Pacific Ocean. This condition is typical of the warmer months of the year from roughly May through October. Stratus clouds usually form offshore and move into coastal areas during the evening hours. As the land heats up the following morning, the clouds will burn off to the immediate coastline, then move back onshore the following evening.

As winter approaches, the High begins to weaken and shift to the south, allowing polar storms to pass through the region. These storms produce periods of cloudiness, strong shifting winds, and precipitation. The number of days with precipitation can vary greatly from year to year, resulting in a wide range of annual precipitation totals. Storm conditions are usually followed by periods of clear skies, cool temperatures, and gusty northwest winds as the storm systems move eastward. Precipitation is generally lowest along the coastline and increases inland toward higher, mountainous terrain. Annual precipitation totals for the Oakland International Airport ranged from 9 to 30 inches during a 40-year period of record (1941 through 1980), with an annual average of 17.77 inches (National Oceanic and Atmospheric Administration [NOAA] 1980). Meteorological data from this station are considered representative of regional conditions, including that of the disposal areas. About 90 percent of rainfall occurs from November through April.

The average high and low temperatures at the Oakland International Airport in July are 71.1°F and 55.5°F, respectively. January average high and low temperatures are 55.6°F and 40.7°F. Extreme high and low temperatures recorded from 1941 through 1980 were 107.0°F and 23.0°F, respectively (NOAA 1980). Temperatures within the Bay are generally less extreme, due to the moderating effect of the Pacific Ocean.

The proximity of the Eastern Pacific High and a thermal low pressure system in the Central Valley region to the east produces air flow generally from the west to northwest along the central and northern California coast for most of the year. The persistence of these breezes is a major factor in minimizing air quality impacts from almost 6 million people that live in the region. As this flow is channeled through the Golden Gate Bridge, it branches off to the northeast and southeast, once inside the Bay. As a result, winds often blow from the southwest in the Berkeley area and from the northwest in the South Bay. Easterly winds that blow toward the offshore waters also occur, but are mainly nocturnal and wintertime land breezes. These land breezes may extend many miles offshore during the colder months of the year until daytime heating reverses the flow back onshore.

During the fall and winter months, the Eastern Pacific High can combine with high pressure over the interior regions of the western United States to produce extended periods of light winds and low-level temperature inversions. This condition frequently produces poor atmospheric dispersion that results in degraded regional air quality. Ozone standards traditionally are exceeded when this condition occurs during the warmer months of the year.

**Baseline Air Quality**

The EPA designates all areas of the United States as having air quality better than (attainment) or worse than (nonattainment) the NAAQS. A nonattainment designation means that a primary NAAQS has been exceeded more than three discontinuous times in 3 years in a given area. Pollutants in an area are often designated as unclassified when there is a lack of data for the EPA to form a basis of attainment status. The SFBAAB is currently in attainment of the federal standards for $NO_2$, $O_3$, and $SO_2$, in nonattainment for CO (urbanized areas only), and unclassified for $PM_{10}$ (ARB 1997a). The urbanized areas of the SFBAAB are designated as "moderate" nonattainment areas for CO by the EPA.

The current $O_3$ attainment status may be changed to a nonattainment status because of exceedances of the $O_3$ standard, which were experienced in the Bay Area in 1995 and 1996. The EPA has published a Notice of Proposed Rulemaking in the December 19, 1997 issue of the *Federal Register*, indicating its intent to reclassify the area and initiating a 60-day public comment period. Following a review of the comments received, the EPA plans to finalize its proposed action sometime in the Spring-Summer of 1998.

The ARB designates areas of the state as either in attainment or nonattainment of the CAAQS. An area is in nonattainment if the CAAQS has been exceeded more than once in 3 years. At the present time, the SFBAAB is in nonattainment of the CAAQS for $O_3$ and $PM_{10}$ and in attainment of the CAAQS for CO, $NO_2$, and $SO_2$ (ARB 1997a). The SFBAAB is designated as a "serious" nonattainment area for $O_3$. (For an explanation of the classification schemes for the NAAQS and CAAQS, i.e., "extreme," "severe," "serious," etc., see sections G.2.4 and G.3.2 in Appendix G).

Maximum pollutant concentrations measured at various monitoring stations in the SFBAAB from 1994 through 1996 are provided in Table 4.1-1. Stations were chosen for inclusion in Table 4.1-1 in order to provide a survey of the background air quality across the far reaches of the project ROI (ARB 1995, 1996, 1997). For example, the Oakland monitoring station is located a few miles east of the project dredging area. The San Francisco station and San Rafael station are nearest to the offshore and North Bay areas, respectively. Vallejo is near the eastern side of San Pablo Bay. The Pittsburg station is the closest station to the north-easternmost portion of the project region that

**Table 4.1-1. Maximum Pollutant Concentrations Monitored in the Project Area (1994-1996)**
(page 1 of 2)

| Monitoring Station | Averaging Time (Measurement) | Maximum Concentration by Year | | | Number of Days Federal Standards Exceeded* | | | Number of Days State Standards Exceeded* | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 1994 | 1995 | 1996 | 1994 | 1995 | 1996 | 1994 | 1995 | 1996 |
| **Ozone** | | | | | | | | | | |
| Livermore | 1-hour (ppm) | 0.13 | 0.16 | 0.14 | 2 | 7 | 8 | 5 | 20 | 22 |
| Oakland | | 0.06 | 0.11 | 0.09 | 0 | 0 | 0 | 0 | 1 | 0 |
| Pittsburg | | 0.11 | 0.12 | 0.12 | 0 | 0 | 0 | 3 | 8 | 5 |
| Richmond - 13th St. | | 0.09 | 0.09 | 0.08 | 0 | 0 | 0 | 0 | 0 | 0 |
| San Francisco - Ark | | 0.06 | 0.09 | 0.07 | 0 | 0 | 0 | 0 | 0 | 0 |
| San Rafael | | 0.09 | 0.09 | 0.11 | 0 | 0 | 0 | 0 | 0 | 2 |
| Vallejo | | 0.10 | 0.13 | 0.11 | 0 | 1 | 1 | 2 | 6 | 5 |
| **Nitrogen Dioxide** | | | | | | | | | | |
| Livermore | Annual (ppm) | 0.020 | 0.020 | 0.020 | 0 | 0 | 0 | NA | NA | NA |
| Pittsburg | | 0.017 | 0.017 | 0.016 | 0 | 0 | 0 | NA | NA | NA |
| Richmond - 13th St. | | 0.019 | 0.018 | 0.017 | 0 | 0 | 0 | NA | NA | NA |
| San Francisco - Ark | | 0.023 | 0.022 | 0.022 | 0 | 0 | 0 | NA | NA | NA |
| San Rafael | | 0.020 | 0.018 | 0.019 | 0 | 0 | 0 | NA | NA | NA |
| Vallejo | | 0.016 | 0.015 | 0.015 | 0 | 0 | 0 | NA | NA | NA |
| Livermore | 1-hour (ppm) | 0.08 | 0.08 | 0.09 | NA | NA | NA | 0 | 0 | 0 |
| Pittsburg | | 0.08 | 0.08 | 0.07 | NA | NA | NA | 0 | 0 | 0 |
| Richmond - 13th St. | | 0.08 | 0.07 | 0.09 | NA | NA | NA | 0 | 0 | 0 |
| San Francisco - Ark | | 0.09 | 0.09 | 0.08 | NA | NA | NA | 0 | 0 | 0 |
| San Rafael | | 0.08 | 0.06 | 0.07 | NA | NA | NA | 0 | 0 | 0 |
| Vallejo | | 0.07 | 0.07 | 0.07 | NA | NA | NA | 0 | 0 | 0 |
| **Carbon Monoxide** | | | | | | | | | | |
| Livermore | 8-hour (ppm) | 3.5 | 2.4 | 2.6 | 0 | 0 | 0 | 0 | 0 | 0 |
| Oakland | | 5.5 | 3.9 | 3.9 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pittsburg | | 3.5 | 2.8 | 2.9 | 0 | 0 | 0 | 0 | 0 | 0 |
| Richmond - 13th St. | | 3.0 | 2.5 | 2.8 | 0 | 0 | 0 | 0 | 0 | 0 |
| San Francisco - Ellis | | 5.4 | 5.5 | 5.6 | 0 | 0 | 0 | 0 | 0 | 0 |
| San Rafael | | 3.0 | 3.3 | 4.0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Vallejo | | 6.4 | 5.3 | 5.0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Livermore | 1-hour (ppm) | 7.0 | 5.0 | 5.0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Oakland | | 7.0 | 5.0 | 7.0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pittsburg | | 6.0 | 6.0 | 7.0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Richmond - 13th St. | | 6.0 | 7.0 | 5.0 | 0 | 0 | 0 | 0 | 0 | 0 |
| San Francisco - Ellis | | 8.0 | 9.0 | 9.0 | 0 | 0 | 0 | 0 | 0 | 0 |
| San Rafael | | 6.0 | 6.0 | 7.0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Vallejo | | 9.0 | 7.0 | 6.0 | 0 | 0 | 0 | 0 | 0 | 0 |

**Table 4.1-1. Maximum Pollutant Concentrations Monitored in the Project Area (1994-1996)**

(page 2 of 2)

| Monitoring Station | Averaging Time (Measurement) | Maximum Concentration by Year | | | Number of Days Federal Standards Exceeded* | | | Number of Days State Standards Exceeded* | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 1994 | 1995 | 1996 | 1994 | 1995 | 1996 | 1994 | 1995 | 1996 |
| | | | | PM10 | | | | | | |
| Livermore | Annual (geometric) μg/m³) | 22.0** | 19.4 | 19.9 | NA | NA | NA | 0 | 0 | 0 |
| Richmond - 13th St. | | 22.0 | 19.3 | 18.6 | NA | NA | NA | 0 | 0 | 0 |
| San Francisco - Ark | | 24.7 | 22.1 | 21.4 | NA | NA | NA | 0 | 0 | 0 |
| San Rafael | | 21.6 | 19.2 | 20.0 | NA | NA | NA | 0 | 0 | 0 |
| Livermore | Annual (arithmetic) (μg/m3) | 25.6** | 22.4 | 22.1 | 0 | 0 | 0 | NA | NA | NA |
| Richmond - 13th St. | | 24.8 | 21.6 | 20.4 | 0 | 0 | 0 | NA | NA | NA |
| San Francisco - Ark | | 28.0 | 24.9 | 24.3 | 0 | 0 | 0 | NA | NA | NA |
| San Rafael | | 24.1 | 20.9 | 21.8 | 0 | 0 | 0 | NA | NA | NA |
| Livermore | 24-hour (μg/m3) | 97 | 52 | 71 | 0 | 0 | 0 | 7.3% | 1.6% | 1.6% |
| Richmond - 13th St. | | 83 | 54 | 43 | 0 | 0 | 0 | 4.9% | 1.7% | 0.0% |
| San Francisco - Ark | | 93 | 50 | 71 | 0 | 0 | 0 | 9.8% | 0.0% | 3.3% |
| San Rafael | | 72 | 74 | 50 | 0 | 0 | 0 | 6.6% | 1.6% | 0.0% |
| | | | | Sulfur Dioxide | | | | | | |
| Pittsburg | Annual (ppm) | 0.001 | 0.001 | 0.002 | 0 | 0 | 0 | NA | NA | NA |
| Richmond - 13th St. | | 0.001 | 0.001 | 0.000 | 0 | 0 | 0 | NA | NA | NA |
| San Francisco - Ark | | 0.000 | 0.000 | 0.000 | 0 | 0 | 0 | NA | NA | NA |
| Vallejo | | 0.001 | 0.001 | 0.001 | 0 | 0 | 0 | NA | NA | NA |
| Pittsburg | 24-hour (ppm) | 0.010 | 0.012 | 0.012 | 0 | 0 | 0 | 0 | 0 | 0 |
| Richmond - 13th St. | | 0.014 | 0.006 | 0.008 | 0 | 0 | 0 | 0 | 0 | 0 |
| San Francisco - Ark | | 0.008 | 0.007 | 0.008 | 0 | 0 | 0 | 0 | 0 | 0 |
| Vallejo | | 0.010 | 0.010 | 0.008 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pittsburg | 1-hour (ppm) | 0.03 | 0.04 | 0.03 | NA | NA | NA | 0 | 0 | 0 |
| Richmond - 13th St. | | 0.03 | 0.05 | 0.03 | NA | NA | NA | 0 | 0 | 0 |
| San Francisco - Ark | | 0.02 | 0.04 | 0.04 | NA | NA | NA | 0 | 0 | 0 |
| Vallejo | | 0.04 | 0.02 | 0.05 | NA | NA | NA | 0 | 0 | 0 |

*Notes:* NA = Not applicable.

* = Annual averaging periods are reported as either being exceeded or not being exceeded. $PM_{10}$ 24-hour standard exceedances are measured as a percentage of the total samples that exceed the standard. Percentage is used because $PM_{10}$ sampling is not performed on a daily basis.

** = Data presented are valid, but incomplete in that an insufficient number of valid data points were collected to meet EPA and/or ARB criteria for representativeness.

*Source:* ARB 1995, 1996, 1997.

includes the Montezuma Wetlands, and the Livermore station is nearest to the Altamont and Vasco Road disposal sites. Locations of the monitoring stations are shown in Figure 4.1-1.

Concentrations of photochemical smog, or $O_3$, are highest during the warmer months and coincide with the season of maximum insolation. Inert pollutant concentrations (pollutants other than $O_3$) tend to be the greatest during the cooler months when extended periods of light wind conditions and surface-based temperature inversions occur. The following is a discussion of the various pollutants monitored within the SFBAAB.

*Ozone*

Ozone is a colorless gas that is formed in the atmosphere by the photochemical reactions of ROG and $NO_x$. It is a respiratory irritant and can cause damage to lung tissue. Sensitive plant species and synthetic materials can also be damaged by $O_3$ at concentrations as low as 0.02 ppm. The data in Table 4.1-1 show that the 1-hour CAAQS of 0.09 ppm was exceeded numerous times during the 1994 through 1996 period in the project region, while the NAAQS was exceeded on 17 occasions at the Livermore station and twice at the Vallejo station.

*Nitrogen Dioxide*

Nitrogen dioxide is a reddish-brown gas with an irritating odor. As a product of nitrogen oxides ($NO_x$), $NO_2$ is one of the primary pollutants in the formation of photochemical smog. Nearly all $NO_2$ is emitted from manmade sources such as automobiles and power plants that burn fossil fuels. Health effects associated with $NO_2$ range from irritation to the eyes, nose, and throat to increased susceptibility to infection. The maximum $NO_2$ concentrations monitored in the project area are shown in Table 4.1-1. These data show that the 1-hour and annual concentrations were less than 50 percent of their applicable standards during the monitoring period.

*Carbon Monoxide*

Carbon monoxide is a clear, odorless gas produced by the incomplete combustion of fossil fuels and organic substances. The natural degradation of plant matter can also contribute to the production of CO, but motor vehicles are by far the largest man-made source. The highest ambient CO concentrations usually occur near congested transportation arteries and intersections. Carbon monoxide is not a respiratory irritant, but rather passes through lungs and interferes with the transfer of oxygen in blood. Symptoms of exposure include dizziness, headache, and, in extreme cases, loss of consciousness. Table 4.1-1 shows that the maximum CO levels monitored within the project region were less than their applicable standards during the monitoring period.

*$PM_{10}$ and $PM_{2.5}$*

$PM_{10}$ and $PM_{2.5}$ are produced by a wide range of activities including natural wind erosion of soil, combustion of fossil fuels, mining, and transporting and handling of minerals. $PM_{10}$ and $PM_{2.5}$ are of concern because the small particles can pass through the bronchial passages in the lung and into the alveoli where they can be retained indefinitely. If $PM_{10}$ or $PM_{2.5}$ contain water-soluble compounds; the soluble portion can be absorbed and transported through the blood system to other organs where they can cause damage.

Table 4.1-1 shows that the maximum $PM_{10}$ levels monitored in the project area periodically exceeded the 24-hour CAAQS. However, the remaining $PM_{10}$ standards were not exceeded at any of these locations during the monitoring period.

Since the standard for $PM_{2.5}$ was only recently promulgated by EPA (July 1997), only limited monitoring data are available for this pollutant.

The Port retained Orion Environmental Associates (Orion) to conduct a monitoring program to measure the levels of fine particulate in the West Oakland area. The monitoring program was initiated on April 22, 1997 and is planned to continue for 12 months. Two stations were set up as part of the program. One monitoring station is located on Port property near the intersection of 7th Street and Middle Harbor Road, and the other is located near the intersection of Filbert and 24th streets in a residential neighborhood in West Oakland. Data were recently released in a progress report covering the first six months of the monitoring program, from April 22 through October 31, 1997 (Orion 1997). In addition, $PM_{2.5}$ data are available for this same time period from two monitoring stations operated by the BAAQMD in Concord and Livermore. A summary of the minimum, maximum, and average values measured thus far at each of the four stations is provided in Table 4.1-2.

**Table 4.1-2. $PM_{2.5}$ Concentration Measurements[a]**

| | $PM_{2.5}$ CONCENTRATIONS ($\mu g/m^3$) | | |
|---|---|---|---|
| *Monitoring Station* | *Minimum* | *Maximum* | *Average* |
| Port Site | 5 | 18 | 9 |
| Residential Site | 4 | 17 | 9 |
| Concord | 0 | 9 | 5 |
| Livermore | 3 | 16 | 8 |

*Note: a.* Data are from 24-hour measurements made during the period from April 22 through October 31, 1997. The Port Site and Residential Site stations were operated by Orion Environmental Associates under contract to the Port of Oakland. The Concord and Livermore stations were operated by the Bay Area Air Quality Management District (BAAQMD).

As shown in Table 4.1-2, data collected to date indicate no major difference in $PM_{2.5}$ particulate concentrations between the Port site and the residential site. Levels appear to be similar to those measured elsewhere in the region, indicating a regional distribution of $PM_{2.5}$ particulate sources rather than a localized source, such as Port facilities or activities. In addition, it can be seen that the new federal $PM_{2.5}$ standard (65 $\mu g/m^3$) was consistently met with a large margin of safety.

*Sulfur Dioxide*

Sulfur dioxide is a colorless, nonflammable gas with a pungent odor. $SO_2$ is a respiratory irritant that is mainly produced from the combustion of sulfur-containing fossil fuels, as a byproduct in the refining of fossil fuels from crude oil, and from the production of sulfuric acid. Marine vessels contribute substantially to $SO_2$ emissions in the SFBAAB (approximately 15 percent of the total from all sources) due to the use of high-sulfur fuels. About one-third of these emissions occur when vessels operate in harbors and bays and two-thirds occur while vessels cruise along the coast (ARB 1984). The data in Table 4.1-1 show that $SO_2$ concentrations monitored within the project region were only a fraction of their applicable standards.

**San Francisco Bay Area Air Basin Emissions**

Table 4.1-3 displays the air emissions that were estimated to have occurred within the SFBAAB in 1995. These data are projections from the SFBAAB 1990 base year emission inventory and incorporate factors such as population growth, lower emitting motor vehicles, and the implementation of current and proposed emission control measures (BAAQMD 1996). Transportation sources are one of the largest contributors to air pollutants in the SFBAAB. Transportation sources account for approximately 49 percent of the ROG, 74 percent of the CO, 54 percent of the $NO_x$, 30 percent of the $SO_2$, and 69 percent of the $PM_{10}$ emitted in the SFBAAB (BAAQMD 1996).

**Table 4.1-3. 1995 Emission Inventory for the San Francisco Bay Area Air Basin (tons/day)**

| | *ROG* | *CO* | *$NO_x$* | *$SO_x$* | *$PM_{10}$* |
|---|---|---|---|---|---|
| Residential | 63 | 198 | 26 | 1 | 17 |
| Commercial | 82 | 94 | 0 | 0 | 7 |
| Industrial | 90 | 94 | 89 | 63 | 14 |
| Infrastructure | 1 | 9 | 34 | 1 | 1 |
| Construction | 13 | 213 | 54 | 5 | 61 |
| Transportation | 262 | 1,792 | 245 | 31 | 321 |
| Agricultural and Natural | 23 | 24 | 6 | 0 | 41 |
| **Total for the Air Basin** | **535** | **2,425** | **454** | **102** | **462** |

*Source:* BAAQMD 1996. Data for year 1995 were projected by the BAAQMD from the 1990 base year emissions inventory.

## 4.2 SURFACE WATER RESOURCES

This section describes the setting for surface water resources; groundwater resources are described in section 4.3.

### 4.2.1 Regional Setting

***Hydrodynamics***

The San Francisco Bay estuary is a complex, dynamic water system composed of interconnected embayments, sloughs, marshes, and channels. The ocean, river, and waste waters that mix in this system vary depending on location and season. Conomos (1979) divides the estuary into the Delta (i.e., the mouth of the Sacramento and San Joaquin rivers) and the Bay, composed of the northern and southern reaches. These two reaches display vastly different circulation and sedimentation patterns based on prevailing hydrodynamic conditions. Circulation, in general, is affected by tides entering the Bay from the Pacific, local winds, basin bathymetry, and the local salinity field (USGS 1984). The northern reach receives the majority of fresh water input (>90 percent), while South Bay receives less than 10 percent of the fresh water budget (O'Connor 1991). South Bay receives the majority (>75 percent) of waste water discharged in the Bay and, during the summer, sewage discharge exceeds fresh water in-flow in this area.

Density-salinity driven currents in the northern reach show ebb dominance of the surface water (4 cm/sec) and flood dominance of the bottom water (5 cm/sec). South Bay waters are influenced by Delta outflow during the winter months when low-salinity water moves southward into the southern reach displacing the saline, denser water northward. In the summer months, however, South Bay currents are largely influenced by wind stress on the surface; northwest winds transport water in the direction of the wind, and the displaced water causes subsurface currents to flow in the opposite direction (i.e., northward) (Conomos 1979). In each embayment, narrow, deep shipping channels (10 to 20 m deep) are bordered by expansive shoaling areas. Currents with the highest velocities occur in these channels; low velocity currents move over the shoals, where sedimentation occurs (USGS 1984).

Tidal currents in San Francisco Bay consist of semidiurnal and diurnal partial tides (USGS 1984). Two high tides and two low tides occur daily, with unequal amplitudes (COE 1990). The bay-wide tidal prism is large, representing 24 percent of the Bay volume, given the low average water depth of the Bay (6.1 m) (Conomos 1979; Conomos et al. 1985).

The Central Bay is often described as being a distinct sub-unit of the Bay's geography (SFEI 1996). Central Bay is most strongly influenced by tidal currents due to its close proximity to the Pacific Ocean. The 50-foot project is located near the interface between the Central and South Bay.

***Water Quality***

*Water Quality Parameters*

The range of water quality parameters in the Central Bay shows the least fluctuation, in comparison to other areas of the Bay, due to the "buffering capacity" of cold, ocean waters (COE 1976, Appendix C). Conventional water quality parameters, metals, and organic levels

were collected for the Regional Monitoring Program (RMP) in February, April, and August 1995. These data for San Francisco Bay are shown in Table 4.2-1 (SFEI 1996).

**Table 4.2-1. 1995 Water Quality Data for the San Francisco Bay near the Oakland 50-foot Project**

| *Parameter* | *Yerba Buena Island (BC10)* [1] | *Alameda (BB70)* [1] | *All San Francisco Bay Stations* |
|---|---|---|---|
| **Conventional Parameters** | | | |
| Temperature (° C) | 12.4-18.6 | 13.0-20.4 | 10.1-25.3 |
| Salinity (0/00) | 13.2-27.5 | 13.5-26.0 | 1-33 |
| Total Suspended Solids (mg/L) | 2.3-7.3 | 0.3-4.2 | 0.28-414 |
| Dissolved oxygen (mg/L) | 6.2-9.5 | 5.8-9.0 | 4.1-10.3 |
| pH | 7.8-7.9 | 7.8-8.0 | 7.6-8.1 |
| Nitrate (µg/L) | 71.4-347.2 | 191.8-438.2 | 1.4-7,683.4 |
| Nitrite (µg/L) | 7.0-16.8 | 8.4-16.8 | 1.4-624.4 |
| Ammonia (µg/L) | 4.2-357 | 12.6-93.8 | 2.8-1,832.6 |
| Phosphate (µg/L) | 46.5-74.4 | 52.7-139.5 | 3.1-2,039.8 |
| Silicates (µg/L) | 1,820-4,513.6 | 2,604-6,168.4 | 812-11,340 |
| **Metals (total or near total*) (µg/L)** | | | |
| Arsenic | 1.55-2.02 | 1.49-2.34 | 1.00-6.74 |
| Cadmium * | 0.0320-0.0900 | 0.0380-0.1000 | 0.017-0.140 |
| Chromium | 0.60-1.64 | 0.40-0.80 | 0.07-42.980 |
| Copper * | 1.33-2.27 | 1.77-2.29 | 0.19-15.28 |
| Lead * | 0.15-0.35 | 0.10-0.32 | 0.010-8.08 |
| Mercury | 0.0022-0.0034 | 0.0021-0.0052 | 0.0001-0.105 |
| Selenium | 0.07-0.18 | 0.17-0.18 | 0.019-2.24 |
| Silver | 0.0026-0.0100 | 0.0043-0.0130 | 0.002-0.113 |
| Zinc | 1.48-2.23 | 1.08-1.98 | 0.22-39.64 |
| **Organics (total) (pg/L)** | | | |
| Total PAHs | 8,993-13,838 | 5,946-14,097 | 2,822-504,872 |
| Total PCBs | 231-396 | 227-493 | 83-6,974 |
| Total DDTs | 64-172 | 86-167 | 30-6,828 |
| Total Chlordanes | 54-143 | 40-161 | 32-1,235 |

*Note:* 1. BC10 and BB70 are the number designations for the water quality stations that are located closest to Oakland Harbor.
*Source:* SFEI 1996

The Pollutant Policy Document (PPD) identifies pollutants of concern in the Bay and the Sacramento-San Joaquin Delta Estuary (SWRCB 1990a). The pollutants of concern were identified based on their widespread occurrence or frequency of occurrence and their potential to cause adverse impacts on beneficial uses. These pollutants are arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, zinc, tributyltin (TBT), organochlorines, chlorinated dibenzodioxins and dibenzofurans, and hydrocarbons (particularly PAHs).

Concentrations of metals and organics in Bay waters, for the contaminants in the PPD, are provided in Table 4.2-2. These data were compiled from Appendix A of the PPD (SWRCB 1990a). Some of the parameters listed generally occur at moderate concentrations in Bay waters and tissue samples and were determined by the PPD not to be a public health concern (SWRCB 1990a). These parameters include tributyltin, copper, silver, and zinc.

Other parameters such as selenium, silver, dioxin, TBT, zinc, cadmium, hexavalent chromium, and copper have been measured at moderate to high levels, which may cause toxic effects to aquatic life and a risk to public health. Cadmium, mercury, tributyltin, dioxins and furans, and PCBs are of serious concern in Bay waters because these parameters were found to strongly bioaccumulate in aquatic organisms.

**Table 4.2-2. Concentrations of Metals and Organics in San Francisco Bay Waters (all values in ppb; from the PPD [SWRCB 1990b])**

| *Parameter* | *San Pablo Bay* | *Central Bay* | *South Bay* |
|---|---|---|---|
| Arsenic | ND | ND | ND |
| Cadmium | ND | ND | 0.1-0.25 |
| Chromium | ND | ND | 6-55 |
| Copper | ND | 0.5-4.0 | 2.5-4.0 |
| Lead | ND | 0.18-0.033 | To 200 |
| Mercury (tl./diss.) | 0.009-0.028/0.006-0.011 | ND/ND | ND/ND |
| Nickel | ND | 1.0 (mean) | 8.0 (max.) |
| Selenium | ND | 150-320 | ND |
| Silver | ND | 0.004-0.310 | 0.042 (mean) |
| Zinc | ND | 0.4-2.0 | ND |
| Tributyltin | 0.002 1 | 0.006 2 | 0.082 3 |
| PCBs | ND | ND | ND |
| DDTs | ND | ND | ND |
| Dioxins and Furans | ND | ND | ND |
| MAHs | ND | <0.5 | ND |
| PAHs | ND | ND | ND |

*Notes:* ND = no data
tl = total
diss = dissolved
1. Water sample collected at Mare Island.
2. Water sample collected at Pier 39 in San Francisco.
3. Water samples collected at marinas in Oakland and Alameda.

DDT levels have declined since the 1970s, with severe contamination limited to areas not within the Port project area (SFEI 1996). The 1995 RMP data showed a range of 30 to 6,828 µg/L in the San Francisco Bay (Table 4.2-1).

The 1995 RMP data (SFEI 1996) showed several contaminants that were above water quality objectives or criteria at the 24 water quality sampling locations (Table 4.2-3). The criteria used to determine acceptable levels were taken from several sources because a single document typically does not include all contaminants. The contaminants that exceeded these criteria at specific sampling locations were chromium; copper; mercury; nickel; lead; selenium; zinc; anthracene; benzo(a)pyrene; benzo(b)fluoranthene; dieldrin; diazinon; heptachlor epoxide; indeno (1,2,3-cd)pyrene; p,p'-DDD; p,p'-DDE; p,p'-DDT; total PCBs; and total PAHs.

*Sources of Pollutants*

Five sources of pollutants have been identified in the PPD, including point sources, urban runoff, nonurban runoff, riverine sources, and others. It is estimated that urban runoff may contribute the greatest pollutant loads to the Bay-Delta Estuary. Nonurban runoff (e.g., agricultural lands) and riverine sources also contribute substantial pollutant loads to the Bay-Delta Estuary. Some contaminants levels are very site-specific based on local municipal and industrial discharges (PPD 1990).

The 1995 RMP identified an additional source of pollutants particularly in the South Bay where water quality standards were exceeded. The source is the remobilization of trace elements from historically contaminated deposited sediments. Decomposition of organic material within benthic sediments solubilizes some nutrients and trace elements. It has been estimated that

during some periods this source can be greater than river input or wastewater discharges (SFEI 1996).

*Spatial and Seasonal Water Quality Variations*

Seasonal variations in wind, ocean conditions, and water in-flow greatly affect water quality parameters in San Francisco Bay and are well documented (Conomos 1979; COE 1976, Appendix C; Krone 1979; O'Connor 1991; COE 1990; USGS 1984; Rubin and McCulloch 1979; Ogden Beeman 1991; SAIC 1992a-d, 1993a). River in-flow controls water quality parameters in the winter and spring months, while wind effects dominate in the summer months. North Bay, which is influenced by fresh water in-flow from the Delta, is typified by oxygenated, low-salinity waters high in suspended solids. Central Bay is characterized by cold, saline waters that are low in total suspended sediment, caused by the intrusion of Pacific waters through the Golden Gate.

In all parts of the Bay, there are spatial and seasonal variations. Water temperature is lowest from January to March and highest in the summer and early fall. Water temperature is highest in July for most of the Bay, although a temperature maximum in Central Bay occurs one month later in August. Dissolved oxygen, total suspended solids, and nutrients levels also tend to vary with biological activity. Dissolved oxygen is lowest in summer when waters are relatively quiescent and warm, and biological oxygen demand is high. Total suspended solids in Central Bay and the northern reach reaches a maximum in late May and June when runoff is at its peak. However, the influence of Delta outflow is not felt in South Bay until March. Suspended solids increase again in late fall due to wind-wave resuspension. In the north reach, levels of silicates and nitrate+nitrite are generally higher in the winter months than in summer, coinciding with the Delta outflow. Ammonia and phosphate present in sewage effluents are relatively constant throughout the year in the northern reach. In South Bay, however, silicate and phosphate concentrations are higher in summer than in winter, and nitrate+nitrite and ammonia concentrations are greater in winter than in summer. The supply of nitrate+nitrite and ammonia by local streams in the winter months exceeds the removal rate by algae. Phosphorus is removed from the system during the winter months when low-phosphorus waters from the Delta enters South Bay and flush it toward the Golden Gate (Conomos et al. 1985).

The RMP (SFEI 1996) also showed general spatial and seasonal patterns in both dissolved trace element and total trace elements. The dissolved trace element levels were elevated in the South Bay and Southern Slough sampling stations during the three sampling times (February, April, and August) compared to other sampling stations. The level of silver in the South Bay and Southern Slough stations was the only dissolved trace element that showed a variation in this pattern of high concentrations in the South Bay. Instead, silver showed a distinct seasonal pattern. Dissolved silver concentrations in Central Bay and North Bay stations were relatively high in August, suggesting a possible source of silver at that time. Dissolved cadmium concentrations were higher in the Central Bay (and comparable to South Bay levels), probably due to the influence of enriched ocean waters. Concentrations of dissolved arsenic, copper, and nickel were elevated at the Petaluma River station compared to adjacent stations in both 1994 and 1995. Lead and mercury were found at comparatively high levels at the River stations in the North Bay. The spatial distribution of total trace element concentrations resembles the distribution of total suspended solids (TSS) with the highest concentrations in the Southern Sloughs and the Petaluma River, intermediate concentrations in the Northern Estuary and River Stations, and lowest concentrations in the Central Bay. Seasonal variations were found for arsenic, cadmium, and dissolved silver. In both 1994 and 1995, arsenic and cadmium were

## Table 4.2-3. Summary of Contaminants above Water Quality Objectives or Criteria

(page 1 of 2)

| Station Name | Code | Chromium | Copper | Mercury | Nickel | Lead | Selenium | Zinc | Anthracene | Benzo(a) pyrene | Benzo(b) fluoranthene |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Guideline → | (5.0 µg/L) | (4.9 µg/L) | (0.025 µg/L) | (7.1 µg/L) | (5.6 µg/L) | (5.0 µg/L) | (58 µg/L) | (540 pg/L) | (31000 pg/L) | (31000 pg/L) |
| Sunnyvale | C-1-3 | – S – | – – – | – S D | – – D | – – D | – – – | – – – | * | * | * |
| San Jose | C-3-0 | – S – | – – – | – S D | – – D | – – D | – – – | – – – | * | * | * |
| Coyote Creek | BA10 | – – – | – S D | – S – | W S – | – S – | – – – | – – – | – S – | – S – | – S – |
| South Bay | BA20 | – – – | – S – | – S – | – S D | – – – | – – – | – – – | * | * | * |
| Dumbarton Bridge | BA30 | – – – | – S – | – S D | – S D | – – – | – – – | – – – | – S – | – S – | – S – |
| Redwood Creek | BA40 | – – – | – – – | – – – | – – – | – – – | – – – | – – – | – – – | – – – | – – – |
| San Bruno Shoal | BB15 | – – – | – – – | – – – | – – – | – – – | – – – | – – – | * | * | * |
| Oyster Point | BB30 | – – – | – – – | – – – | – – – | – – – | – – – | – – – | * | * | * |
| Alameda | BB70 | – – – | – – – | – – – | – – – | – – – | – – – | – – – | – – – | – – – | – – – |
| Yerba Buena Island | BC10 | – – – | – – – | – – – | – – – | – – – | – – – | – – – | – – – | – – – | – – – |
| Golden Gate | BC20 | – – – | – – – | – – – | – – – | – – – | – – – | – – – | – – – | – – – | – – – |
| Richardson Bay | BC30 | – – – | – – – | – – – | – – – | – – – | – – – | – – – | * | * | * |
| Point Isabel | BC41 | – – – | – – – | – – – | – S – | – – – | – – – | – – * | * | * | * |
| Red Rock | BC60 | – – * | – – – | – – – | – – – | – – – | – – – | – – * | – – – | – – – | – – – |
| Petaluma River | BD15 | W S – | – – – | W S D | – – D | – – – | – – – | – – – | – S – | – S – | – S – |
| San Pablo Bay | BD20 | – – – | – S – | – S – | – S – | – – – | – – – | – – * | – – – | – – – | – – – |
| Pinole Point | BD30 | – S – | – – – | – – – | – – – | – – – | – – – | – – – | – – – | – – – | – – – |
| Davis Point | BD40 | – S – | W – – | – S – | W – – | – – – | – – – | – – – | – – – | – – – | – – – |
| Napa River | BD50 | – – – | W S – | – – – | W S – | – – – | – – – | – – – | – – – | – – – | – – – |
| Pacheco Creek | BF10 | – – – | W S – | – – – | W – – | – – – | – – – | – – – | * | * | * |
| Grizzly Bay | BF20 | – – – | W S – | – S – | – S – | – – – | – – – | – – – | – – – | – – – | – – – |
| Honker Bay | BF40 | – – * | W S – | – – – | – – – | – – – | – – – | – – – | * | * | * |
| Sacramento River | BG20 | – – – | – – – | – – – | – – – | – – – | – – – | – – – | – – – | – – – | – – – |
| San Joaquin River | BG40 | – – – | – – – | – – – | – – – | – – – | – – – | – – – | – – – | – – – | – – – |

*Note:* Trace element objectives are from the Basin Plan (SF-RWQCB 1995). The Basin Plan does not have an objective for selenium; this criterion comes from the EPA (Federal Register, May 4, 1995). Trace organics results are compared to the human health ($10^{-6}$ risk for carcinogens), fresh and salt water criteria for the consumption of organisms only, found in the EPA Federal Register, May 4, 1995. The total PAHs objective is from the Basin Plan as the Federal Register does not have a criterion for total PAHs. The diazinon guideline is from the National Academy of Sciences.

W = Wet season (February)
S = Spring season (late May)
D = Dry season (August)
– = not above guideline
* = not available or not sampled

## Table 4.2-3. Summary of Contaminants above Water Quality Objectives or Criteria

(page 2 of 2)

| Station Name | Code | Diazinon | Dieldrin | Heptachlor Epoxide | Indeno (1,2,3-cd) pyrene | p,p'-DDD | p,p'-DDE | p,p'-DDT | Total PCBs (SFEI) | Total PAHs (SFEI) |
|---|---|---|---|---|---|---|---|---|---|---|
| | Guideline → | (9000 pg/L) | (140 pg/L) | (110 pg/L) | (31000 pg/L) | (840 pg/L) | (590 pg/L) | (590 pg/L) | (45 pg/L) | (31000 pg/L) |
| Sunnyvale | C-1-3 | * | * | * | * | * | * | * | * | * |
| San Jose | C-3-0 | * | * | * | * | * | * | * | * | * |
| Coyote Creek | BA10 | – – – | – – D | W S – | – S – | – S – | – S – | – – – | W S D | W S D |
| South Bay | BA20 | * | * | * | * | * | * | * | * | * |
| Dumbarton Bridge | BA30 | – – – | – – – | – – – | – S – | – – – | – S – | – – – | W S D | W S D |
| Redwood Creek | BA40 | – – – | – – – | – – – | – – – | – – – | – – – | – – – | W S D | – S D |
| San Bruno Shoal | BB15 | * | * | * | * | * | * | * | * | * |
| Oyster Point | BB30 | * | * | * | * | * | * | * | * | * |
| Alameda | BB70 | – – – | – – – | – – – | – – – | – – – | – – – | – – – | W S D | – – – |
| Yerba Buena Island | BC10 | – – – | – – – | – – – | – – – | – – – | – – – | – – – | W S D | – – – |
| Golden Gate | BC20 | – – – | – – – | W – – | – – – | – – – | – – – | – – – | W S D | – – – – |
| Richardson Bay | BC30 | * | * | * | * | * | * | * | * | * |
| Point Isabel | BC41 | * | * | * | * | * | * | * | * | * |
| Red Rock | BC 60 | – – – | – – – | – – – | – – – | – – – | – – – | – – – | W S D | – – – |
| Petaluma River | BD15 | W – – | – – – | W – – | – S – | – S – | – S – | – S – | W S D | W S D |
| San Pablo Bay | BD20 | – – – | – – – | W – – | – – – | – – – | – S – | – – – | W S D | – S – |
| Pinole Point | BD30 | – – – | – – – | – S – | – – – | – – – | – S – | – – – | W S D | – – – |
| Davis Point | BD40 | – – – | – – – | – – – | – – – | – – – | – S – | – – – | W S D | – S – |
| Napa River | BD50 | – – – | – – – | – – – | – – – | – – – | – S – | – – – | W S D | W – – |
| Pacheco Creek | BF10 | * | * | * | * | * | * | * | * | * |
| Grizzly Bay | BF20 | – – – | – – – | W – – | – – – | – – – | – S – | – – – | W S D | – – – |
| Honker Bay | BF40 | * | * | * | * | * | * | * | * | * |
| Sacramento River | BG20 | – – – | – – D | – – – | – – – | – – – | – – – | – – – | W S D | – – – |
| San Joaquin River | BG30 | – – – | – – – | W – – | – – – | – – – | – – – | – – – | W S D | – – – |

*Note:* Trace element objectives are from the Basin Plan (SF-RWQCB 1995). The Basin Plan does not have an objective for selenium; this criterion comes from the EPA (Federal Register, May 4, 1995). Trace organics results are compared to the human health ($10^{-6}$ risk for carcinogens), fresh and salt water criteria for the consumption of organisms only, found in the EPA Federal Register, May 4, 1995. The total PAHs objective is from the Basin Plan as the Federal Register does not have a criterion for total PAHs. The diazinon guideline is from the National Academy of Sciences.

W = Wet season (February)
S = Spring season (late May)
D = Dry season (August)
– = not above guideline
* = not available or not sampled

*Source:* SFEI 1996.

elevated in August. Silver concentrations were elevated in August in the South Bay. Total concentrations of the trace elements associated with particulate concentrations (chromium, copper, lead, mercury, nickel, silver, and zinc) were often highest in April when the TSS concentrations were highest.

The RMP data for 1995 (SFEI 1996) showed spatial and seasonal variations in trace organics. Most dissolved trace organics including PCBs, chlordanes, DDTs, HCHs (hexachlorocyclohexane) and diazinon were elevated in the South Bay relative to the rest of the estuary, with concentrations decreasing from the most southern sampling location to the Golden Gate sampling location. Dissolved pesticides, DDT, chlordanes, and diazinon, were relatively high in the North Bay with some seasonal variations. Concentrations of diazinon in February were high throughout the Estuary. HCHs were lower in the River sampling stations than in any other part of the Estuary. Total concentrations of the trace organics, PAHs, PCBs, DDTs, and chlordanes showed the same spatial pattern as TSS with high concentrations in the South Bay, low concentrations in the Central Bay, high concentrations in the North Bay, and intermediate concentrations in the River stations. These organics also showed seasonal variation consistent with the high concentration of TSS in April. Dissolved and TSS adjusted trace organics data indicate sources in the South Bay for all the organics and at the River Stations for DDT. Dissolved PAHs were much higher in all stations in August than in February and April. Diazinon was high in all stations in February, intermediate in April, and low in August.

### 4.2.2 Proposed Dredge Area

*Hydrodynamics*

Oakland Harbor is located in the east-central portion of San Francisco Bay at the confluence of the northern reach of San Francisco Bay and South Bay. The general hydrodynamics for these areas and Central Bay have been discussed in the section on regional hydrodynamics (section 4.2.1).

Oakland Outer Harbor is influenced by hydrodynamic conditions typical of Central Bay (see section 4.2.1). Current measurements and modeling predictions made by the Corps (COE 1990) in Central Bay indicated that net tidal fluxes in the vicinity of the Outer Harbor were south along the east side of the Bay and that northward moving currents occurred on the west side of the entrance to South Bay.

In the Inner Harbor, current and wave patterns are largely generated by tides interacting with bottom and shoreline configurations. Field measurements of current speeds at the Inner Harbor entrance indicated velocities between approximately 25 to 50 cm/sec with peaks up to 107 cm/sec. South of the peninsular Seventh Street Terminal in the Inner Harbor, currents move in a counterclockwise eddy.

Velocities measured in the Middle Harbor averaged between 3.5 and 4.5 cm/sec, with short duration peaks of 25 cm/sec. Current velocities were higher in the upper meter than at the bottom meter for both Inner and Middle Harbor. An average tidal range of 2.5 meters was measured in June 1997 (Hartman 1997).

*Water Quality*

There are limited data available that describe existing water quality conditions in Oakland Harbor. The data relevant for characterization of the proposed dredging site in this section are taken from studies performed regionally. General existing water quality conditions can be inferred for the Oakland area based on these data. Because the Oakland Harbor dredging site is located in an urban and industrial area, water quality conditions likely fluctuate with changing storm sewer releases. These effects are compounded by seasonal and diurnal temperatures and seasonal fresh water in-flow fluctuations that are observed in the open Bay and, possibly to a minor degree, atmospheric deposition (SFEI 1996).

The Outer Harbor is open to the west and experiences water quality conditions consistent with those in the Central Bay. The inner portions of Oakland Harbor are likely to experience seasonally variable salinities, increased temperatures, and slightly depressed dissolved oxygen levels compared to the open Bay due to the lack of circulation caused by the confines of the channel.

The two closest water quality stations from the 1995 RMP, identified as BB70 and BC10, have characterized conventional water quality parameters(Table 4.2-1). This monitoring program showed variability during three sampling times during the year. Samples were taken in February (during the wet season), April (a period of declining Delta flows), and in August (during the dry season) (SFEI 1996).

*Temperature*

Central Bay water temperatures are moderated by the entry of Pacific Ocean waters through the Golden Gate. The RMP for 1995 found temperatures at the Alameda Station (BB70) to be 13°C, 13.6°C, and 20.5°C in February, April, and August, respectively. At the Yerba Buena Island Station, temperatures were 12.4°C, 13.5°C, and 18.6°C in February, April, and August, respectively (Table 4.2-1) (SFEI 1996).

Temperatures were measured during the Habitat Evaluation Study (Entrix 1997). Temperatures ranged from 13.8° to 23.5°C at the project site in the spring, and 15.4°C to 21.7°C in the summer. Temperatures were also measured in another study at various locations in the Inner Harbor and Middle Harbor in June 1997 (Hartman 1997). Temperatures varied from 16°C to 21°C.

*Dissolved Oxygen*

Dissolved oxygen levels measured by the 1995 RMP ranged from 5.8 to 9.0 mg/L at the Alameda Station and 6.2 to 9.5 mg/L at the Yerba Buena Island Station (Table 4.2-1). This concentration of dissolved oxygen is well above the minimum ambient dissolved oxygen concentration of 5 mg/L established by the SF-RWQCB (1995).

Dissolved oxygen measured in June 1997 in another study at seven locations in the Inner and Middle harbors showed concentrations between 5.7 to 6.67 mg/L (Hartman 1997).

*pH*

The 1995 RMP measured pH at the 1-meter depth at the Alameda Station between 7.8 and 8.0, and at the Yerba Buena Island Station between 7.8 and 7.9 (SFEI 1996). Bottom water samples

collected in 1975 from locations in Oakland Outer Harbor measured from 7.5 to 7.8 (COE 1979). Because pH is affected by changes in temperature, salinity, alkalinity, and biological processes (i.e., photosynthesis, mineralization, and respiration), measurements of pH are expected to vary seasonally in Oakland Harbor.

*Salinity*

Central Bay water salinities are some of the highest measured in the Estuary. The high salinity levels are directly influenced by the influx of Pacific Ocean water, which can have salinities as high as 33.2 ppt (Conomos 1979). Central Bay salinity measurements tend to increase slightly with depth where the more dense, saline waters of the Pacific Ocean intrude the Bay (COE 1976). The RMP measurements of salinity during the three sampling periods in 1995 ranged from 13.5 ppt during the wet season to 26 ppt during the dry season at the Alameda Sampling Station and 13.2 ppt (wet season) to 27.5 ppt (dry season) at the Yerba Buena Island Station (Table 4.2-1). Six bottom water samples collected in Outer Harbor demonstrated salinities ranging from 31.3 to 32.9 ppt (COE 1979).

*Sedimentation and Erosion*

The majority of sediment entering San Francisco Bay is eroded in the Sacramento and San Joaquin river basins and carried to the northern reach of the Bay as suspended load and bedload (O'Connor 1991). The yearly suspended sediment load discharged to the Bay is on the order of 8 to 10 mcy, most of which is discharged during the winter months (PTI 1989). The highest total suspended solids (TSS) concentrations occur in the northern reach at the "null zone" – i.e., that portion of the northern reach where landward and seaward density currents have an equal and opposite effect – (up to 600 mg/L) and generally decrease downstream. Although sedimentation in the null zone and the northern reach leads to reduced suspended sediment loads in other portions of the Bay, in general, the deposited sediments are also a source of resuspended sediments during winter storms and in the summer months (O'Connor 1991). Krone (1966) estimated that up to 170 mcy of sediment is resuspended in the Bay yearly by wind and wave action.

The Corps (1988) synthesized historic data on sediment patterns (Smith 1963) and bedforms (Rubin and McCulloch 1979) in Central Bay. Depositional areas showing rapid rates of sediment accumulation in Central Bay include the flanks of deep channels at the Golden Gate and those extending north from Angel Island to the Richmond Bridge. The area immediately south of Brooks Island is experiencing deposition at intermediate rates, while the southern portion of Berkeley Flats to Treasure Island is scouring (COE 1988).

In a recent study performed by Ogden Beeman (1992), National Ocean Service charts generated in 1955 and 1990 were compared to assess changes in water depth. The analysis revealed areas where substantial accretions and reductions (i.e., due to erosion) of sediments have occurred over the 35-year period. Outer and Inner Oakland Harbor show net accretions of sediments on the order of 6 feet or more.

*Total Suspended Solids*

The TSS levels in San Francisco Bay are highly variable depending on river and local stream sediment inflows and wind-wave resuspension at shallow water depths. Mean TSS measurements collected in Central Bay surveys between 1960 and 1990 ranged from 18 to 36

mg/L (COE 1976, 1990; Winzler and Kelly 1985). In September 1988, during a low freshwater inflow period, the Corps recorded average TSS measurements of 16 mg/L at the Golden Gate Bridge and 34 mg/L at the entrance to South Bay (slightly southwest of the entrance to Oakland Inner Harbor) (COE 1990). The 1995 RMP measurements ranged from 0.3 to 4.2 mg/L at the Alameda Station and 2.3 to 7.3 mg/L at the Yerba Buena Island Station (Table 4.2-3). During the 1995 RMP, these stations recorded some of the lowest TSS measurements in the Bay, with the highest levels at the Petaluma River of 414.4 mg/L. Turbidity was measured as a percent of light transmission (transmissivity) in September 1997 (MEC 1997). Background levels of turbidity were measured at 35 to 40 percent transmissivity.

*Nutrients*

Municipal and industrial input (i.e., local stream inflow and sewage input), freshwater inflow, and the Pacific Ocean are the primary sources of nutrients contributing to San Francisco Bay's nutrients levels. Mineralization and bottom sediments are secondary sources. Nutrients levels fluctuate with periods of increased and decreased biological productivity and urban discharges. Consequently, utilization of nutrients (i.e., photosynthesis) and nutrient availability vary spatially and seasonally within the Bay. Central Bay nutrients levels are somewhat higher than ambient oceanic levels but correlate with the seasonal fluctuations induced by seasonal coastal upwelling. Sewage effluents are the primary contributors of ammonia, nitrate+nitrite, and phosphate; the ocean and Delta outflow (i.e., the Sacramento and San Joaquin river delta) supply the majority of silicates (Conomos et al. 1985). The Corps (1979) reports total Kjeldahl nitrogen and total phosphate were measured ranging from 0.20 to 0.80 mg/L and from 0.10 to 0.21 mg/L, respectively. These measurements were taken from Outer Harbor bottom water samples. The highest nutrient levels measured at the Alameda Sampling Station for the 1995 RMP measured phosphate at 139.5 µg/L, ammonia at 93.8 µg/L, nitrate at 438.2 µg/L, nitrite at 16.8 µg/L, and silicates at 6,168.4 µg/L (Table 4.2-3). At the Yerba Buena Island Station, the highest measurements were phosphate at 74.4 µg/L, ammonia at 357 µg/L, nitrate at 347.2 µg/L, nitrite at 16.8 µg/L, and silicates at 4,513.6 µg/L (Table 4.2-3).

*Metals and Organic Chemicals*

Pollutant levels in Oakland Inner Harbor water are not available. Concentrations of metal and organic parameters in Oakland Outer Harbor waters are generally the same as those described for Central Bay in the section on regional water quality. The 1995 RMP sampling stations closest to Oakland Harbor, at Alameda Sampling Station and Yerba Buena Island Station, measured metals and organics (Table 4.2-3).

The harbor is situated adjacent to a highly developed municipal and industrial area, a source of pollutants via urban runoff and point discharges (PPD 1990). Pollutants of concern identified in the PPD (1990) most likely reside in Oakland Harbor waters, although contamination levels may vary depending on seasonal runoff and flushing rates.

### 4.2.3 Possible Reuse/Disposal Options

The section describes existing hydrodynamic and water quality conditions at each of the reuse/disposal areas under consideration. Discussions include parameters that are specifically relevant to each particular site. Therefore, different parameters are discussed for each reuse/disposal site depending on the classification (i.e., in-Bay, Upland, or Ocean) of the site.

*Vision 2000 Upland*

Currently, this reuse site is part of the FISCO property leased to the Port and includes an upland area and two piers that extend out into the Middle Harbor (see Figure 2.2-2). The region of influence for upland surface water hydrology includes the FISCO and, to the east, the Union Pacific Railroad property. The site would be modified to create four new berths (Berths 55 through 58) under the Berth 55-58 project, which is being evaluated by a separate EIR. The 50-foot project is only evaluating the placement of dredged material to raise the grade in the Vision 2000 Upland area. The ROI also includes the eastern part of the Oakland Army Base (Figure 2.2-2). The environmental setting of the Oakland Army Base site is described below for the New Berth 21 area.

The existing hydrodynamic and water quality conditions are expected to be similar to those discussed in section 4.2.2 for the Oakland Harbor area and particularly the Inner Harbor. Additional water quality parameters are discussed in this section. The following discussion summarizes data from studies that are specific to properties in the Berth 55 area: FISCO (U.S. Navy 1995a,b,c,e,g; 1996a,b); Union Pacific Railroad property (Port of Oakland 1996b); Shippers Imperial property (Port of Oakland 1996a); and Southern Pacific Transportation property (Port of Oakland 1996c); and other references as cited below.

*Surface Runoff and Drainage*

The site topography of the area adjacent to the Vision 2000 Upland area is nearly flat due to its creation from tidal flat reclamation by infilling. The shoreline areas along the Inner Harbor to the south, Middle Harbor to the east, and the Outer Harbor to the north are protected by channel training walls, sheet piling, riprap, and other artificial shoreline protection structures. Much of the adjacent area is covered by asphalt or concrete, and no natural drainage channels are present.

Annual precipitation at the site averages about 17.5 inches per year, falling mostly between October and April. The area around the site is drained primarily through a stormwater drainage system that discharges water to the Outer, Middle, and Inner Harbor channels. Management of stormwater is discussed under the runoff water quality section below.

Localized ponding of runoff has occurred in the southern portion of FISCO when storm drainage systems were overloaded or clogged. Although the ponding has been substantial on occasion, it has not resulted in the flooding of any buildings. Currently, the Port of Oakland has corrected drainage problems to this property. In addition, Southern Pacific has rerouted its storm drainage system to bypass FISCO and to connect directly to the Oakland main system.

There have been reports of ponding on other areas of FISCO due to storm drain blockages, including areas between M and N streets near 6th Street and 9th Street between buildings 741 and 742. Both of these problems were repaired in 1996. Smaller scale ponding also occurs during heavy rains in some poorly drained low-lying areas.

*Flood Hazards*

FISCO and the remainder of the Vision 2000 Upland area have not been mapped for flood hazards by the Federal Emergency Management Administration (FEMA), nor are there flood hazard areas indicated in the Navy's Master Plan (U.S. Navy 1988). The site is neither near nor

contains any surface streams; therefore, it is not subject to floods from overbank spillage. Adjacent Port of Oakland areas mapped by FEMA are outside the 100-year flood zone. No portions of the site are below the coastal base flood elevations (6.6 feet above mean sea level [msl]) identified for the Oakland Harbor. The estimated stillwater elevation during the 100-year flood at high tide in the area is estimated at 7.0 feet National Geodetic Vertical Datum (NGVD) (FEMA 1982). The training walls along the Oakland Middle Harbor range in elevation from about 8.4 feet to 9.0 feet NGVD. The Union Pacific Intermodal Railyard fill embankment in this area ranges from about 13.5 feet to 17 feet NGVD. Elevations in the waterfront areas along the Oakland Middle Harbor range from about 12.4 feet to 18.9 feet NGVD. No areas of the site have been subject to coastal flooding from tidal or wave activity (FEMA 1982). Seismic-induced flooding is discussed in section 4.3.1.

*Runoff Water Quality*

The Vision 2000 Upland area is occupied by the Marine Terminal tenants, who participate in the Port of Oakland Storm Water Pollution Prevention Program (SWPPP) as members of the Marine Terminals Subgroup. The Port of Oakland and their tenants have a stormwater permit for their respective operations, and surface water from the ROI has been sampled as required by the permits.

The Port tenants have implemented a number of Best Management Practices (BMPs) to limit contaminants in stormwater runoff, including limiting certain vehicle maintenance to covered, internally drained areas, carefully maintaining oil and grease traps and oil/water separators, and eliminating steam cleaning of vehicles in areas draining to storm drains. To conduct sampling in a cost-effective manner, provide data best suited to monitoring stormwater discharges, and to evaluate the effectiveness of BMPs, the monitoring program is tailored to the potential sources of contamination. If the contaminants are found above concentrations of concern, follow-up sampling is provided. The program, including contaminants of concern, is fully explained in their Group Stormwater Monitoring Program (Port of Oakland 1992a), which is currently under revision (Port of Oakland 1997d). Recent testing data are provided in the 1996-1997 Monitoring Report (Port of Oakland 1997e).

For the 1996-1997 season, the Port sampled five locations representing containerized freight yards, break bulk storage and maintenance, vehicle/generator maintenance, truck maintenance facilities, and commercial real estate during each of two storm events. Test parameters included Total Petroleum Hydrocarbons as diesel and motor oil (TPH-D,MO), aromatic hydrocarbons at one site, and selected metals.

The pH of samples ranged from 5.96 to 8.71 TDS ranged from 43 to 1,800 mg/L TPH was not detected at the break bulk storage/railroad maintenance site, and not detected at the first sampling event for commercial real estate, vehicle/generator maintenance, and containerized freight yard sites. The highest measurement of TPH was 22.2 mg/L at the vehicle/generator maintenance facility that had produced non-detectable results less than a month earlier. TPH-D appeared at the vehicle/maintenance facility at 280 and 620 μg/L, and barely detectable in one sample at the truck maintenance facility. TPH-MO was found at both facilities to a high of 8,200 μg/L. Of the aromatic compounds, only toluene at 1.4 μg/L was detected. Cadmium, copper, lead, nickel, and zinc were found in concentrations low enough to be in compliance with the stormwater permit. None of the concentrations were high enough to require additional engineering controls.

The Navy conducts stormwater monitoring at FISCO in compliance with the State RWQCB's General Permit for Discharge of Stormwater from Industrial Activities. In addition, the Navy implemented BMPs to limit concentrations in stormwater runoff. BMPs at the railroad facilities on FISCO property include the use of oil/water separators; stormwater drains constructed with concrete sumps; overflow collection pans on locomotive fueling tracks; automatic fuel shutoff valves; a spill prevention, control, and countermeasures plan for underground storage tanks (USTs); and materials handling procedures.

In its 1995-1996 annual report, the Navy noted a substantial decrease in contaminants from its activities at FISCO compared to previous years because of base downsizing, closures, and the transfer of properties to the Port resulted in a major reduction in the number and intensity of industrial operations occurring on the site (U.S. Navy 1996b). The Navy sampled for TPH; benzene, toluene, ethylbenzene, xylenes (BTEX); total organic carbon (TOC); a variety of metals; and PCBs. The 1995-1996 sampling did not detect any TPH, BTEX, or PCBs. Titanium (170 to 180 μg/L), zinc (40 to 5,400 μg/L), and lead (200 μg/L) were detected in stormwater samples. TOC was occasionally detected in levels from 5.1 to 50 μg/L. The concentrations at FISCO were similar to those found at the surrounding Port of Oakland properties.

***New Berth 21***

The New Berth 21 site is surrounded by the Oakland Army Base property, which is the ROI. Under this reuse/disposal option, the area adjacent to Berths 8, 9, 10, and 21 would be filled with dredged material to create a new Berth 21 in Oakland Outer Harbor. Recent information on this site is provided in two documents: a site investigation for Berths 8 and 9 (Port of Oakland 1992a) and the Environmental Baseline Survey for the Oakland Army Base (U.S. Navy 1996).

*Hydrodynamics and Water Quality*

The existing hydrodynamic and water quality conditions are similar to those discussed in section 4.2.2 for the Oakland Harbor.

*Surface Runoff and Drainage*

According to the Environmental Baseline Survey for the Oakland Army Base (U.S. Navy 1996), no natural water courses or springs exist on or pass through the installation. The site is flat, and runoff and drainage are controlled by an extensive stormwater collection system installed during WWII. Runoff is collected in storm drains throughout the site and is directed toward the Outer Harbor, where it is discharged at 13 outfalls. Some ponding occurs at the site, resulting from the alteration of drainage patterns by settling and on-site development since WWII.

*Flood Hazards*

The New Berth 21 site is located near the Vision 2000 Upland Area, and has a similar elevation and topographic expression. Therefore, the potential for flooding is similar to the Vision 2000 Upland Area.

*Runoff Water Quality*

A Notice of Intent (NOI) for General Permit to Discharge Stormwater associated with industrial activity was issued to the Oakland Army Base in March 1992 by the SWRCB. The base complies with the sampling requirements described in this permit.

***Middle Harbor Enhancement Area***

The existing hydrodynamic and water quality conditions for the aquatic areas of the MHEA are similar to those discussed in section 4.2.2 for the Oakland Inner Harbor and Outer Harbor area.

For upland water resources, the description of existing conditions at the Vision 2000 Upland area also applies to this site, since the MHEA is adjacent to the Vision 2000 Upland area.

***Former NAS Alameda***

*Surface Runoff and Drainage*

The site considered for placement of dredged material at the former NAS Alameda is currently occupied by a flat, paved airfield with runways crossing largely unpaved areas. The shoreline to the north and west is protected by riprap, concrete, and other artificial shoreline protection materials. Because the site is composed of artificial fill, no natural drainage channels are present.

Annual rainfall at the site is about 17 inches per year, with most of the precipitation falling between the months of October and May. Precipitation that does not infiltrate into the unpaved areas is collected and discharged within a stormwater system maintained by the Navy. At least nine outfalls into the Inner Harbor Channel are mapped in the project area (U.S. Navy 1996c). Two topographic depressions are present at the site, a 100-foot by 500-foot low area located in the western central part of the site, and a larger depression approximately 1,000 feet by 400 feet along the runway in the extreme eastern part of the site. These areas are subject to ponding during heavy rains.

*Flood Hazards*

Former NAS Alameda has neither been mapped for flood hazards by FEMA, nor are there flood hazard areas indicated in the Navy's Master Plan (U.S. Navy 1988). The site is not near and does not contain any surface streams; therefore, it is not subject to floods from overbank spillage. Nearby Port of Oakland areas with similar topographic expression, elevation, and geography mapped by FEMA are outside of the 100-year flood zone. No portions of the site are below the coastal base flood elevations (6.6 feet msl) identified for the Oakland Harbor. The estimated stillwater elevation during the 100-year flood at high tide in the area is estimated at 7.0 feet National Geodetic Vertical Datum (NGVD). No areas of the site have been subject to coastal flooding from tidal or wave activity (FEMA 1982).

NAS Alameda is similar to the Vision 2000 Upland Area with respect to geographical setting within the Bay, elevation, and topography. It therefore holds a similar potential for seismic induced flooding as the Vision 2000 Upland Area. Please refer to the discussion on flooding due to tsunamis and seiches in the Vision 2000 Upland Area section of this document.

*Runoff Water Quality*

Surface runoff from NAS Alameda has been sampled as part of the Navy's NPDES Permit Stormwater Management Program. The program falls under the General Industrial Activities Stormwater Permit (General Permit), which calls for the elimination of a non-stormwater discharges and the implementation of a pollution prevention program involving: (1) the elimination of pollutants from sources by implementation of BMPs, and (2) monitoring to confirm the effectiveness of BMPs. The document which outlines the program for elimination of pollutants using BMPs is the Storm Water Pollution Prevention Plan (SWPPP), completed in 1993 and updated in 1996 (U.S. Navy 1996c). The results of monitoring are compiled in the 1995-1996 annual report (U.S. Navy 1996d).

Dry weather sampling was performed at two sites to assess the potential of contaminated groundwater to enter the stormdrain system pipelines. In both cases, no targeted compounds were detected, indicating no contribution of contaminants to stormwater by contaminated groundwater (U.S. Navy 1996d).

Samples from stormwater sampling events were collected and analyzed for seven of the 45 outfalls at NAS Alameda. However, none of the data were collected from stormwater in the area where the dredged material would be placed. All seven samples were collected from the eastern part of NAS Alameda where there is much more human activity with a higher potential for stormwater contamination. Therefore, there are no direct data on the quality of stormwater at this site.

***San Francisco Deep Ocean Disposal Site (SF-DODS)***

*Hydrodynamics*

A current regime, showing different current patterns as depths changed, was observed during the surveys (EPA 1993a). The regime consists of near-surface (0 to 75 m), mid-depth (75 to 800 m, at least 50 m above the bottom), deep (>800 m, at least 50 m above the bottom), and near bottom (10 to 15 m above bottom) currents. Water depth at the site ranges from 2,700 meters to 3,100 meters. Near-surface currents exhibited an equatorward flow, particularly in the spring during periods of upwelling. Upwelling tended to be weaker than at other sites along the California coast. Poleward flows were prominent in mid-depths in the area, likely due to the California undercurrent.

Currents were measured continuously for a 1-year period in 1991 and 1992 (EPA 1993a). Near surface currents (0-75 meters) were up to 30 centimeters per second. Mid-depth currents (75-800 meters) were generally less than 30 centimeters per second. Deep currents (below 800 meters) were generally less than 10 centimeters per second. Near bottom currents were generally less than 1 centimeter per second in depth ranges of the SF-DODS.

*Water Quality*

EPA-sponsored water quality surveys were conducted within the Gulf of the Farallones along the continental slope in the vicinity of the SF-DODS (Ramp et al. 1992). Other studies performed within or in the vicinity of the study area include surveys performed in the vicinity of the NODS and California Cooperative Oceanic Fisheries Investigations (CalCOFI) surveys performed within the Gulf of the Farallones (U.S. Navy 1993c; EPA 1993a). In addition, the U.S.

Navy conducted water quality monitoring at the site in 1993 during disposal of dredged material from NAS Alameda and NCS Oakland (U.S. Navy 1995h). The principal purpose of this monitoring was to track the disposal plume and evaluate the effects of disposal on water quality. However, this study also collected data on temperature, salinity, and suspended solids representing background conditions at the site. Various water quality measurements of temperature, dissolved oxygen, pH, salinity, TSS, nutrients, and metals and organic chemicals are described below.

*Temperature*

Results of the surveys indicate that there is a high variability in the temperature profile related to seasonal changes in association with upwelling, changes in the California current system, wind conditions, and various other current patterns within the area. Outflow from San Francisco Bay tended to be a factor in the seasonal variability in temperatures in the shallower shelf area (lower temperature during high outflow), although it did not appear to substantially affect the deeper slope area where SF-DODS is situated (Noble and Ramp 1992). Temperature profiles that were obtained from conductivity-temperature-density (CTD) casts in the summer (July 1991) indicated a well-mixed isothermal surface layer, below which temperatures decreased rapidly (thermocline), followed by gradual changes with depth into an isothermal layer near the bottom (U.S. Navy 1993c; EPA 1993a). Temperatures in the upper 100 m of the water column ranged from 11°C to 14°C. Temperatures dropped to 4°C at about 1,000 m and approximately 2°C at 2,000 m. The profiles were typical for California coastal areas in the summer. Temperature measurements made by the Navy in September 1993 were similar, except that temperatures in the upper 100 m ranged from 9°C to 16°C (U.S. Navy 1995h).

*Dissolved Oxygen*

Data for dissolved oxygen concentrations within SF-DODS were collected in the summer, July 1991 (EPA 1993a). The dissolved oxygen profile indicated an oxygen minimum zone (due to sinking and decomposition or grazing of organic material) at about 800 m with oxygen concentrations of 0.5 mg/L. Surface waters had oxygen levels of 8 mg/L, with a gradual decline in concentrations with depth through the mixed layer. Below the minimum zone, dissolved oxygen levels increased to greater than 3 mg/L at about 2,000 m.

*pH*

Although pH values within the study area were not determined during the EPA surveys, expected values may be inferred from other studies that have been performed in the area of the Gulf of the Farallones. Values reported ranged from 7.8 to 8.3 (Nybakken et al. 1984; IEC 1982), and are expected to vary with changes in carbon dioxide and oxygen levels resulting from changes in planktonic primary production (i.e., higher pH values where oxygen levels are high and carbon dioxide levels are low as a result of high productivity) (EPA 1993a).

*Salinity*

Salinity profiles within the study area, which were obtained from the July 1991 CTD casts, indicated values of 32.9 ppt in surface waters (25 m) increasing to 34.7 ppt at a depth of 3,900 m (U.S. Navy 1993c). As with temperature, salinity values varied seasonally, particularly in the surface layer, which had lower values in the winter and spring during periods of high river outflow (EPA 1993a). In the 1993 Navy study, the salinity pattern was similar, except that surface

salinities were slightly higher (33.3 ppt). Salinity was 34.5 ppt at the maximum depth (1300 m) measured.

*Total Suspended Solids*

TSS were not measured during the EPA surveys, although information is available for areas along the shelf in the Gulf of the Farallones (spring and summer), near the shelf-break (spring), and in similar depths. Values for regions over the shelf tended to be higher than slope and shelf break areas, ranging from 0.3 to 2.9 mg/L in the top 25 m of the water column (Gordon 1980). Concentrations near the shelf-break ranged from 0.08 to 2.51 mg/L (EPA 1993a; IEC 1982). At an ocean reference site near the SF-DODS in the 1993 Navy study (U.S. Navy 1995h), TSS levels were highest (0.28 to 0.80 mg/L) in surface waters. From 100 m to 1,000 m depth, TSS varied little, ranging from 0.1 to 0.3 mg/L. SF-DODS is not expected to be as affected by the plume from San Francisco Bay.

Light transmissivity measurements were made in the fall (September 1991) as an indication of suspended solids and turbidity (EPA 1993a). Light transmissivity measurements made throughout the water column in Study Area 5, on the western boundary of SF-DODS, were 88 to 90 percent. Similar values were found along the shelf break, but much lower values were found over the continental shelf (transmittance levels of 10 to 80 percent) as a result of the higher concentrations of suspended solids. As with TSS values, light transmittance/turbidity is expected to vary seasonally in relation to seasonal changes in river outflow in San Francisco Bay, during periods of upwelling and high productivity, particularly over the continental shelf. Measurements of suspended solids made by the Navy during disposal of dredged material at the site in 1993 are discussed in section 5.2.3.

*Nutrients*

Nutrient concentrations within the area are expected to be influenced by upwelling, seasonally variations in productivity, variations in surface winds influencing the mixed layer, turbidity and, to a small extent, by outflow from San Francisco Bay. Nutrient concentrations were not specifically measured during the EPA surveys; however, nutrients were measured in the vicinity of the Gulf of the Farallones in July 1984 during CalCOFI surveys (EPA 1993a) and also at a continental slope site near Año Nuevo, south of the NODS (U.S. Navy 1993c; Bruland 1980). Phosphate values during the CalCOFI surveys ranged from 0.25 to 2.0 micromoles per liter (μM/L) in surface waters, and increased to 4 μM/L at depths greater than 1,000 m. Surface concentrations for nitrates and silicates were <1 to 20 μM/L and 1 to 40 μM/L, respectively. As is typical with nutrient concentrations, nitrate and silicate values were also greater with depth (100 m), having concentrations of 10 to 30 μM/L and 20 to 50 μM/L, respectively. Nutrient values obtained during the Navy studies resulted in surface values of 0.47 μM/L, 1.0 μM/L, and 3.8 μM/L for phosphates, nitrates, and silicates, respectively. Concentrations for depths greater than 1,000 m ranged from 2.6 to 3.27 μM/L for phosphates, 36.5 to 41.4 μM/L for nitrates, and 120 to 165 μM/L for silicates.

*Metals and Organic Chemicals*

Limited trace metal data available in the vicinity of SF-DODS includes studies reported by Bruland (1980) which were performed along the continental slope off central California. Trace metals measured included cadmium, copper, nickel, and zinc. Concentrations of these metals tended to be generally lower in surface waters than deeper waters due to uptake from

biological processes. Cadmium had a maximum value of 0.115 μM/L near the oxygen minimum zone, while zinc and nickel increased with depth, likely due to solubilization from particulates (U.S. Navy 1993c; EPA 1993a; Bruland 1980). Copper concentrations also increased with depth. Other factors which influence surface concentrations of these metals include upwelling, resuspension of bottom sediments by currents, atmospheric deposition, and transport from river outflow from San Francisco Bay.

Organic compounds are likely to enter the site through various processes such as transport by San Francisco Bay outflow, atmospheric deposition, and oil spills or discharges (EPA 1993a). Studies of organic chemicals were previously performed along the continental shelf and within the vicinity of the Gulf of the Farallones. The polynuclear aromatic hydrocarbons, phenanthrene and pyrene, and organochlorine compounds were below analytical detection limits (EPA 1993a; deLappe et al. 1980; IEC 1982). Petroleum hydrocarbons exhibited very low concentrations, ranging from 140 to 280 nanograms per liter (ng/L) (EPA 1993a; Nybakken et al. 1984). Total polychlorinated biphenyls (PCBs) ranged from 24 to 105 ng/L, and diphenyldichloroethylene (DDE) had values of 4.6 to 27 ng/L (EPA 1993a; Nybakken et al. 1984). Trace amounts of chlordane, hexachlorocyclohexane, dieldrin, and toxaphene were also measured with values less than 500 ng/L (EPA 1993a; Nybakken et al. 1984).

***Hamilton Wetlands Restoration***

*Hydrology*

Surface water hydrology at the Hamilton restoration site is affected by meteorological conditions, topography, soils, and urban development. The climate of the region around the airfield is characterized by mild summers and cool winters. Temperatures seldom go below freezing. Average annual precipitation in the region is from 24 to 30 inches (Rantz 1971). The Hamilton Army Airfield and adjacent properties to the north, west and south are low-lying, subsided diked historic baylands. Surface soils on much of the airfield are classified as xerothents, clay loams, gravelly loams, and urban lands (USDA 1985). These soils typically exhibit rapid runoff rates, with low groundwater infiltration rates and low erosion potential. Much of the airfield is developed and therefore exhibits high runoff rates typically associated with urban development. The airfield area consists of depressed grassy areas and raised concrete and asphalt areas associated with taxiways and perimeter roads. Because the airfield runway area has extensive impervious surfaces of concrete and asphalt, it also may exhibit high localized runoff rates (COE 1995a).

*Flooding and Drainage*

Many of the lands associated with the Hamilton restoration site are near or below sea level and are protected by a series of levees. Surface runoff within Hamilton is conveyed by a system of storm drains that feed into perimeter drainage channels along the northern and southern perimeter levees. These channels gravity drain to a series of pumps located in the northeastern corner of the Hamilton airfield adjacent to the eastern levee, and storm water runoff is discharged into San Pablo Bay by these pumps. The Antenna Field is drained primarily by two well-defined excavated channels which run roughly north-south and east-west. The bottom elevation of these earth channels is generally -6.4 to -8.4 feet MLLW. A shallow borrow pit along the western portion of the northern boundary of the site provides additional drainage. Surface runoff from within the site flows into the Hamilton Army Airfield perimeter drainage channel. Because the drainage channels on and immediately adjacent to the Antenna Field are several feet

deep, the site is relatively well drained. Nonetheless, some ponding does occur during and immediately after periods of heavy rainfall due to slight local variations in elevation.

Off-site surface water inputs from adjacent areas include the Pacheco Creek and Arroyo San Jose watersheds to the west, Bel Marin Keys to the northwest, and the St. Vincent's and New Hamilton Partnership properties to the south. Stormwater flows from Pacheco Creek and Arroyo San Jose feed into Pacheco Pond. A portion of the St. Vincent's property drains by gravity into the Hamilton drainage and pump system. The New Hamilton Partners property recently constructed a flood protection levee along much of the southern perimeter of Hamilton and a pump station that discharges into the perimeter drainage channel on Hamilton airfield. A small portion of the Bel Marin Keys Unit V property drains by gravity into the Hamilton drainage and pump system (U.S. Army et al. 1996).

Pacheco Pond (also known as Ignacio Reservoir) is a freshwater wetland and flood detention basin located northwest of Hamilton airfield. It provides temporary storage of flood flows on Arroyo San Jose and Pacheco Creek and drains through tide gates to Novato Creek at low tide. (U.S. Army et al. 1996). At high water levels, Pacheco Pond expands in area and increases creek backwater elevations, flooding low-lying commercial and residential areas near the mouths of Arroyo San Jose and Pacheco Creek. High water levels may also cause Pacheco Pond to overtop surrounding levees, including the Novato Creek tide gate structure. The Air Force installed two slide-gated siphons in the late 1960s to provide flood relief by allowing Pacheco Pond to drain into the airfield (U.S. Army et al. 1996). These siphons no longer operate.

The Hamilton Airfield and portions of the antenna field lie within the 100-year floodplain (personal communication, FEMA 1997). Landfill 26, located just southwest of the panhandle area in the northwest corner of the Airfield, is unlined and currently has an engineered clay cap and surface water collection systems. The landfill is subject to short period flooding during storm events greater than a 10 year storm. Surface runoff entering the Landfill 26 local drainage area is routed into a culvert which conveys the runoff into a seasonal wetland mitigation site on the panhandle. Landfill 26 has not received final RWQCB closure and it is assumed that the Army will obtain closure prior to property transfer.

Surface runoff upstream of Landfill 26 comes from the Pacheco Creek watershed, which drains an area of 1.9 square miles. The topography of the lower Pacheco Creek floodplain is such that flood waters overtop the channel bank northwest of the northwestern Pacific Railroad bridge, reportedly during 10-year and larger storms (FEMA 1989). A portion of this water flows toward the Landfill 26 drainage rather than returning to the Pacheco Creek channel further downstream. The general slope of the floodplain toward Landfill 26 and the Hamilton airfield panhandle reflects the historic creek alignment.

The runway at Hamilton airfield extends over the length of the airfield in a northwesterly direction. The runway is a thick concrete slab with approximate elevations ranging from 1.6 ft MLLW near the panhandle to minimum elevations of -1.4 ft MLLW midway through the airfield to +7.6 ft at the bayward end where the eastern levee crosses the runway (the runway ramps up from the center of the site toward San Pablo Bay). Most of the runway elevations are 1.6 ft to -1.4 ft MLLW, sloping upward toward the northwest. This runway is not anticipated to be removed as part of base closure activities.

The Airfield runway will influence tidal wetland drainage patterns and tidal channel scour depths because it acts as a local topographic divide and is at approximately mean lower low

water elevation. The influence of the runway on wetland evolution and circulation can be accommodated in final design, and several approaches are possible. The first approach is to place dredged material on the runway to maintain it as a topographic drainage divide. The second approach is to place dredged material to reduce the tidal prism on the southern side of the runway such that several smaller channels cross the runway, each of which would be small enough not to scour to depths at which the runway would interfere. Lastly, small sections of the runway could be removed to reduce the influence of the runway on higher order slough channels anticipated to form in the area.

The runway will also impose a subsurface infiltration barrier for tidal and seasonal wetlands. This barrier could create a "perched" water table isolated from deeper ground water resources. Two possible consequences could occur. First, there would be no groundwater recharge, precluding this beneficial function normally attributed to wetlands. Second, infiltration would be restricted in the seasonal wetlands, which could extend the duration of ponding in the seasonal wetlands and thereby benefit wildlife resources that utilize the restored seasonal wetlands. Because the site is underlain with bay mud, the effects of the runway on infiltration and recharge are assumed minimal.

*Water Quality*

Most of the airfield was a former tidal marsh and mudflat. The existing wetlands and soil conditions are important in determining water quality at the airfield and adjacent areas. Salt marsh is the largest type of wetland occurring at the site. However, freshwater wetlands are also present including the area at the north end of the runway and Pacheco Pond. Wetlands are important because they can improve water quality by decreasing water velocity, inducing sediment deposition, and removing nutrients and contaminants. Nutrients and other contaminants can adsorb to sediments in a wetland and be removed by deposition, chemical breakdown, and assimilation into plant and animal tissues (COE 1995a). Soils in this area can affect water quality because of the presence of acid-sulfate soils. The soils have a low pH (high acidity) and are the result of draining historic salt marsh and the subsequent natural processes occurring upon oxidation of sediments that were previously submerged and under anaerobic conditions. Acid-sulfate soil conditions are present at the airfield, although these conditions are not extreme at present (COE 1995a)

SALINITY

Salinity at the Hamilton site is a mix of surface runoff during rainstorms and shallow groundwater seepage. The salinity varies from fresh to brackish, depending on rainfall and evaporation. Salinity in this part of San Pablo Bay is typically 32 parts per thousand, with lower levels during periods of high runoff.

CONTAMINANTS

Urban runoff from the airfield area and adjacent parcels to the west is collected by a series of storm sewers and drainage channels around the perimeter of the airfield and drains to pump stations that discharge into San Pablo Bay. Surface water quality data for these areas are very limited (COE 1995a). San Pablo Bay experiences poor dispersion of water contaminants dues in part to its large expanses of extremely shallow water. Previous water quality measurements in the vicinity of the Novato/Ignacio and the Hamilton Field treatment plant outfalls found that annual median values for most physical and chemical water parameters reflected compliance

with standards established by the SF-RWQCB in the Basin Plan. However, the annual maximum values of pH, total coliform, turbidity, color, and ammonia exceeded the Basin Plan criteria at times.

*Beneficial Reuse of Freshwater*

The Hamilton project proposes to create a complex of tidal, seasonal and freshwater wetlands. Four water sources are potentially available to support this diverse wetland assemblage 1) tidal waters from San Pablo Bay which can be used to create vast areas of tidal salt marsh; 2) direct rainfall input provides freshwater on a seasonal basis, though not in large quantities; 3) groundwater discharge during winter when overall groundwater levels increase from regional infiltration can supply some amount of water and 4) runoff from adjacent properties that could provide freshwater on a seasonal basis in potentially large quantities. The Hamilton restoration site could improve flood protection for these adjacent areas by acting as a discharge area for storm flows. Wetlands are well known for their flood protection functions (Mitsch and Gosselink 1992). These freshwater inputs could then be used within the restored wetlands as a water supply to support a diverse array of wetland types, particularly seasonal and freshwater wetlands.

***Montezuma Wetlands Restoration***

This site was evaluated for wetlands restoration using dredged material in the Draft EIR/S for the Montezuma Wetlands Project (COE and Solano County 1994). Based on comments received on that draft document, the applicant for the MWP revised the project design and a Final EIR/S is in preparation.

*Hydrology*

Two small watersheds adjacent to the site with a combined area of about 3,100 acres drain intermittently into the site from the Montezuma Hills to the east. The Montezuma Hills drainage area east of Collinsville Road covers 1,730 acres and drains into the site via Clank Hollow. The uplands area west of Collinsville Road, adjacent to the site, covers 1,370 acres. These watersheds support agricultural activities including sheep and cattle grazing and feed production. During major winter storms considerable runoff reaches the site, providing moderate quantities of nutrients and total suspended solids (TSS). Surface water in the interior of the site results from rainfall runoff and groundwater discharge. Some of this water collects in seasonal ponds during the winter and spring.

*Flood Hazards*

Potential sources of flooding include daily tidal fluctuations, storm runoff from upland drainage areas, and flooding from the Sacramento-San Joaquin rivers and Delta system. The site currently is drained through a network of shallow channels connected to two float-activated pumping stations.

Upland areas that may contribute runoff to the site include a total drainage area of about 3,300 acres, 1,730 acres of which include the Montezuma Hills that drain through Clank Hollow, and 1,370 acres of which are uplands adjacent to the site, east of Collinsville Road. Clank Hollow and adjacent upland storm runoff during the rainy season accumulate within the low-lying

areas of the site adjoining the principal drainage pathways. During relatively large storm events, runoff from Lucol Hollow may drain onto the site.

The site currently is protected from the effects of daily tidal flooding from the Montezuma Slough and the Sacramento and San Joaquin rivers by a manmade levee system. This levee, which extends along the western and southern margins of the site, forms the eastern bank of Montezuma Slough and the northern bank of the Sacramento River.

Deltaic flooding of the site and adjacent areas could occur through overtopping or breaching of the perimeter levee, or from overtopping at other topographic low points. The mean higher high water level is 3.84 feet above the mean lower low water level (NOAA 1980). If combined with a storm event, these high tides could cause flooding at the site. A review of elevations at the site indicates a potential avenue of flood waters from the northeastern corner of McDougal Cut and from the adjoining property on Birds Landing Road at the northwest corner of the site. However, the potential for overtopping the levee is minimized by the water storage capability of Suisun Bay and Sherman _sland, located to the south and southeast of the site, respectively.

*Tides*

Elevations on the site range from -9 to 10 feet National Geodetic Vertical Datum (NGVD) (Levine-Fricke 1992). The tidal source for this site is Montezuma Slough.

*Salinity*

The two major surface water bodies in the vicinity of the site are the Sacramento River along the southern site boundary and the Montezuma Slough along the western site boundary. Quality and salinity in these waters vary considerably with tides, season, annual rainfall, delta outflow, and operation of the Montezuma Salinity Control Structure. In general, the less saline Sacramento River water is high in nutrients and TSS, and most of the annual volume and sediment loading occurs during major winter storm events.

Surface water salinity levels in the immediate vicinity of the site have been affected by the recent installation of the Montezuma Salinity Control Structure. This structure was designed to capture less saline Sacramento River water at ebb tide and tidally pump it to the more saline western Suisun Marsh, to meet state water quality control standards. A set of Contra Costa Water District drinking water supply intakes are located at Mallard Slough across the Sacramento River, about 3.5 miles to the southwest.

On-site shallow groundwater is brackish and unsuitable as a potential drinking water source or for agricultural purposes, and its potential beneficial uses are limited. Groundwater quality data collected in October 1990 indicate that shallow groundwater at the site contains high concentrations of total dissolved solids (up to 25,000 mg/L), sodium (up to 7,000 mg/L), and chloride (up to 12,000 mg/L) (Levine-Fricke 1992).

Water quality data from two local supply wells showed that the deeper groundwater contains relatively low concentrations of TDS (generally below 700 mg/L). Current beneficial uses of deeper groundwater in the vicinity include domestic, industrial, and agricultural water supply.

*Toxicants*

Surface water quality of Montezuma Slough and the nearby Sacramento River and Suisun Bay were evaluated by the DWR for seven inorganic elements in 1988. Levels for these elements were compared to standards set by the SF-RWQCB. All inorganic elements detected were below MCLs, except one sample for total lead collected near Martinez; however, both total and dissolved concentrations of copper, lead, and zinc exceeded Water Quality Objective Limits (WQOLs) (COE and Solano County 1994). These limits have been established by the state for the protection of saltwater aquatic life. It should be noted that elevated concentrations of lead and zinc have been detected in background soil samples collected throughout the San Francisco Bay Area (Lee et al. 1995).

Additional data regarding surface water and shallow groundwater quality were obtained by Levine-Fricke at the Montezuma Wetlands site and by the DWR at five monitoring stations in the project vicinity. Total and dissolved concentrations of inorganic elements that were detected (arsenic, cadmium, chromium, copper, lead, mercury, and zinc) were all below their respective MCLs, except for one sample for total lead collected from a DWR monitoring station located off site in Suisun Bay near Martinez. Concentrations of total and dissolved arsenic, cadmium, chromium, and mercury levels were below WQOLs. Both total and dissolved concentrations of copper, lead, and zinc exceeded WQOLs at DWR monitoring stations in the project vicinity. However, since laboratory detection limits for copper, lead, and zinc were greater than the WQOLs, it is not known whether samples collected from the Montezuma Wetlands site exceeded WQOLs for these elements.

***Various Landfills***

Potential impacts from this disposal option are related to the sediment rehandling facility proposed to dewater sediments prior to transportation. The facility would be constructed in the Vision 2000 Upland area; the surface water resources in this area are discussed under the Vision 2000 Upland area.

## 4.3 GEOLOGY AND GROUNDWATER

### 4.3.1 Regional Setting

This section provides an overview of the geology, soil, seismicity, and groundwater features in the region.

*Physiography*

The project site lies along the eastern margin of San Francisco Bay within the Coast Ranges Geomorphologic Province of California. The Province is defined by the north- to northwest-trending Coast Ranges, which are traversed by numerous faults of the San Andreas fault system. The dominant geologic processes that have shaped the San Francisco Bay Area region are active faulting along the San Andreas, Hayward, and other faults; uplift and erosion of the East Bay and peninsular hills; and subsidence of the San Francisco Bay basin.

The San Francisco Bay is an approximately 400-square-mile body of water between the Sacramento Valley Delta system and the Pacific Ocean. Drainage from the Central Valley region enters the Bay through the Carquinez Strait at San Pablo Bay, and is discharged to the Pacific Ocean through the Golden Gate. Shallow water reclamation by infilling along the margins has reduced the original Bay from approximately 700 square miles to its present size. Approximately 85 percent of the Bay is less than 30 feet deep; the deepest waters lie at the Golden Gate where depths exceed 340 feet. To the west of the Bay are the relatively low hills of the San Francisco and Marin peninsulas; to the east lie the Richmond, Berkeley, and Hayward-Fremont hills; to the south are the San Bonito and Santa Clara valleys; and to the north is San Pablo Bay and the Napa and Sonoma valleys.

*Geologic Structure*

The geology of the area is characterized by three structural blocks bounded roughly by the San Andreas and Hayward faults. The three structural blocks are the San Francisco and Marin peninsular hills, rocks underlying San Francisco Bay, and the East Bay hills. The Hayward fault branches off of the San Andreas fault southeast of San Jose and occupies the foot of the East Bay hills (Figure 4.3-1). East of the project site, the East Bay hills are represented by the Berkeley hills, composed of Cretaceous age marine sedimentary rocks overlain by Tertiary non-marine sedimentary rocks and volcanic deposits. The San Andreas fault is located within the San Francisco peninsula hills to the west, and becomes ocean-bound north of the Golden Gate, west of the Marin peninsula. Basement rocks comprising the peninsular hills west of the project site are composed primarily of Franciscan Formation graywacke, metabasalt, greenschist and blueschist metamorphic facies assemblages, and ribbon cherts. Basement rocks underlying sediments in the San Francisco Bay are also Franciscan Formation units.

*Depositional History and Stratigraphy*

Sediments occupying the San Francisco Bay region reflect syntectonic deposition of Pleistocene age marine and non-marine sediments into a broad shallow basin during glacially controlled fluctuations in sea level. The San Francisco Bay appears to be a pull-apart basin that has been continuously subsiding since late Quaternary time (the past 700,000 years) in response to local

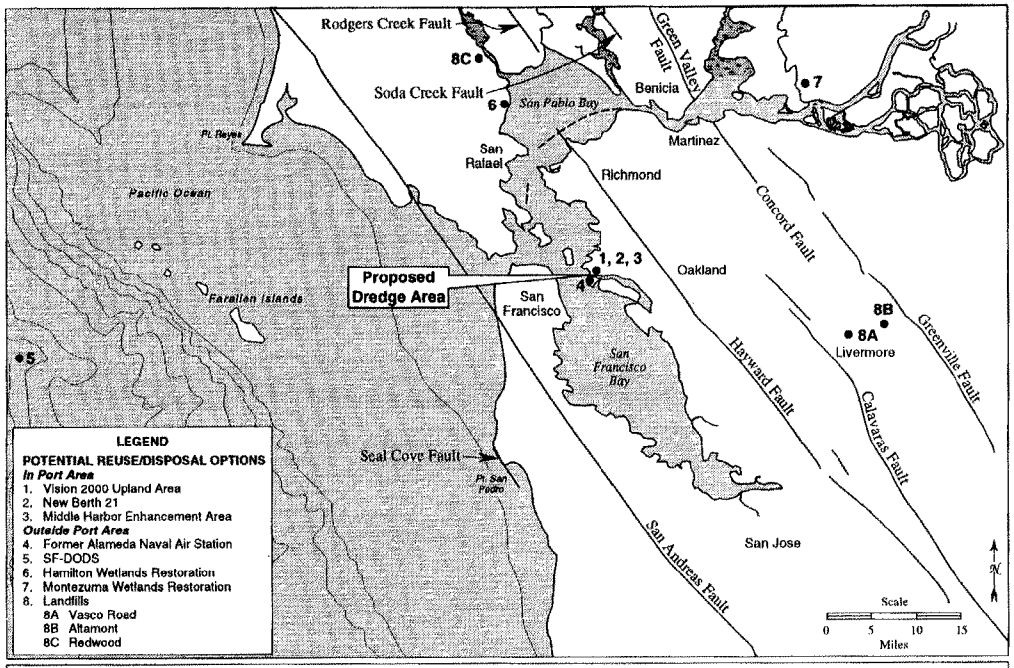



**Figure 4.3-1**

**REGIONAL FAULT MAP**

crustal subsidence between the San Andreas and Hayward faults (Rogers and Figuers 1991; Carlisle and Rollins 1994). The stratigraphy beneath the San Francisco Bay region records changes in depositional environments due to changes in sea level. During times of extensive glaciation, the sea level may have been 400 feet or more lower than present. The following is a description of the primary geologic units that underlie a large part of the San Francisco Bay region. Geologic cross-sections in the vicinity of the Oakland Harbor are shown in Figure 4.3-2.

*Alameda Formation*

The Franciscan Formation basement was above sea level and exposed to dissection by rivers and streams. As the basement began to subside between 1,000,000 and 500,000 years ago, the initial unit deposited on its surface was the Alameda Formation, a complex variety of a lower non-marine alluvial fan, fluvial (streams and floodplains) and lacustrine (lake) deposits, and an upper marine unit. The lower and upper units range in thickness from 300 to 600 feet, and 200 to 400 feet, respectively.

*Old Bay Mud (Yerba Buena Formation)*

As the basin continued to subside and the sea level abruptly rose at the beginning of the last interglacial episode, about 115,000 years ago, the Pacific Ocean fully entered the region depositing the Old Bay Mud on top of the Alameda Formation erosional surface. The Old Bay Mud is thicker than 50 feet beneath the central part of the Bay, with a maximum thickness of more than 100 feet just east of Yerba Buena Island.

*San Antonio Formation*

During the Wisconsin glacial stage (90,000 to 11,000 years ago), the sea level fell, exposing the Yerba Buena Formation to subaerial erosion. Deposited on top of the Yerba Buena was a sequence of estuarine and alluvial sediments named the San Antonio Formation. The San Antonio sediments, typically 25 feet thick, were deposited in complex dynamic depositional environments that include alluvial fans, flood plains, lakes, swamps, and beaches. The individual units are discontinuous and difficult to correlate regionally. There are three mappable units within the uppermost San Antonio Formation. From top to bottom, they include the following: wind blown (aeolian) and beach sands called the Merritt Sand; sandy clays underlain by sandy channel fill materials collectively called the Posey Sand; and unnamed alluvial deposits overlying the Old bay Mud. The Merritt and Posey sands form the uppermost aquifer beneath the East Bay shoreline, confined by the Young Bay Mud. In some areas, such as the shipping channel, the Young Bay Mud has been removed by past dredging operations, exposing the underlying Merritt/Posey aquifer.

*Young Bay Mud*

Another rise in sea level beginning between 11,000 and 8,000 years ago inundated the region. Deposited on top of the San Antonio Formation was an estuarine mud known as the Young Bay Mud, a series of unconsolidated muds deposited in quiet water characterized by high initial void ratios and low unit densities. The Young Bay Mud infills drowned valleys of the Wisconsin glacial stage, and reached a maximum thickness east of Hunters Point, San Francisco of about 120 feet.

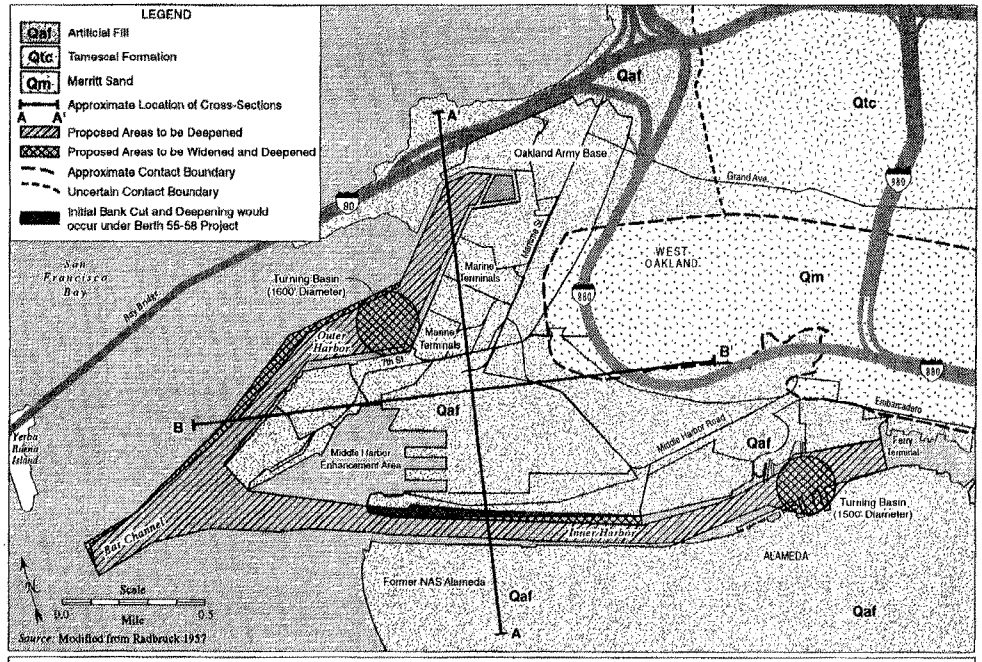



**Figure 4.3-2**

**GEOLOGIC MAP OF THE PROPOSED PROJECT SITE**

*Temescal Formation*

Outcropping on the East Bay Plain east of the study area is a younger alluvial unit known as the Temescal Formation (Rogers and Figuers 1992; Figure 4.3-2). It overlies the San Antonio alluvial unit, and occurs as alluvial terraces deposited in incised alluvial channels. The Temescal formation consists almost wholly of silt and clay, and is generally finer grained than the underlying unit. The Temescal Formation likely represents cooler, wetter periods of early Holocene time (11,000 to 6,800 years ago) when high stream carrying capacities promoted the infilling of existing channels with alluvial materials.

*Seismicity*

The San Francisco Bay area lies within the active San Andreas fault system. Major faults in the area include the San Andreas, Hayward, Calaveras, and Concord faults (Figure 4.3-1). The region is therefore subject to potential significant ground shaking due to earthquakes along these faults and other faults within the San Andreas system.

During the last 160 years, the San Andreas fault system has produced numerous small-magnitude and a dozen moderate to large magnitude earthquakes (magnitude >6) within the Bay Area (Toppozada et al. 1978, 1979; Working Group on California Earthquake Probabilities (WGCEP) 1988, 1990; Ellsworth 1990). The WGCEP (1990) estimated an approximately 67 percent probability of one or more large (magnitude >7) earthquakes occurring within the Bay Area between 1990 and 2020. Schwartz (1994) indicated that new information obtained since 1990 suggests that the probability of a large earthquake is substantially higher than the WGCEP estimate.

The Alquist-Priolo Special Studies Zones Act of 1972, administered by the California Division of Mines and Geology, is designed to prohibit the location of most structures for human occupancy across the traces of active faults and to mitigate thereby the hazard of fault rupture. Development projects are regulated if they fall within one of these zones. The proposed dredging site and none of the upland disposal sites are located within a special studies zone, and no active faults are mapped at any of the sites based on the Fault Map of California (Jennings 1994).

*Seismic-Induced Flooding*

Tsunamis are seismic induced floods caused by the transfer of energy from an earthquake epicenter to coastal areas by ocean waves. Given its low elevation and proximity to San Francisco Bay, the proposed project site is potentially susceptible to flooding by tsunamis passing through the Golden Gate inlet. Although tsunamis are generated in many areas around the Pacific Rim, only Alaska's Aleutian Trench could generate tsunamis capable of causing significant runups in Northern California (Garcia and Houston 1975). The last noticeable tsunami observed within San Francisco Bay was the result of the Great Alaskan Earthquake of 1964. Significant damage along the west coast from that tsunami was restricted to Crescent City, located on unprotected coastline.

Tsunamis that enter San Francisco Bay decrease in height within the Bay. The Great Alaskan Earthquake produced a maximum recorded runup of 7.5 feet at the Golden Gate Bridge (City and County of San Francisco 1974), but no significant damage was reported. This compares to a 7.0 foot theoretical 100-year runup calculated by Garcia and Houston (1975). However, because San Francisco Bay is highly sheltered and the entrance through the Golden Gate Bridge is oblique (i.e., not direct) to waves traveling from Alaska, wave magnitudes are expected to be significantly

weakened. Therefore, runup at the proposed project site due to a major earthquake in the Aleutian Islands is expected to be minor, and this expectation is consistent with the experience from the Great Alaska Earthquake.

Seiches are waves generated in an enclosed body of water, such as San Francisco Bay, from seismic activity. The largest runup ever measured in the Bay was 4 inches following the 1906 earthquake (ARRA 1995). The Bay Area has not been adversely affected by seiches during its history within this seismically active region of California.

*Groundwater*

Oakland harbor is identified in the Basin Plan for the San Francisco Bay Region as being within the East Bay Plain "significant groundwater basin" (SF-RWQCB 1995). Beneficial uses for the groundwater basin include municipal industrial process and uses, agricultural uses and, potentially, drinking water.

The majority of groundwater in the East Bay Plain area is a bicarbonate type containing calcium and sodium as the predominant cations. The San Antonio Formation, described below, beneath the Port of Oakland has existing saltwater intrusion and contains brackish groundwater with TDS concentrations generally exceeding 5,000 mg/L. The Alameda Formation contains relatively fresh water with TDS concentrations generally below 1,000 mg/L and is locally used for irrigation and industrial purposes (SCI, 1997). A groundwater chemistry baseline for the upper Alameda Formation indicates that the groundwater is generally good quality.

Subsurface Consultants, Inc. (SCI, 1997) recently completed a hydrogeologic investigation for the proposed project that includes a compilation of new and existing data. The following summarizes the occurrence of groundwater in the each hydrostratigraphic unit as reported by SCI (1997). A hydrostratigraphic unit is a formation or group of formations containing water. Additional site specific information for each disposal site is presented in their respective sections, below.

UNDIFFERENTIATED FILL

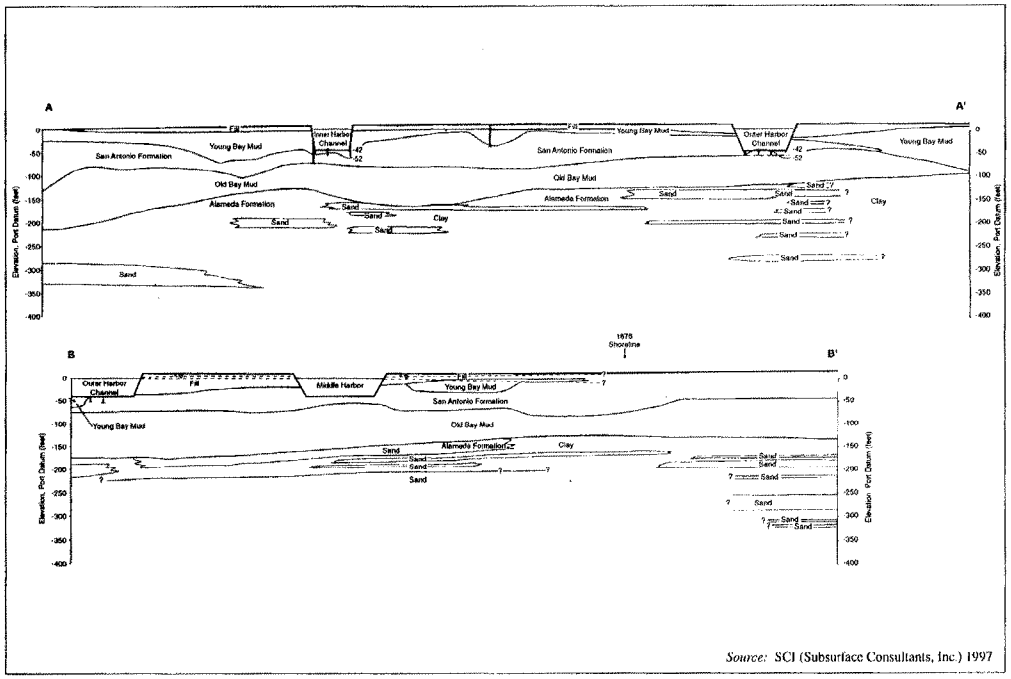
Groundwater in the surficial fill unit is unconfined. The saturated thickness is generally less than 20 feet, and the groundwater levels range from about +8 to +10 feet inland to about +4 feet near the channel areas. The average hydraulic conductivity is between $1 \times 10^{-3}$ and $8 \times 10^{-3}$ cm/s. In the FISCO area and NAS Alameda area, groundwater flow is radial toward the channels and San Francisco Bay. The horizontal gradient ranges from 0.001 ft/ft at FISCO to 0.005 ft/ft at NAS Alameda.

YOUNG BAY MUD

The Young Bay Mud is an aquitard and forms a confining layer above the San Antonio Formation. It has a low permeability of $1 \times 10^{-7}$ cm/s. It is present under a large portion of the study area, but is missing in the shipping channel areas (Figure 4.3-3).

SAN ANTONIO FORMATION

The San Antonio Formation is a confined aquifer. Pump tests and grain size analysis indicates a hydraulic conductivity of between $1 \times 10^{-3}$ and $5 \times 10^{-3}$ cm/s. Groundwater flow is radial from the inland Port areas toward the Middle and Inner/Outer Harbor channels. Groundwater at NAS




*Source:* SCI (Subsurface Consultants, Inc.) 1997

**Figure 4.3-3**

**GEOLOGIC CROSS-SECTIONS OF THE PROJECT AREA**

Alameda flows toward the Inner Harbor channel. The horizontal groundwater gradient is very low, approximately 0.0003 ft/ft. A tidal study conducted by SCI (1997) indicates tidal influenced groundwater level fluctuations of about 2 feet near the channels.

OLD BAY MUD

The Old Bay Mud is a regionally continuous aquitard forming a confining layer over the Alameda Formation. It separates highly brackish groundwater in the San Antonio Formation from relatively fresh groundwater in the sand units of the Alameda Formation. The average permeability of this unit is $2 \times 10^{-8}$ cm/s.

ALAMEDA FORMATION

The Alameda Formation is comprised of alternating layers of sands and clays with variable thickness from one location to another. The hydraulic conductivity calculated from pump tests in the upper part of the unit is $5 \times 10^{-4}$ cm/s. The flow direction in the study area is to the southeast and south; however, the flow is probably influenced by two known pumping wells. The gradient is approximately 0.003 ft/ft, and is likely to be influenced by pumping. Tidal influence is low.

*Slope Stability*

In 1997, the Port of Oakland retained Liftech and their subconsultant, Geomatrix, to provide an evaluation of the wharves after dredging from 40 feet to 46 feet (Geomatrix 1997b). The Liftech team performed calculations to estimate factors of safety for the shoreline slope stability of selected berths, including berths 23 to 26, 30, 32, 33, 35, 37, 38, 60 to 63, 67, and 68. The depths used in the calculations represented the existing conditions at the berths, including allowable overdredging below design dredge depths. It was assumed that dredging would extend to the maximum dredge depth at the face of the wharf. Calculated factors of safety for circular failure surfaces are given in Table 4.3-1.

In addition to the factor of safety calculations for static loading conditions, the team evaluated the expected relative performance of the shoreline slopes under design earthquake loading conditions. The design earthquake considered was assumed to have an exceedance of 20 percent in 50 years corresponding to the Level 1 earthquake used in the design of Howard Terminal and Berths 26 and 30. Based on subsurface conditions assumed to be representative at each berth and engineering judgment, estimates of the relative performance of the shoreline slopes under design seismic loading conditions were developed (Table 4.3-2). For each berth, the relative performance was estimated to be either good, moderate, or poor for the indicated existing maximum dredge depth.

### 4.3.2 Proposed Dredge Area

*Geology*

The geology and hydrostratigraphy units underlying the proposed dredge area are described in section 4.3.1. Cross-sections are shown in Figure 4.4-3.

**Table 4.3-1. Calculated Factors of Safety — Shoreline Slope Stability for Static Loading Conditions**

| *Berth Number* | *Maximum Dredge Depth Elevation (ft)* | *Calculated Factors of Safety* [1] |
|---|---|---|
| 23 | 46 | 1.4 |
| 23 | 46 | 1.4 |
| 24 | 46 | 1..3 |
| 25 | 46 | 1.4 |
| 26 | 46 | 1.7 |
| 30 | 44 | 1.7 |
| 32 | 38 | 1.5 |
| 33 | 38 | 1.6 |
| 35 | 44 | 1.7 |
| 38 | 44 | 1.4 |
| 60 | 44 | 1.4 |
| 62 | 44 | 1.8 |
| 67 | 44 | 1.4 |
| 68 | 44 | 1.3 |
| 68 | 44 | 1.6 |

*Note:* 1. Calculated factors of safety for circular failure surfaces that intersect the ground surface at the back of the existing wharf structure or inboard of the wharf, and intersect the mudline at the toe of the slope or outboard of the toe.

**Table 4.3-2. Estimated Relative Performance of Shoreline Slopes Design Seismic Loading Conditions**

| *Berth Number* | *Maximum Dredge Depth Elevation (ft)* | *Estimated Relative Performance* |
|---|---|---|
| 23 | 46 | Moderate |
| 24 | 46 | Moderate |
| 25 | 46 | Moderate |
| 26 | 46 | Good |
| 30 | 44 | Good |
| 32 | 38 | Moderate |
| 33 | 38 | Moderate |
| 35 | 44 | Moderate |
| 37 | 44 | Moderate |
| 38 | 44 | Moderate |
| 60 | 44 | Poor |
| 61 | 44 | Poor |
| 62 | 44 | Poor |
| 63 | 44 | Poor |
| 67 | 44 | Good |
| 68 | 44 | Good |

***Sediment Quality***

The sediment quality in Oakland Harbor has been characterized repeatedly in recent years in conjunction with various dredging projects. These data were summarized in the EIS/EIR for the 42-foot project (USACE/Port of Oakland 1994). Sediment quality data for the 50-foot Project are summarized in Section 3.2 and Appendix A of this document. The data are also briefly described here by area and sediment type.

MS/OBM was predominantly sandy (> 80 percent), with lesser proportions of silt and clay (Table 4.3-3). YBM was generally less than 50 percent sand, with equal proportions of silt and clay. Total organic carbon (TOC) concentrations were relatively low throughout Oakland Harbor, but were

**Table 4.3-3. Mean Values of Sediment Conventional Variables by Sediment Type and Area — 50-foot Project**

| *Sediment Type* | *Area* | *Gravel (%)* | *Sand (%)* | *Silt (%)* | *Clay (%)* | *TOC (%)* | *Total Sulfides (mg/kg)* | *TVS (%)* |
|---|---|---|---|---|---|---|---|---|
| MS/OBM | IB | 3 | 65 | 22 | 11 | 0.14 | 0.69 | 1.45 |
| | IC | 0 | 79 | 13 | 9 | 0.19 | 1.13 | 1.34 |
| | IW | 0 | 88 | 7 | 6 | 0.21 | 0.77 | 8.21 |
| | OB | 0 | 89 | 6 | 6 | 0.17 | 0.65 | 8.96 |
| | OC | 0 | 86 | 8 | 6 | 0.16 | 0.84 | 6.68 |
| | OW | 0 | 87 | 7 | 5 | 0.12 | 4.24 | 0.86 |
| | TC | 0 | 52 | 29 | 19 | 0.30 | 7.71 | 1.93 |
| | TW | 0 | 81 | 13 | 6 | 0.15 | 7.44 | 1.11 |
| | overall | 0 | 78 | 13 | 8 | 0.18 | 2.93 | 3.82 |
| YB | IW | 1 | 46 | 29 | 24 | 1.13 | 730 | 14.9 |
| | OW | 1 | 48 | 27 | 24 | 0.86 | 545 | 8.92 |
| | TW | 2 | 21 | 40 | 37 | 1.68 | 2730 | 6.07 |
| | overall | 1 | 38 | 32 | 29 | 1.22 | 1340 | 9.96 |
| YM | IW | 0 | 26 | 42 | 33 | 1.15 | 1030 | 14.9 |
| | OW | 1 | 27 | 40 | 33 | 0.88 | 664 | 7.71 |
| | TW | 2 | 11 | 45 | 34 | 1.54 | 2160 | 6.90 |
| | overall | 1 | 21 | 42 | 33 | 1.19 | 1280 | 9.82 |
| YS | IB | 0 | 47 | 26 | 28 | 1.35 | 845 | 4.40 |
| | IC | 0 | 41 | 28 | 30 | 0.90 | 611 | 3.57 |
| | IW | 0 | 24 | 42 | 34 | 1.14 | 966 | 22.0 |
| | OB | 1 | 55 | 22 | 23 | 0.76 | 135 | 2.70 |
| | OC | 1 | 41 | 32 | 27 | 0.93 | 283 | 21.9 |
| | OW | 1 | 22 | 44 | 34 | 1.03 | 619 | 10.3 |
| | TC | 0 | 57 | 23 | 21 | 1.35 | 565 | 3.70 |
| | TW | 0 | 6 | 50 | 44 | 1.50 | 1640 | 7.24 |
| | overall | 0 | 37 | 33 | 30 | 1.12 | 708 | 9.48 |

*Notes:*
MS/OBM = Merritt Sands/Older Bay Mud
YB = Younger Bay Mud > 8 ft below mudline
YM = Younger Bay Mud, 4 - 8 ft below mudline
YS = Younger Bay Mud up to 4 ft below mudline
IB = Inner Harbor berths
IC = Inner Harbor Channel
IW = Inner Harbor Widening Area
OB = Outer Harbor berths
OC = Outer Harbor Channel
OW = Outer Harbor Widening Area
TC = Turning Circle
TW = Turning Wings

lowest in MS/OBM sediments (Table 4.3-1). Total sulfide concentrations were less than 10 mg/kg in MS/OBM, but were at least 100 times higher in some YBM. Total volatile solids (TVS) concentrations were slightly higher in YBM than in MS/OBM (Table 4.3-1).

All metals (here used to include metalloids) analyzed except cadmium and selenium were detected in each MS/OBM sample (Table 3.2-2). The mean concentrations in each of the 8 areas are summarized in Table 3.2-2. Mean concentrations were relatively similar to each other, with the lowest and highest means generally within a factor of two of each other. All metals were detected in each YBM sample from both the Outer Harbor (Table 3.2-3) and Inner Harbor (Table 3.2-4). With the exception of chromium, nickel, and selenium, mean metals concentrations were higher in YBM than in MS/OBM by factors ranging from 2 to 10. For chromium, nickel, and selenium, the mean concentrations in YBM and MS/OBM were similar. Mean metals concentrations in YBM from the turning basin were up to 20 times higher than mean concentrations in MS/OBM from the turning basin (Tables 3.2-2 and 3.2-4).

Organic compounds were detected much less frequently than metals. Less than half the MS/OBM samples contained detectable concentrations of organic compounds (Table 3.2-2). Total DDT, total PCBs, and tributyltin were almost never detected in these samples. PAHs were detected in all YBM samples analyzed. The mean concentrations of total PAHs were approximately 2 orders of magnitude higher in YBM from the Outer Harbor than in MS/OBM from the same area. The mean concentrations of total PAHs in YBM from all Inner Harbor areas except the turning basin were higher than mean concentrations in YBM from Outer Harbor areas by factors ranging from 2 to 5. YBM from the turning basin had the highest concentration of PAHs in the entire project area, up to 259,000 mg/kg (Table 3.2-4).

Other organic compounds (total DDT, total PCBs, and tributyltin) were detected in approximately half the YBM samples (Table 3.2-3). The concentrations of other organic compounds in YBM from Inner Harbor areas were generally similar to concentrations in YBM from Outer Harbor areas. The concentrations of other organic compounds in YBM from the turning basin was up to 10 times higher than concentrations in YBM from other areas (Table 3.2-4).

To determine whether Oakland Harbor sediments have contaminant levels above or below Bay-wide averages, data from 50-foot project analyses were compared to data summarized in Table 4.3-4. For the chemicals shown in this table, the mean concentrations in MS/OBM were less than the mean concentrations from the Central Bay, except for chromium, which was more than twice as high. Conversely, the mean concentrations in YBM were higher than the mean concentrations from the Central Bay, except for cadmium and silver, which were lower.

YBM samples from the 50-foot Project area were also tested for toxicity using a whole-sediment test with the amphipod *Ampelisca abdita*, and a suspended-particulate-phase test with larvae of the mussel *Mytilus galloprovincialis* (Table 3.2-5). For amphipods, the mean percent survival ranged from 33 to 87 percent. The means for percent survival for each geographical area/sediment type combination showed little variation, ranging from 62 to 71 percent. The majority of the samples tested, 24 of 39, were considered acutely toxic to *A. abdita* according the PN 93-2 guidelines (Table 3.2-5).

YBM from the 42-foot channel and widening areas were determined not to be lethal to *M. galloprovincialis*, but minor sublethal effects were demonstrated. At the highest concentration of SPP tested, 100 percent, which corresponds to a 1:4 sediment/water mixture, survival was greater than 75 percent for all samples (data shown in Appendix A) and the proportion of normal larvae

**Table 4.3-4. Mean Concentrations of Selected Toxicants in Surficial Sediments from Three Basins and Four Peripheral Areas of San Francisco Bay**

| | Basins | | | Periphery | | | |
|---|---|---|---|---|---|---|---|
| | *Northern Estuary*[a] | *Central Bay*[a] | *South Bay*[a] | *Oakland Inner Harbor*[b] | *Islais Creek Harbor*[b] | *Redwood Creek*[b] | *Richmond Harbor*[b] |
| **Trace Metals (ppm, dry weight)** | | | | | | | |
| Mercury | 0.25 | 0.15 | 0.31 | 0.57 | 1.30 | 0.42 | 0.40 |
| Cadmium | 0.24 | 0.14 | 0.17 | 0.67 | 2.23 | 2.47 | 0.65 |
| Copper | 48 | 25 | 43 | 72 | 78 | 66 | 36 |
| Lead | 19 | 24 | 23 | 97 | 102 | 87 | 39 |
| Chromium | 103 | 82 | 107 | ND | 140 | 91 | 123 |
| Silver | 0.25 | 0.18 | 0.42 | ND | 4.69 | ND | ND |
| **Organic Compounds (ppb, dry weight)** | | | | | | | |
| Total PAH | 1,039 | 1,766 | 2,584 | 7,200 | 62,700 | ND | ND |
| Total DDT | 3.5 | 2.5 | 3.2 | 120 | 3 | ND | 260,700 |
| Total PCB | 3.8 | 9.3 | 14.3 | 361 | 305 | ND | ND |

*Notes:* ND = No Data
[a] San Francisco Estuary Institute 1997
[b] Long and Markel 1992

was statistically indistinguishable from the proportion of normal larvae in the control (0 percent SPP) in 29 of 38 samples (Table 3.2-5). According to PN 93-2, the dredged material associated with these samples is not predicted to be acutely toxic.

Sediment chemistry data gathered from several in-Bay studies were summarized by Long and Markel (1992). Data collected from the central basins of the Northern Estuary, Central Bay, and South Bay during 1996 were compared with data collected in the peripheral areas (i.e., harbors, ship channels, marinas, and industrial waterways). The data, presented in Table 4.3-4, indicated that the peripheral harbors and channels had higher contaminant concentrations than the basins. Among the three basins, mean concentrations were somewhat similar. Table 4.3-5 compares mean concentrations measured in 1996 for all basins combined with mean concentrations reported in peripheral areas by Long and Markel (1992). Sediment concentrations of the six trace metals, PAHs, DDT, and PCBs in the peripheral areas were consistently higher than concentrations measured within the San Francisco Bay basin areas. This trend was noted by Long and Markel (1992) who inferred that the average sediment toxicity may be higher in peripheral harbors and channels than in the basins. They also noted that the distribution of toxicity is subject to small-scale patchiness (Long and Markel 1992).

*Seismicity*

The seismicity of the proposed dredge area is described in section 4.3.1, and is similar to the adjacent upland sites (Vision 2000 Upland area, New Berth 21, and NAS Alameda described below).

### 4.3.3 Possible Reuse/Disposal Options

In the reuse/disposal options discussed below, the same parameters are not necessarily discussed at each site, due to the differing characteristics (e.g., upland, in-Bay, and marine) of the sites.

**Table 4.3-5. Overall Average Concentrations (± Standard Deviations) of Selected Toxicants and Numbers of Samples Tested in Basin and Peripheral Areas**

| *Chemical* | *All Basins* | *All Periphery* |
|---|---|---|
| **Trace Metals (ppm, dry weight)** | | |
| Mercury | 0.45 ± 0.73, n = 396 | 0.52 ± 0.63, N = 701 |
| Cadmium | 0.94 ± 1.25, n = 256 | 1.10 ± 1.13, n = 743 |
| Copper | 36 ± 22, n = 376 | 62 ± 73, n = 503 |
| Lead | 32 ± 27, n = 461 | 69 ± 371, n = 853 |
| Chromium | 108 ± 129, n = 140 | 80 ± 70, n = 256 |
| Silver | 0.51 ± 0.51, n = 148 | 1.63 ± 1.83, n = 188 |
| **Organic Compounds (ppb, dry weight)** | | |
| Σ 18 PAH* | 2,700 ± 2,700, n = 11 | 2,480 ± 39, 100, n = 10 |
| Σ 7 PAH | 1,600 ± 1,400, n = 77 | 12, 200 ± 18, 700, n = 24 |
| Total DDT | 9 ± 15, n = 75 | 190 ± 380, n = 78 |
| Total PCB | 45 ± 35, n = 37 | 287 ± 245, n = 15 |

*Notes:* * Sum of 18 individual PAH compounds (from Figure 72, Long et al. 1988)
** Sum of 7 individual PAH compounds (from Table 29, Long et al. 1988).

***Vision 2000 Upland***

The Vision 2000 Upland area encompasses the eastern half of the existing finger piers that are to receive fill material for the proposed project. The ROI is the FISCO property and, to the east, the Union Pacific Railroad property.

*Geology and Soil Materials*

The Vision 2000 Upland area is underlain by Quaternary sedimentary rocks capped by a relatively thin veneer of fill materials used to reclaim tidal flats and other shallow intertidal areas. A simplified geologic map of the proposed project area is shown in Figure 4.3-2, modified from Radbruch (1957). Cross sections of the site are shown in Figure 4.3-3. The following descriptions of the geologic and fill materials are compiled from SCI (1997), Rogers and Figuers (1991), U.S. Navy (1995a,b,c,e,g; 1996a), and Port of Oakland (1996a,b,c; 1997a). The entire Vision 2000 Upland area lies bayward of the historic margin of San Francisco Bay, which has been filled over a period of about 120 years. The largest properties comprising the site include Port of Oakland property to the north, the FISCO property east of the Middle Harbor area, and railroad properties adjacent to FISCO such as Union Pacific Railroad and Southern Pacific Transportation Company railyards. FISCO was filled primarily in the late 1930s and early 1940s by pumping hydraulically dredged sediments from the Bay into diked basins constructed in mudflats and shallow water areas. Fill materials at FISCO are typically poorly to moderately compacted sands and silty sands. Tidal flats at the railroad properties were filled beginning in the late 1800s by dredge spoils, construction debris, rubble, and other materials. Overall, the fill is estimated to be less than 25 feet thick across much of the site and, more likely, 5 to 12 feet thick, depending on the pre-existing conditions and the surface elevation before infilling.

Strata beneath the fill are composed of approximately 400 to 600 feet of alluvial and estuarine sediments. The deepest of these units lying unconformably on Franciscan basement are interbedded gravel, sand, and sandy clay of the Alameda Formation. The upper contact of the Yerba Buena Formation beneath the site is approximately 80 feet below ground surface (bgs). Overlying the Yerba Buena Formation are layers of silt, silty clay, and clay sediments of the San

Antonio Formation. The Posey and Merritt Sand members occupy the upper part of this unit. Above the Posey and Merritt Sands are fine grained sediments of the Young Bay Mud. The Younger Bay Mud is prevalent and continuous near the Bay, becoming more discontinuous to the east. In some locations, the Bay Mud grades into interbedded sand, silt, and clay that may have been derived from eroded and reworked Merritt Sands. The Bay Mud ranges in thickness from less than 10 feet to more than 45 feet.

*Faulting*

No active faults or faults that fall under the Alquist-Priolo Special Studies Zone Act of 1972 have been mapped on the site. The nearest active fault is the Hayward fault, located approximately 5 miles east of the project site. The San Andreas fault lies approximately 15 miles to the west, and the Calaveras fault lies about 15 miles to the east (Figure 4.3-1).

*Ground Shaking*

The Vision 2000 Upland area is subject to strong ground motions due to its proximity to the Hayward and San Andreas faults, presence of underlying unconsolidated Bay Muds and fill materials underlying the site. The recorded peak accelerations from the Loma Prieta earthquake in the area were more than three times greater than the peak accelerations at nearby bedrock locations such as Yerba Buena Island (Carlisle and Rollins 1994). As a result, the Association of Bay Area Governments (ABAG) has predicted that the amplification of seismic waves in the fill materials at the site would be at the extreme high end of the response spectrum of geological materials found in the Bay Area. It is predicted that an earthquake with a magnitude of 7.1 on the northern part of the Hayward fault would be "heavy" (Mercalli Index IX) due to ground shaking (ABAG 1995).

The peak ground acceleration recorded at a strong motion-recording station at the Marine Operations Building, Berth 24, was 0.25g during the Loma Prieta earthquake of October 1989. Using computer modeling techniques, Carlisle and Rollins (1994) predicted that a magnitude 7.25 and 8.25 earthquake on the Hayward fault would produce peak ground accelerations of 0.41g and 0.65g, respectively, at the former NAS Alameda. Because the geologic and fill materials at Alameda are similar to those at the Vision 2000 Upland, these data are probably applicable.

Site-specific horizontal earthquake response spectra were developed for ground motions that may be expected within the Vision 2000 Upland area during future seismic ground motions in the San Francisco Bay Area (Port of Oakland 1997a). Smooth site-specific response spectra were developed for four hazard levels identified within the Port of Oakland, corresponding to 50, 20, 10, and 5 percent probabilities of exceedance in 50 years (72, 224, 475, and 950 return periods, respectively). Peak horizontal ground accelerations were 0.29g, 0.45g, 0.57g, and 0.68g for the probability of exceedance levels cited above. The duration of strong shaking associated with earthquakes that dominate the design-level ground motion hazard for the Vision 2000 Upland area would be approximately 15 to 20 seconds, although lower amplitude shaking may continue longer.

*Settlement*

The Young Bay Muds and fill materials are relatively uncompacted which may lead to consolidation and settlement. The maximum amount of consolidation of Bay mud and fill depends on the density and thickness of the materials. Bay mud 10 to 30 feet thick beneath 10 to

20 feet of sand fill will theoretically settle on the order of 1.5 to 5 feet. Lee and Praszker (1969) have estimated that a 10-foot thick Bay mud layer will achieve maximum consolidation within 2 years, while about 40 years is required for a 30-foot layer to fully consolidate. The rate of settlement is most rapid immediately after loading and gradually decreases with time. Bay mud is frequently associated with settlement problems because of its relatively low shear strength (Goldman 1969).

Differential settlement results from spatial variations in uniformity of thickness of the Bay mud or the overlying fill. Areas of historical tidal flats are susceptible to differential settlement because the filling of tidal channels has resulted in variations in fill thickness.

The U.S. Navy reported settlement of at least 6 inches to as much as 2 feet in a number of locations within FISCO (U.S. Navy 1988). Settlement of roadways and the ground surface surrounding buildings has resulted in relative increased loading dock heights and poor drainage conditions in some areas. Settlement is not expected to impact the piers because these are constructed on concrete pile foundations driven into the Merritt Sand.

*Liquefaction Potential*

One of the major causes of damage to Bay Area structures during the Loma Prieta earthquake was liquefaction of underlying soil materials. Liquefaction of soil results from the transformation of loose water-saturated granular material from a solid state to a liquefied state due to the increase in pore water pressure during an earthquake. Materials that are most susceptible to liquefaction are loose, well sorted sands with low amounts of clay binder. These materials may lose their bearing capacity during an earthquake, causing severe differential settlement and foundation damage to structures. In general, more compressible soils, such as plastic silts or clays, do not generate excess pore pressure as quickly or to as great an extent as less compressible soils, such as sands. Soils with large amounts of sand or clay, therefore, tend to be less susceptible than sandy soils to liquefaction-type behavior. The potential for the generation of excess pore pressure and for the loss of cohesion and strength are also largely dependent on the density of the soil.

Engineered fill covering most of the Vision 2000 Upland area contains a wide range of materials, including hydraulically placed Merritt Sand. In addition, the fill material is underlain by relatively unconsolidated and saturated Bay mud. Therefore, the potential for liquefaction at the site is moderate to high.

*Lateral Spreading*

Lateral spreading, or ground lurching, is the horizontal component of soil movement in the direction of a free face that results from the liquefaction of a supporting layer due to an earthquake. Fissures in a nearly horizontal or gently sloping ground surface are a common feature of lateral spreading. Lateral spread movements may be on the order of millimeters to several meters or more, and typically are accompanied by surface fissures and slumping. Flow slides, which generally occur in liquefied materials on steeper slopes, may involve ground movements of hundreds of meters.

With the exception of local subsidence in the vicinity of the North Marginal Wharf due to erosion resulting from failure of sheet pilings or a concrete curtain wall (U.S. Navy 1987), lateral spreading has not been reported in any of the geologic studies reviewed for this report. The absence of

reports of lateral spreading indicates that the perimeter dikes have been effective in retaining the fill material behind them.

*Groundwater*

The Vision 2000 Upland area is underlain by three fundamental hydrostratigraphic units. From older to younger, they are: the Alameda Formation, San Antonio Formation (the Posey and Merritt Sands, in particular), and surficial fill unit (U.S. Navy 1995a,b,c,e,g; 1996a,b; Port of Oakland 1996a,b; SCI 1997). The hydrostratigraphic units are described in section 4.3, and geologic cross-sections are shown in Figure 4.3-2.

Removal of the Young Bay Mud by dredging operations in the Inner, Middle, and Outer harbors has exposed the Merritt Sand aquifer, potentially allowing saltwater intrusion eastward into the aquifer. Studies for deeper berthfront dredging at Alameda NAS and FISCO noted that the dredging project would not significantly increase saltwater intrusion into this aquifer, but that groundwater withdrawals should be managed to prevent intrusion of saltwater into the aquifer, presumably to maintain the head in groundwater within the Alameda Formation aquifer (U.S. Navy 1990).

Groundwater data, particularly the hydraulic gradient and flow direction, is variable from location to location. However, several generalizations concerning the hydrogeology can be made based on available water level data. Recharge of the aquifers originate from precipitation and infiltration from off-site areas, since the majority of the site is covered by asphalt and concrete. The regional groundwater flow direction is westerly from the Berkeley Hills to San Francisco Bay. Under the Vision 2000 Upland area, groundwater generally flows toward the Inner or Outer Harbor channels depending on the site's location. Groundwater is usually encountered at depths between 4 and 13 feet bgs, which fluctuate seasonally. The hydraulic gradient typically ranges from 0.001 to 0.006 ft/ft. However, most data do not distinguish between gradients in fill vs. the Merritt Sand.

*Groundwater Quality*

This reuse/disposal option is located adjacent to the proposed dredge area, and groundwater quality at this site is described in section 4.3.1.

***New Berth 21***

The New Berth 21 site is surrounded by the Oakland Army Base property, and the region of influence is the Oakland Army Base. Recent information on the site is provided in two documents: a site investigation for Berths 8 and 9 (Port of Oakland 1992b) and the Environmental Baseline Survey for the Oakland Army Base (COE 1996b).

*Geology and Soil Materials*

Soil materials encountered at the Oakland Army Base consist of fill materials overlying Young Bay Mud. The fill is characterized by dark green to black, silty sandy clays and fine sands to a depth of about 8 feet. Gravel is commonly present in the upper 5 to 8 feet. Bay Mud, a very soft gray to black-gray clay, was encountered at depths ranging from 8 to 15 feet, the maximum depth of borings.

*Groundwater*

Groundwater is generally encountered between 3 to 8 feet below ground surface (bgs). Because the documents reviewed for this discussion do not include boring or well information below 15 feet bgs, the groundwater encountered probably represents the saturated zone within the unconsolidated fill above the Young Bay Mud. No site-specific data were available on the hydraulic gradient, flow direction or tidal influence.

*Groundwater Quality*

This reuse/disposal option is located adjacent to the proposed dredge area, and groundwater quality at this site is described in section 4.3.1.

*Faulting*

No active faults or faults that fall under the Alquist-Priolo Special Studies Zone Act of 1972 have been mapped on the site. (This Act requires a special study within 400 feet of an active fault.) The nearest active fault to the site is the Hayward fault, located approximately 5 miles east of the project site. The San Andreas fault lies approximately 15 miles to the west, and the Calaveras fault lies about 15 miles to the northeast (Figure 4.3-1).

The New Berth 21 / Oakland Army Base is adjacent to the Vision 2000 Upland area, and is underlain by similar fill and geologic materials. Therefore, the potential for ground shaking, settlement, liquefaction, and lateral spreading is similar to the Vision 2000 Upland area.

***Middle Harbor Enhancement Area***

The Middle Harbor Enhancement Area is adjacent to the Vision 2000 Upland area, which is described above.

Sediment chemistry data gathered from 31 surface grab samples are presented in Appendix H. The Young Bay Muds in Middle Harbor are primarily fine-grained, silt-clay sediments. Mean concentrations of contaminants are within the range of background concentrations (Table 4.3-4) reported by the San Francisco Estuary Institute's Regional Monitoring Program (RMP) with three notable exceptions. Average chromium concentrations in Middle Harbor sediments (165 ppm) are somewhat higher than the average RMP background (97 ppm) but not unusual for this general region and geological basin. PCBs were detected at eight of the 31 stations sampled and, where detected, the totals were an order of magnitude greater than average background concentrations reported in the most recent RMP results (33 - 68 ppb total PCBs in Middle Harbor compared to 3-14 ppb). Total DDT was uniformly higher than background concentrations (2.5 - 3.5 ppb) at every station sampled in Middle Harbor (4 - 48 ppb). Sediment from all locations sampled would be classified as non-cover material for wetlands creation according to the testing guidelines defined by SF-RWQCB (Wolfenden and Carlin 1992); all surface sediments analyzed from Middle Harbor exceed the wetland cover criterion for total DDT (3 ppb), and sediments from six of the 31 stations sampled also exceed the cover criteria either for total PCBs (50 ppb) or total PAHs (4000 ppb). However, these chemical concentrations would not necessarily eliminate these sediment for consideration for aquatic disposal in San Francisco Bay or in the ocean.

The non-cover material proposed for Middle Harbor habitat restoration is actually less contaminated than existing material. Unlike existing Middle Harbor sediment, the proposed non-

cover material does not exceed cover screening concentrations for PAHs and PCBs. In addition, while Total DDT concentrations in non-cover sediments proposed for Middle Harbor habitat exceed the cover screening criteria (3.8 to 5.8 ppb) , these concentrations are also lower than DDT concentrations in existing Middle Harbor sediment (4 to 48 ppb).

*Former Alameda NAS*

*Geology and Soil Materials*

Soil borings at NAS Alameda have identified four of the Quaternary formational units that are discussed above in the regional setting (section 4.3.1), and one surficial fill unit overlying the site. The following description of the stratigraphic units is generalized from a number of sources, including the U.S. Navy's Solid Wastewater Quality Assessment Test (SWAT) and data summary report (U.S. Navy 1993d), Data Summary Background and Tidal Influence Studies report (U.S. Navy 1995g), and Sector II FOSL (U.S. Navy 1997a).

Fill composed of a variety of materials overlies the Alameda NAS site. The predominant material is well-sorted fine to medium sand with silt and clay binder. The fill thickness ranges between 20 and 30 feet in the western part of the base. The fill materials are likely composed of dredged sediments originating from the Seaplane Lagoon, Oakland Middle Harbor, and other nearby sites in San Francisco Bay.

Underlying the fill material is the Young Bay Mud stratigraphic unit, composed of gray to black clay and silt, with poorly graded sand and silt lenses. The muds range in thickness between 30 to 110 feet. They tend to be thicker in the north and decrease in thickness to the south.

Below the Young Bay Mud is Merritt Sand of the San Antonio Formation. The Merritt Sand is composed of brown, fine to medium grained poorly graded sand up to 60 feet in thickness. To the south, the sand thins and is truncated by a paleochannel that trends east-west across the middle of the site.

The lowest unit encountered at the site is the Old Bay Mud of the Yerba Buena Formation. It consists of gray silty clay and silt, and its thickness at the site is unknown.

*Faulting*

No active faults or faults that fall under the Alquist-Priolo Special Studies Zone Act of 1972 have been mapped on the site. The nearest active fault to the site is the Hayward fault, located approximately 6 miles east of the project site. The San Andreas fault lies approximately 16 miles to the west, and the Calaveras fault lies about 20 miles to the northeast (Figure 4.3-1).

*Ground Shaking*

Ground shaking in this area is similar to that in the Vision 2000 Upland area, which is described above.

*Settlement*

Settlement in this area is similar to that in the Vision 2000 Upland area; refer to that discussion above for background information on Bay mud settlement. NAS Alameda had a significant problem under one of the runways due to the 1989 Loma Prieta earthquake due to settlement into

a buried ship (personal communication, J. Prall 1997). It can be reasonably expected that some settling of the fill materials and younger Bay Muds would occur if built upon.

*Liquefaction Potential*

Liquefaction potential at this site is the same as that at the Vision 2000 Upland area discussed above.

*Lateral Spreading*

For background information on lateral spreading, see the discussion in the Vision 2000 Upland area above.

Lateral spreading has not been reported at Alameda in any of the geologic studies reviewed for this report. However, the occurrence of fill materials overlying unconsolidated Bay Muds suggests that some lateral spreading may occur during a moderate or strong earthquake.

*Groundwater*

Two saturated units have been identified at NAS Alameda. The uppermost unit is the unconsolidated fill overlying the Young Bay Mud. Groundwater is encountered at depths ranging from 4 to 8 feet bgs (U.S. Navy 1996d). Sources of recharge to this unit are precipitation over the unpaved part of the site and saltwater intrusion. The lower unit is a semi-confined aquifer within the San Antonio Formation located between the Young and Old Bay Mud aquitards. The depth to groundwater within this unit is about 40 to 70 feet bgs.

The groundwater beneath the project site is significantly influenced by tidal activity in the Oakland Inner Harbor channel. During low tide, flow is north-northeast toward the Inner Harbor, with a hydraulic gradient of approximately 0.012 fpf. At high tide, the groundwater flow direction is southwest, away from the harbor, and the gradient is approximately 0.013 fpf (U.S. Navy 1995g).

***SF-DODS***

The most current information on existing sediment conditions at the SF-DODS is provided by reports on recent monitoring of the site (SAIC 1996 and 1997). Since designation of the SF-DODS in 1994, SAIC, under contract to the Corps -- San Francisco District, has conducted two episodes (January 1996 and December 1996) of monitoring to determine the distribution and effects of dredged material disposed at the site. Approximately 178,000 cubic yards of dredged material were disposed at the site in 1995, and 746,000 cubic yards were disposed in 1996. All of this material was generated by the Oakland Harbor 42-foot Project. The effects of this disposal can be determined by comparing data from the 1996 monitoring episodes to data collected at the site in 1990 and 1991 (SAIC 1991 and 1992), prior to disposal. Sediment data from these four monitoring episodes are presented in Table 4.3-6, along with data from the 42-foot project for comparison.

In short, the data indicate that existing (1996) sediment conditions at the SF-DODS are generally intermediate between conditions prior to site designation, and the condition of sediments dredged for the Oakland 42-foot project. This is as expected when the site was designated for disposal use. Only material deemed suitable for ocean disposal by the U.S. EPA and the Corps, based on the results of chemical and biological testing, were disposed at the site. The effects of disposal are greater for some sediment parameters than others, as described below.

*Conventional Sediment Parameters*

Conventional sediment parameters include grain size, total organic carbon (TOC), and total solids. Surface sediments at the site in are primarily fine-grained, with percent fines (silt and clay) ranging from 64 to 97 percent in the 1996 data (Table 4.3-6). There is some indication in the data that disposal has resulted in a coarsening of sediments; sediments were 99 percent fines in 1990. However, the 1996 grain size data were similar to those for 1991, suggesting little change. TOC has decreased at the site since disposal, presumably because the Oakland Harbor sediments had lower TOC than the SF-DODS prior to disposal (Table 4.3-6). The upper end of the percent total solids has increased at the site, indicating lower water content for the sediments; this would be expected with a coarsening of sediments. These patterns can be explained by coarsening of sediments at sampling stations with the greatest amount of disposed material, while other locations are relatively unaffected.

*Target Chemicals of Concern*

The following target chemicals of concern were detected in SF-DODS sediments at levels above detection limits:

- Metals (except beryllium, antimony, and thallium)
- Anthracene
- Phenanthrene
- HPAHs
- DDE
- Dieldrin and DDD
- PCBs
- Total Oil and Grease and petroleum hydrocarbons

All other organic chemicals were below detection limits.

*Metals*

The only metals showing a clear increase in concentration in site sediments between 1990/91 and 1996 were lead and silver (Table 4.3-6). For lead, the presumed cause of this is the higher concentration of lead in Oakland Harbor sediments approved for ocean disposal than in the SF-DODS sediments prior to disposal. The cause of the increase in silver (December 1996) is not clear. For several other metals (arsenic, cadmium, chromium, copper, and mercury), Oakland Harbor sediment had higher concentrations than SF-DODS sediments, but this did not result in increased concentrations at the site after disposal. Of the metals detected, only mercury showed the highest concentrations near the center of the site, where dredged material accumulation was the greatest. No metals occurred at concentrations expected to result in adverse biological effects, and metals concentrations at the site generally did not exceed concentrations in sediments from the Oakland Harbor 42-foot project approved for ocean disposal, so that no additional monitoring or site management actions were triggered.

**Table 4.3-6. Summary of Sediment Quality Data for the SF-DODS**

| *Chemical* | *SF-DODS 1990* [a] | *SF-DODS 1991* [b] | *SF-DODS Jan. 1996* [c] | *SF-DODS Dec. 1996* [c] | *Oakland Harbor 42-foot Project* [c] |
|---|---|---|---|---|---|
| Total Solids (%) | 24.6 - 31.5 | 29.5 - 31.5 | 30.7 - 52.3 | 29.1 - 46.8 | NA |
| TOC (%) | 3.17 - 3.92 | 3.21 - 3.76 | 1.6 - 3.2 | 0.87 - 2.3 | 0.01 - 1.15 |
| Percent Fines | 99 | 77 - 96 | 75 - 97 | 64 - 90 | 3 - 95 |
| **Metals (mg/kg dw)** | | | | | |
| Arsenic | 4.4 - 5.2 | 6.62 U | 1.4 U - 7.5 | 2.0 - 7.5 | 1.6 - 12 |
| Cadmium | 0.28 - 0.38 | 0.25 U | 0.21 - 0.52 | 0.10 - 0.19 | 0.1 U - 0.60 |
| Chromium | 100 | 137 - 167 | 61 - 94 | 61 - 120 | 157 - 627 |
| Copper | 52 - 56 | 41 - 62 | 36 - 57 | 29 - 62 | 9 - 85 |
| Lead | 9.6 - 12.0 | 5.25 U | 16 - 29 | 6.6 - 35 | 4 - 50 |
| Mercury | 0.15 - 0.21 | 0.13 - 0.20 | 0.043 U - 0.076 | 0.047 - 0.247 | 0.007 - 0.55 |
| Nickel | 77 - 82 | 78 - 115 | 56 - 80 | 62 - 97 | 35 - 125 |
| Selenium | 2.8 - 5.4 | 9.37 U | 1.4 - 4.4 | 0.28 U - 2.4 | 0.07 U - 0.35 |
| Silver | 0.45 - 0.59 | 0.87 U | 0.08 - 0.80 | 0.12 U - 2.4 | 0.023 - 0.60 |
| Zinc | 99 | 108 - 147 | 68 - 100 | 76 - 120 | 28 - 175 |
| **Organics (µg/kg dw)** [d] | | | | | |
| LPAHs | 92 J - 170 U | 170 U - 210 U | 48 - 110 | 36 - 163 | 1 - 836 |
| HPAHs | 170 U - 220 | 170 U - 420 U | 62 | 34 - 1,436 | 7 - 3,787 |
| Dieldrin | 0.5 U | 6.7 U - 9.2 U | 1 U - 1.9 U | 2 | 1-8 |
| DDT/DDE/DDD | 0.5 - 1.7 U | 6.7 U - 23 U | 1 U - 2.0 - 4.6 U | 3 - 7 | 0.4 - 22 |
| TPCBs | 7.5 - 21 U | 84 U - 460 U | 13 U - 92 U | 19 U - 63 - 97 U [e] | 2.8 U - 40 U |

*Notes:*
a. SAIC 1991
b. SAIC 1992
c. EPA 1998a
d. Detection limits shown for undetected compounds (U) are for individual compounds, not totals.
e. PCBs were undetected at all stations monitored, with the exception of ST-13. The total PCB concentration at ST-13 was 63 µg/kg, while the other stations ranged from 19 U µg/kg to 97 U µg/kg.
NA Not available at time of this writing.
U Undetected analyte. Value shown is the detection limit.
dw dry weight
Sample collection methods for the cited studies differ. A box corer was used to collect the upper 10 cm of sediments from the SF-DODS site in 1990, 1991, and 1996. A vibracorer was used in Oakland Harbor to collect sediment cores through several feet of sediment for compositing.

*Organic Compounds*

Organic contaminants detected at the SF-DODS in 1996 (Table 4.3-6) included low molecular weight polynuclear aromatic hydrocarbons (LPAHs), high molecular weight PAHs (HPAHs), dieldrin, DDD, DDE, and two Aroclors (1254 and 1260) of polychlorinated biphenyls (PCBs). The highest concentrations of these chemicals were found at stations near the center of the site, where the accumulation of dredged material was greatest. PAHs are the primary components of petroleum products. Dieldrin is a chlorinated pesticide, as are DDD and DDE, which are also degradation products of DDT. PCBs were primarily used as hydraulic and heat transfer fluids (in electrical transformers), and are found in some effluents from chemical manufacturing plants, Kraft-pulp mills, and sewage treatment plants.

Interpretation of the data for organic compounds in Table 4.3-6 is complicated by the high analytical detection limits in the 1990 and 1991 surveys. For example, it is difficult to tell whether there was an increase in LPAH concentrations at the SF-DODS in 1996, because of the high detection limits in 1990 and 1991. This is in spite of the expectation of such an increase because of the higher levels of LPAHs in the Oakland Harbor sediments approved for ocean disposal. There is an indication in the December 1996 data, however, that HPAHs did increase at the site following disposal. Likewise, it appears that DDD/DDE increased at the site, because the detected values in 1996 exceeded the detection limits for undetected values in 1990 (if not in 1991). For dieldrin and PCBs, it is not possible to tell if levels increased at the site in 1996 because of the high detection limits in 1990 and 1991. These high detection limits also make it difficult to determine whether the levels of these chemicals were higher in Oakland Harbor than at the SF-DODS prior to disposal there. The exception is the PAHs, which were clearly higher in Oakland Harbor than at the SF-DODS prior to disposal. It is also apparent from Table 4.3-6 that existing (1996) levels of organic contaminants at the SF-DODS are lower than those in the material dredged from Oakland Harbor during the 42-foot project and approved for ocean disposal. In addition, no organic compounds occurred at the SF-DODS at concentrations expected to have adverse biological effects. Therefore, there is no indication that past disposal has resulted in significant adverse effects related to organic compounds at the site, and no related additional monitoring or management actions have been triggered.

***Hamilton Wetlands Restoration***

*Geology and Soil Materials*

The Hamilton restoration site is located on San Pablo Bay intertidal deposits (Bay Mud) (Wagner and Burtugno 1982). The intertidal deposits are composed of silt, clay, organic matter, and supported salt marshes. These deposits have accumulated around the rim of San Pablo Bay during the formation of the Bay, following the sea level rise at the end of the last major ice age (Holocene period). Most of the property lies on intertidal deposits that have been leveed off from the Bay and drained, effecting varicus transformations in the deposits and soil, such as subsidence and acid sulfurization. At the airfield imported gravelly upland soil material has been placed as fill on the transformed intertidal deposits underlying the runways, parking pads, roads, and building pads.

On the Bay side of the levee, new intertidal deposits have accumulated since levee construction and now support salt marsh. Much of the newly deposited material originated from 19th century hydraulic mining in the Sierra Nevada foothills. The historic Bay shoreline at the airfield was located less than a mile west of the present shoreline (Jones & Stokes Associates 1993). East of the

historic shoreline were areas of open saltwater, tidal channels, and salt marsh vegetation growing in the natural soil, the Novato soil series. The Novato soil is now present at the airfield only east of the levee. Where the former Novato soil occurred west of the levee, it has undergone biogeochemical changes and transformed into the Reyes soil series. Later, much of the Reyes soil was covered with imported fill.

The Novato soil consists of horizons of dark gray, mottled and gleyed clay, massive or lacking soil structure, saline, moderately to strongly alkaline, and containing irregular, thin strata of organic material and clam shells. The soil has a high water content and low sediment consolidation.

The Reyes soil consists of a survey horizon of mottled, dark grayish-brown clay and a subsoil of prominently mottled, dark olive-gray clay. The soil has developed an angular blocky structure, is non-saline, and very strongly to extremely acidic. The acidity has developed as a result of a natural soil process occurring upon oxidation of the previously anaerobic tidal marsh soil. The sulfides in the Novato soil oxidize to sulfates, which then form sulfuric acid. The acidic soil condition may develop within weeks of drainage and persist for many decades. The acidity may initially be extreme and then lessen with time.

At the airfield local upland soil material has been placed as fill ranging in depth from several inches to several feet and compacted over extensive areas of Reyes soil, under the roadways and parking pads, and as berms extending into the vegetated areas. The soil fill material is variable but is commonly a reddish-brown, very gravelly sandy clay loam, typical of subsoil material from any of the four major upland soil series occurring in the vicinity.

*Seismicity*

The restoration site is located 13 miles northeast of the San Andreas fault, 7 miles northwest of the Hayward fault, and 8 miles southwest of the Rodgers Creek fault. Two potentially active faults are also located in proximity to the site. The Burdell Mountain fault is located 1.5 miles north of the site and Tolay fault lies 6.5 miles from the site.

The site could be affected by strong ground shaking due to movement along one of these or any one of a number of other active faults in the region.

A possible trace of the Burdell Mountain fault is mapped as extending toward and terminating about 4,000 feet north and west of the site (Rice 1974). There are various estimates of the date of the last displacement on the Burdell Mountain fault. It is generally thought to have been active in Quaternary time (the last 2.5 million years), and there is some evidence suggesting that it may have been active in Holocene time (the last 11,000 years). However, the fault is not designated as an "active" fault by the State and is not included within an Alquist-Priolo Special Studies Zone.

The U.S. Geological Survey has estimated that there is a 67 percent probability that there would be one or more earthquakes of magnitude 7.0 or greater in the Bay area in the next 30 years (USGS 1990).

The seismic hazards at the Hamilton restoration site include liquefaction, lurching, ground rupture, tsunamis, and seiche . These conditions are described below.

- *Liquefaction.* Liquefaction typically occurs in areas where groundwater is shallow, and materials consist of clean, poorly consolidated, fine sand. Since Bay mud does not contain substantial amounts of granular materials, liquefaction hazards at the site are minimal.

- *Lurching.* The Bay mud that underlies the site is susceptible to lurching, particularly where bordered by steep channel banks or adjacent hard ground.

- *Ground Rupture.* There are no active or potentially active faults which are known to cross the project site. Therefore, the potential for ground rupture is minimal.

- *Tsunamis.* A tsunami with a 100-year recurrence interval has an estimated runup of about 4 feet in the vicinity of the site. At current elevations, the site could be flooded due to such a tsunami (Garcia 1975).

- *Seiche.* The 1906 San Francisco earthquake caused a seiche in the San Francisco Bay with several oscillations of only one to two inches (Lawson 1908). Based on the lack of significant historic seiches within San Francisco Bay, the likelihood of a destructive seiche affecting the site area is extremely remote.

MUDWAVES

Mudwaves are boils of material which are raised as a result of placement of heavy material in an adjacent location. Because a portion of the site is underlain by Bay mud there is a potential to create mudwaves.

SETTLEMENT

Settlement of the Hamilton restoration site could occur with the placement of new material over the existing surface, causing a compression of the underlying material.

LEVEE FAILURE

Failure of the perimeter levee at any time can lead to the uncontrolled flooding of the project area. Failure of levees at individual cells (phase) could cause uncontrolled drainage of one phase's water and slurried cover sediment into the adjacent phase area (this would only affect an adjacent phase area that has not been filled). Stability analyses for levees should consider both short- and long-term conditions, including seepage and rapid draw-down. These analyses are essential because significant deformation and failures can occur in levees constructed over soils containing peat, even when conventional static failure analysis indicates stability (ASCE Geotechnical Special Publication No. 31, 1992).

*Groundwater*

The depth to groundwater varies at the airfield from near zero (at the surface) to 8 feet. No aquifers with potable water are known to exist in this area (Woodward-Clyde Consultants 1985). Shallow groundwater beneath portions of the site has a direct hydraulic connection with the Novato Creek subsurface drainage and may be affected by tidal fluctuations (Woodward-Clyde Consultants 1985). Because of the impermeable nature of Bay Muds, tidal and surface runoff fluctuations have little effect on groundwater levels under the airfield area (COE 1995a).

The general direction of groundwater flow at the Hamilton restoration site varies. The groundwater flow direction under most of the airfield area and antenna field is to the east, toward San Pablo Bay and the tidal flats; however, the low transmissivity of Bay muds greatly reduces the movement of shallow groundwater under the site into San Pablo Bay (Woodward-Clyde Consultants 1985; EIP Associates 1993).

GROUNDWATER QUALITY

The shallow groundwater at Hamilton Army Airfield has a high salinity due to the historic influence of San Pablo Bay. This perched aquifer is of poor quality and is not used as a potable water source. A deep, higher quality aquifer is present at an unknown depth. Because of the prevalence of Bay muds, it is unlikely that runoff recharges the deeper groundwater under the airfield. Groundwater is influenced by fresh water levels in Pacheco Pond located north and west of the abandoned runway and may be less saline in this area.

The existing wetlands and soil conditions are important in determining water quality at the Hamilton restoration site. Wetlands are important because they can improve water quality by decreasing water velocity, inducing sediment deposition, and removing nutrients and contaminants. Nutrients and other contaminants can adsorb to sediments in a wetland and be removed by deposition, chemical breakdown, and assimilation into plant and animal tissues (COE 1995a).

Soils in this area can affect water quality because of the presence of acid-sulfate soils. These soils have a low pH (high acidity) and are the result of draining historic salt marsh and the subsequent natural processes occurring upon oxidation of sediments that were previously submerged and under anaerobic conditions. Acid-sulfate soil conditions are present at the site, although these conditions are not extreme at present (COE 1995a).

The historic discharge of urban runoff from the airfield has affected the upper intertidal zone of the salt marsh in the vicinity of the pump station outfall. Elevated concentrations of metals, including high lead concentrations, and petroleum hydrocarbons have been found in sediments in this area. The solvent trichloroethylene has been found in the perimeter drainage channel in surface water runoff. The RWQCB is currently considering requiring an National Pollutant Discharge Elimination System (NPDES) permit for the discharge of surface runoff (COE 1995a).

Groundwater quality at the airfield has been affected due to the presence of hazardous and toxic wastes. The main contaminants of concern that have been found in groundwater are petroleum hydrocarbons, such as gasoline, oils, and solvents. A major source of groundwater contamination is the petroleum oil and lubricant (POL) removal parcel. Several areas of the airfield, such as the burn pit and former sewage treatment plant, also have groundwater contamination.

*Sediment/Soil Quality*

Soil contamination has been documented at numerous locations on the Hamilton restoration site. Contamination is primarily the result of leaking and above ground storage tanks, the aircraft maintenance area, the former sewage treatment facility, the burn pit area and the East Levee Landfill. Potential soil contaminants include petroleum hydrocarbons, semi volatile and volatile organics, metals, pesticides, PCBs and lead. Some of these sites are currently being investigated or remediated under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) or under the environmental investigation program (EI).

LANDFILL 26

The groundwater table in the Landfill 26 area typically within 10 feet of the ground surface and may be confined by the engineered clay cap of the landfill. There is some evidence that small groundwater seeps currently exist which may generate an outward flux of landfill-associated contaminants into adjacent surface waters. The extent of this possible contaminant transport pathway is being investigated (personal communication, J. Gregg, 1997).

OUTBOARD COASTAL SALT MARSH

A number of field investigations have examined contaminant levels in the 88-acre coastal salt marsh. The most recent investigation was performed in 1995 and a variety of earlier investigations examined parts but not all of the coastal salt marsh. Contaminants detected include oil and grease, pesticides and herbicides, PAHs, and 13 metals (arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, copper, lead, mercury, nickel, vanadium, and zinc). The following discussion is excerpted from the 1995 investigation report that summarized previous investigations and reported new results (Woodward-Clyde 1996). The field investigations were generally divided into five discrete locations based on apparent contaminant sources:

*Pump Station Area.* Hamilton Airfield pump station area discharges into the northwestern portion of the coastal salt marsh. These pumps discharge on-site and off-site generated storm water. Contaminants could have been generated from past operational spills as a result of aircraft staging, maintenance, and fueling. There is also off-site agricultural drainage discharged by the pumps.

*East Levee Landfill.* The East Levee Landfill (ELL) is located in the center of the coastal salt marsh. The ELL contains large pieces of concrete, steel, and asphalt forming a riprap bar.

*ELL Burn Pit.* The eastern tip of the ELL was used as a burn pit.

*Former Sewage Treatment Plant.* The Former Sewage Treatment Plant (FSTP) outfall is located midway between the ELL and the pump station discharge. The FSTP provided primary and secondary sewage treatment for sanitary wastes. The 2-foot diameter abandoned outfall pipe extends approximately 600 feet eastward from the levee into the coastal salt marsh. The pipeline traverses the marsh on piles and the terminus is near the eastern vegetated edge of the marsh. There is a small outfall basin and a narrow channel that conveyed the discharge from the pipe across the remainder of the marsh and the mudflat to the open water of San Pablo Bay.

*San Pablo Bay.* Contaminants could have been introduced by tidal action from San Pablo Bay.

*Pre-1995 Sampling.* Various sampling efforts had been conducted in different locations within the coastal salt marsh. Detections at the pump station discharge area included Total Recoverable Petroleum Hydrocarbons (TRPH), metals, and low concentrations of Semi-Volatile Organic Compounds (SVOCs) and Polynuclear Aromatic Hydrocarbons (PAH, sometimes referred to as Poly-Nuclear Aromatics [PNAs]). A 1993 qualitative risk assessment for the pump station discharge area indicated moderate to high ecological risk. One sample at the FSTP outfall showed no metal detections (no other analytes were considered) above concentrations present in the sediment samples from other portions of the salt marsh. Low concentrations of heavy-end petroleum hydrocarbons were detected in soil samples from trenches in the general ELL area. Subsequent installation of five monitoring wells did not indicate contamination in groundwater

samples but significant contamination was found in sediments from the well borings. Detections in the ELL burn pit trenches and soil borings included TRPH, Total Petroleum Hydrocarbons (TPH) as diesel, SVOCs, volatile organic compounds (VOCs), and metals in soils.

*1995 Sampling.* A total of 60 sediment samples (both surface and shallow depth) from the coastal salt marsh, the intertidal mudflats, three perched ponds in the coastal salt marsh, and the FSTP outfall were collected and analyzed for a wide spectrum of potential contaminants. The sediment results showed no significant detections of benzene, toluene, ethylbenzene, and xylene (BTEX), TPH as gasoline, diesel and JP-4 jet fuel, phenols, or VOCs. Detections included oil and grease, pesticides and herbicides, PAHs, and 13 metals (arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, copper, lead, mercury, nickel, vanadium, and zinc).

The RWQCB sediment screening criteria for wetlands cover use (RWQCB 1992) includes criteria for eleven of the contaminants detected in the 1995 coastal salt marsh sampling (total DDT, total PAH, arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, and zinc). Minimum detected concentrations exceed the wetland cover criteria for three of the 11 contaminants (total DDT, total PAH, and silver). Mean detected concentrations exceed the wetland cover criteria for seven of the 11 contaminants (total DDT, total PAH, copper, lead, mercury, silver, and zinc). These contaminants all have their highest detections in the vicinity of the pump station discharge area, though elevated mercury levels are fairly widespread and copper, lead, and zinc all have at least one elevated concentration away from the pump station area. Maximum detected concentrations exceed the wetland cover criteria for all eleven contaminants. Spatial patterns of the four remaining contaminants (arsenic, cadmium, chromium, and nickel) vary; arsenic and nickel elevated concentrations are fairly widespread, cadmium elevated concentrations are near the ELL, and chromium elevated concentrations are in the vicinity of the pump station discharge area.

Tissue samples of the salt marsh plant pickleweed (*Salicornia virginica*) were collected and analyzed. Detections included three organic compounds (1,1,1-trichloroethane, methylene chloride, and toluene) and 20 inorganics (aluminum, arsenic, barium, beryllium, boron, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, molybdenum, nickel, potassium, sodium, vanadium, and zinc).

***Montezuma Wetlands Restoration***

*Geology*

The Montezuma Wetlands site is located in recent alluvium and bay muds in the floodplain of the Sacramento River and the Montezuma Hills. It contains river basin and marsh deposits (75 to 90 feet deep) consisting of unconsolidated peat, clays, and silt with discontinuous sand and gravel lenses. The western portion of the site contains peat beds up to 30 feet thick, while the southern margin of the site contains greater amounts of sand than others parts of the site. These sediments have been diked and drained since the 1880s.

The major soils associations found at the site are Joice muck, Tamba mucky clay, and Reyes silty clay near the levee along Montezuma Slough. These poorly drained soils are located in nearly level areas, presenting little potential for erosion. These soils are underlain by Quaternary coarse-grained sand and gravel deposits (USDA 1977, Levine-Fricke 1992).

The Reyes Series soil consists of poorly drained silty clays that have formed in mixed bay and stream alluvium. The A horizon of this soil is typically light brown gray to grayish brown, while the B horizon varies considerably depending on the percentage of fine material and humus present. Due to this draining and cultivation, the top 2 to 4 feet of the soil tends to be desiccated and stiffer than the underlying mud. The Reyes Series soil generally has a slow permeability and may contribute to surficial ponding. Undisturbed Reyes Series soil has generally neutral pH but, after cultivation, becomes more acidic due to the oxidation of sulfides under the altered drainage conditions (USDA 1985). The soil is underlain by clay and silt of mixed river and bay sediments with an undulating upper boundary at depths that range from 2 to 8 feet below the ground surface.

The Joice Series consists of very poorly drained muck that has formed in mixed bay and stream alluvium. The soil typically is black, clayey muck to a depth of more than 5 feet. The Joice Series soil generally has a moderately rapid permeability but may contribute to surficial ponding.

The Tamba Series consists of very poorly drained, mucky clay that has formed in mixed bay and stream alluvium. Tamba Series soil is light brownish-gray, grayish-brown, and yellowish-brown, mottled mucky clay about 10 inches thick, underlain by mottled, mucky clay that extends to depths of more than 5 feet. The Tamba Series soil generally has a moderate permeability but may contribute to surficial ponding.

Sediment sampling was conducted as part of the MWP DEIR/S (COE and Solano County 1994) to determine the characteristics of topsoils in the area and their suitability for mixing with dredged materials to enhance colonization and plant growth. In general, these soils were characteristic of soils with high organic matter content. The pH values were variable, but tended to be lower in the surface sediments and neutral (less acidic) in the deeper sediments. Other constituents measured in the surface sediments as indicators of sediment quality included organic and inorganic nitrogen, inorganic phosphorous, potassium, calcium, and magnesium. It was concluded that these surface sediments were worth salvaging to mix with dredged materials to promote and enhance plant growth. The MWP DEIR/S contains more detailed information regarding the soil characteristics at the site.

Sampling completed in association with the MWP DEIR/S indicated that the mean concentration of metals measured in the surface soils was less than background levels in all cases except for antimony and nickel.

*Faulting*

The site is located 4.5 miles northwest of the Antioch fault zone and 12.5 miles southeast of the Green Valley fault (Figure 4.3-1). There are no known active (i.e., Holocene) faults within 0.5 mile of the site, nor is the site within an Alquist-Priolo Special Studies Zone.

*Hydrogeology*

The following discussion is based on a technical report prepared by Levine-Fricke (1992). The report presents the results of groundwater investigations conducted to measure hydraulic conductivity, groundwater elevations, groundwater quality, and tidal fluctuations in groundwater levels. The report also characterizes surface waters in the Montezuma Wetlands area.

The Montezuma Wetlands site is located on the eastern margin of Suisun Marsh and the deltaic juncture of the Sacramento and San Joaquin rivers with Suisun Bay (see Figure 2.2-11). It comprises 2,200 acres of tidal marshland slough and transitional upland area.

Shallow groundwater levels at the site range between 0.2 feet and 3.4 feet below the ground surface. Shallow groundwater elevations typically remain below about 2.5 feet below mean sea level (msl), with some elevations as low as 7.58 feet below msl. The groundwater elevation of the site increases gradually from the Montezuma Slough eastward toward the gently rolling Montezuma Hills. Monitoring well data indicate a consistent hydraulic gradient from the Sacramento River and Montezuma Slough to shallow groundwater.

The majority of shallow sediments at the site consist of fine-grained silts, clays, and organic soil (peat), which generally have low horizontal permeabilities (e.g., about $10^{-5}$ cm/sec). Vertical permeabilities are expected to be lower than the horizontal conductivities. Given these low hydraulic conductivities, it is thought that the rate of recharge is lower than the rate of evaporative losses. Monitoring well data indicate that groundwater levels over most of the site are not subject to the tidal fluctuations of the Montezuma Slough and Sacramento River.

Water-bearing silty sands are present at the site within 500 feet of the Sacramento River. Horizontal permeability is higher within these sandy sediments than within other sediments elsewhere at the site. Vertical permeability is thought to be low; monitoring well data indicate that the sandy sediments are overlain by silty clay. Monitoring well data indicate the potential for significant recharge into this shallow groundwater from the Sacramento River. Groundwater levels in the sandy sediments vary according to the tidal fluctuations of the Sacramento River.

Deeper water supply wells in the vicinity of the site generally range between depths of 60 and 200 feet below ground surface. Differences in water quality between shallow and deeper groundwater indicate that these two water-bearing units are hydraulically separated.

Groundwater contamination has not been documented in either the shallow or deep aquifers beneath the site. Very few underground storage tanks or industrial properties are present in the vicinity of Montezuma Wetlands. Agriculture in the area may have contributed to an increase in nitrates, pesticides, or herbicides in the shallow aquifer. Several farms in the area use water from the deeper aquifers for municipal and agricultural purposes; therefore, it is presumed that the water is of generally high quality (personal communication, T. Gandesbery 1995).

Additional data regarding shallow groundwater quality were obtained by Levine-Fricke at the Montezuma Wetlands site and by the DWR at five monitoring stations in the project vicinity. Total and dissolved concentrations of inorganic elements that were detected (arsenic, cadmium, chromium, copper, lead, mercury, and zinc) were all below their respective MCLs, except for one sample for total lead collected from a DWR monitoring station located off site in Suisun Bay near Martinez. Concentrations of total and dissolved arsenic, cadmium, chromium, and mercury levels were below WQOLs. Both total and dissolved concentrations of copper, lead, and zinc exceeded WQOLs at DWR monitoring stations in the project vicinity. However, since laboratory detection limits for copper, lead, and zinc were greater than the WQOLs, it is not known whether samples collected from the Montezuma Wetlands site exceeded WQOLs for these elements.

***Various Landfills***

The rehandling facility that would be used under this disposal option would be located at the Vision 2000 Upland area. Please refer the discussion of that site in to section 4.3.3 for a description of the soils, geology, and groundwater at that site.

## 4.4 BIOLOGICAL RESOURCES

Biological resources include vegetation, fish and wildlife, special status species, and sensitive habitats that are known or likely to occur in the vicinity of the proposed dredge area and the reuse/disposal sites. Each location is addressed in a separate subsection below. For each location, study methodologies and other sources of information are provided. Information has been organized by habitat or taxonomic group where appropriate to improve readability. Each subsection includes a separate discussion of special status species that may occur at the site, including state- and federally-listed, proposed, and candidate threatened and endangered species; other legally protected species (e.g., marine mammals); other state- and federally-recognized species of concern; and plants considered rare and endangered by the California Native Plant Society (CNPS).

### 4.4.1 Proposed Dredge Area

*Information Sources*

This evaluation is based on biological surveys which were conducted for the Port of Oakland during the winter, spring, summer, and fall of 1997; and on the review of pertinent EISs/EIRs, data bases, and other relevant literature. These sources are described below.

Baseline data were collected for biological resources within the Port of Oakland study area during 1997 for this EIR/S. The Port contracted Entrix to conduct a detailed habitat evaluation of the aquatic habitats within the Port and vicinity. A summary of the Final Habitat Evaluation report is presented in Appendix K.2. The Inner Harbor, Middle Harbor, and Outer Harbor were quantitatively evaluated for species diversity (richness) and abundance. The surveys are described briefly below.

*Bird Surveys*

Birds were surveyed in two seasons (winter and summer) throughout the Inner Harbor, Middle Harbor, and Outer Harbor areas of the Port and some immediately adjacent areas (see Appendix K.2). Birds were identified to species and counted separately in multiple habitat types within each site. Habitat types included open water, near shore waters (to 15 feet from shore), at or among pilings, mud/sand tidal edge, small rock tidal edge, and riprap. Species totals of all birds counted on all surveys within a season were tallied for these site/habitat combinations.

A separate study of the seasonal breeding colony of California least terns at Alameda grounds was conducted to identify specific foraging habitat requirements. The results of this study were used to determine potential impacts to the California least tern (Entrix 1997b).

*Fish and Decapod Crustacean Surveys*

To obtain an adequate representation of the species that reside in or migrate through the habitats represented in the Port and vicinity, three seasonal surveys were conducted, each consisting of 3 weeks of sampling activities. The spring survey was conducted from 15 April through 9 May 1997, the summer survey was conducted from 11 June through 7 July 1997, and the fall survey was conducted from 9 September through 2 October 1997. Surveys were conducted in seven sites that were deemed representative of the habitats to be altered, created, or otherwise affected by the

proposed 50-foot deepening project and the proposed habitat enhancement activities. Seven reference stations were also surveyed. Surveys were conducted at sites in the following locations: the Inner Harbor (two sites), the Middle Harbor (three sites), the Outer Harbor (two sites), Bay Farm Island (two sites), Borrow Pit (two sites), and one site each at Emeryville Flat, Alameda Naval Air Station, Crown Beach, and the adjacent to Bay Farm Island (see Appendix K.2 [Figures K-2, K-3]). Fish and decapod crustacean (shrimp and crab) sampling was conducted with an otter trawl, a kodiak trawl, roundhaul net, beach seine, long-line, hook and line, minnow traps, and hydrocoustic techniques. Crab sampling was also conducted with crab traps. For each site, species data were collected and logged into a data base, including species name, life stage, size, and individuals.

*Benthic Surveys*

Benthic sampling was conducted during each of the seasonal surveys. Transect surveys were conducted in all three seasons the intertidal rocky substrate habitat in the Middle Harbor. Inner Harbor was only surveyed in spring and summer, due to fall season tide conditions. The condemned pier at the Naval Supply center and the finger pier directly north of it were selected for concrete piling habitat surveys. Deep benthic (infaunal) sampling was restricted to the Middle Harbor deep dredged habitat and the Borrow Pit deep dredged habitat because these sites are not subject to the periodic maintenance dredging that occurs at other deep dredged sites within the Port facilities. Other infaunal sampling sites included eelgrass beds, shallow soft substrate habitat, and the intertidal soft substrate habitat sites. For each site, species data were collected and logged into a data base including species name (or lowest practical taxon) and counts. Additional, non-quantitative visual surveys were conducted in subtidal rocky substrate habitat and eelgrass bed habitat.

In addition to the data obtained through the above surveys, recent EIRs and EISs (COE and Port of Oakland 1994; LTMS 1996; U.S. Navy 1997d,e) were consulted for additional information on potentially affected areas.

***Physical Setting***

The eastern San Francisco Bay naturally consists of shallow flats formed by silt and clay sediments carried from the Delta. The underlying sediment in this area consists of Merritt Sands, which are coarse and compacted. A variable layer of silty mud (Bay mud) has covered the Merritt Sands in many areas. Much of this sedimentation occurred during the Gold Rush era during the 1840s and 1850s; however, an equilibrium appears to exist at present, with annual cycles of moderate erosion and sedimentation (Krone 1979). When the Harbor is dredged, the overlying fine sediments are removed and the Merritt Sands are re-exposed. As a result, the benthic community in the area is very dynamic with the alteration of the substrate from silty mud to coarse sand to silty mud as more sedimentation occurs. Figure 4.4-1 illustrates the various substrates encountered in the Port.

The vertical boundaries of the dredge area are from the high tide line to 44 feet deep with respect to mean lower low water (MLLW) in the maintained channels. The habitat types discussed in the benthic and fish community sections below have been delineated by a combination of depth and substrate. As a result of these distinctions, the following habitats were recognized: Deep Dredged (>20 feet deep), Shallow Subtidal Soft Substrate (< 20 feet deep), Intertidal Soft Substrate, Intertidal Rocky Substrate, Concrete Piling, and eelgrass bed. Figure 4.4-1 illustrates the division of habitats described. The following is a brief overview of the major characteristics of the project area; a more detailed discussion of the inhabitants appears in subsequent sections.

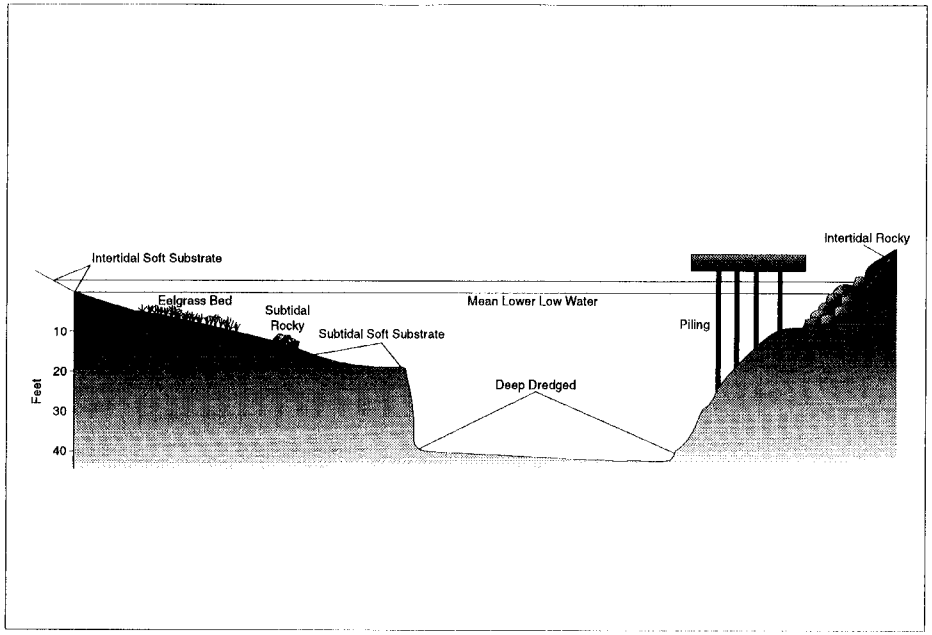



**Figure 4.4-1**

**IDEALIZED CROSS-SECTION VIEW OF THE HABITATS SURVEYED DURING THE AQUATIC STUDIES**

The harbor is situated in South Bay, but near enough to the marine influences of Central Bay that published, broad descriptions of water quality may not be well-tailored to the local conditions. For example, Cloern et al. (1985) describe a South Bay channel habitat as having average transmissivity of 27 percent per meter. By contrast, MEC (1997) reported transmissivity of 40 percent per meter within the harbor. Observations by Entrix during the spring, summer, and fall of 1997 indicate the harbor area was always less turbid than the surrounding unprotected shoals. This difference in water clarity of 40 percent vs. 27 percent, computed over a 10-meter (33-foot) water column results in 50 times more light reaching the bottom. Temperature and salinity ranges measured by Entrix (1997) were 13.8°C to 23.5°C and 20 ppt to 33 ppt, respectively, indicating a substantial modification of marine conditions (generally less than 15°C, and more than 32 ppt in the Gulf of the Farallons).

Minimal waves and spray in this protected embayment limit upper intertidal organisms to slightly below the high tide line. With two exceptions, this habitat primarily consists of riprap with coarse-grained sand to fine gravel interspersed among the rocks. One exception in the Inner Harbor is the training wall, which consists of large rocks that fit tightly together with minimal crevices for sand or gravel to settle. The other exception, in the Outer Harbor, is the gravel beach located at the western end of the area. The hard substrate (riprap and training wall) provides habitat for sessile organisms such as barnacles and limpets. The crevices between the rock riprap provide habitat for a variety of small crabs and bay mussels. In most areas of both the Outer Harbor and the Inner Harbor, the riprap, which holds the fill that the facilities are built on, continues down to the deep water. Near the bottom, rock habitat becomes altered by the sedimentation covering the rocks.

Piers and docking areas built on pilings are interspersed through the Inner Harbor and predominate the water's edge in the Outer Harbor. These structures provide habitat for a "fouling" community that has much in common with the rocky intertidal inhabitants (Appendix K.2). The predominant organisms include bay mussels, barnacles, hydroids, entoprocts, and tunicates.

A shallow subtidal area (0 to 20 feet deep) exists in the Outer Harbor and near the approach of the Inner Harbor. This area consists of a muddy/sandy shoal. The soft sediment provides a very different habitat than the rocky intertidal high-tide region of the Port. Entrix's recent habitat evaluation report indicates that these areas have the greatest species richness. This area provides habitat for a diverse group of macroinvertebrates and fish.

The deep-dredged area is composed of soft sediment ranging from 20 feet to a maintained depth of about 44 feet MLLW. The substrate is soft sediment and the aquatic community resembles that of the shallow subtidal minus a few species of gobies, perch, decapods, and other miscellaneous species that have significantly lower abundance in the deeper channels.

In summary, the affected aquatic environment is characterized by deep-dredged channels bordered by mud/sand shoals and a rocky shoreline. The overall habitat diversity is relatively high because it has both marine and estuarine characteristics and has a large depth range (LTMS 1996). Additional detail on major groups of organisms and special status habitats and species is provided in the following subsections.

### *Biological Communities*

*Plankton Community*

Oakland Harbor, situated near the northern limit of "South San Francisco Bay," is expected to have planktonic elements in common with both the South Bay and Central Bay. Long-term studies of plankton community composition have not been reported for either water body, but a recent summary by Herbold et al. (1992) brings together much of the work that has been done.

Phytoplankton are an important part of the base of the food chain in most water bodies. Alpine and Cloern (1988) showed that phytoplankton production in the nutrient-rich waters of the South Bay can be limited by turbidity when the mixed zone depth is deeper than the photosynthetic depth, a condition that is thought to be common only in the deeper channels. Interpretation is somewhat difficult because of the importance of benthic diatoms (Nichols and Thompson 1985), which can be suspended by wave activity and contribute to water-column production in shallow areas. Due to the movement of materials through the Central Bay from adjoining subembayments (South Bay and San Pablo Bay) and the ocean, the Central Bay can be expected to show different patterns than each of the neighboring areas. The differences in the interannual variability of hydrologic conditions in each embayment make the patterns in the Central Bay difficult to predict and analyze (Herbold et al. 1992). The classes of phytoplankton present in the study area include diatoms (Bacillariophyceae), coccolithophores (Haptophyta), dinoflagellates (Pyrrophyta,) silicoflagellates (Chrysophyta), cryptomonads (Cryptophyceae), and green algae (Chlorophyceae) (COE and Port of Oakland 1994).

In the South Bay, dominant spring bloom species include *Cyclotella* species, *Thalassiosira* species, and *Skeletonema costatum*. Diatoms are often less abundant during other times of the year when flagellated algae may be predominate. These flagellated algae include cryptomonads *Chroomonas* and *Cryptomonas*, and the green algae *Pyramimonas*. In the South Bay channels, bacterioplankton production can be a large fraction of phytoplankton production. Protozoan populations can also be significant and form part of a "microbial loop" that represents an alternative trophic input to the zooplankton (Herbold et al. 1992).

Copepods can be the most abundant taxonomic group of zooplankton found in the Bay. The predominant species in the South Bay include *Acartia* spp. and *Oithona davisae* (Herbold et al. 1992). At times, zooplankton components include a variety of fish larvae such as anchovy, herring, gobies, and silversides, as well as various stages of decapod larvae including *Crangon* and *Cancer* and an assortment of larval stages of other macroinvertebrates. Besides these meroplanktonic forms (i.e., species that are planktonic for only part of their life cycle), conspicuous zooplankton include temporary invasions or blooms of large gelatinous forms such as various medusae and ctenophores (Entrix, observations in April and July 1997).

*Benthic Community*

Benthic infauna is an important food source for the aquatic community. Many of the bottom dwelling fish such as white croaker feed on polychaetes and other infaunal species. Many of the benthic organisms found in San Francisco Bay are introduced species, presumably brought in with ships ballast and bait-bucket introductions, such as the clam *Potamorcorbula amurensis* and the recently introduced sea slug *Philine auriformis* (which were quite abundant in the project area). Many introduced species are well adapted to the dynamic conditions in San Francisco Bay. The

result of their success is that the majority of the species currently found in the benthic community are introduced species (Carlton 1979).

The description of the benthic community in the Port of Oakland and vicinity is broken down coarsely by substrate type, since the benthic community in a given location is correlated with the grain size of the substrate in the area. The shallow subtidal and deep dredged areas are predominantly soft sediments and the rocky intertidal and pilings are hard substrate environments.

Samples were not collected in the deep dredged channels of the Inner Harbor and Outer Harbor due to the constant disturbance in the area from dredging and ship traffic. Therefore, it is assumed that the benthic community in this area is unstable due to frequent disturbances.

The shallow subtidal soft substrate community in the Outer Harbor was dominated primarily by crustaceans. A listing of all the animals collected is contained in Appendix K.2 (Table K-1).

Rocky intertidal and pilings in the affected area are inhabited by sessile organisms with marine affinities such as the native Bay mussel, many species of algae, bryozoans, sponges, and tunicates. As indicated by the recent surveys of this area, this habitat (particularly the rocky intertidal) is quite diverse with 50 to 70 species being observed in a single low tide event (Appendix K.2). The species observed in the rocky intertidal at the entrance to the Inner Harbor are listed in Appendix K.2 (Table K-2).

Below the mean low water line, the spaces between rocks were filled with mud. In this area of the rocky intertidal, several species of clams and polychaetes were observed. Because they were surveyed during the rocky intertidal field event, and this habitat was not surveyed by other means, they were included with the hard substrate organisms.

*Fish and Decapod Crustaceans*

Decapods inhabit an ecotone between the benthic and pelagic (open water) communities. As most of the decapods were collected in the recent surveys by methods used to collect fish, they are being included in the fish discussion.

Like the benthic community, the decapods are an important food source for the fishes. Crangon shrimp are common food items for many fishes of the Bay and Delta, including striped bass, American shad, green and white sturgeon, and Pacific tomcod (Herbold et al. 1992).

The summer sampling event indicated a greater abundance of decapods than the spring or the fall. Most notably, the abundance of juvenile Dungeness crabs in the summer increased by orders of magnitude over abundances encountered during spring survey. These abundances then fall off sharply in the fall. The decapods abundant in both areas included: black shrimp, broken-back shrimp, sand shrimp, Dungeness crab, graceful rock crab, Pacific rock crab, and red rock crab. Black shrimp, sand shrimp, Dungeness crab, and red rock crab were also abundant in the shallow subtidal region of the Outer Harbor (Appendix K.2).

A wide variety of fish inhabit the affected environment including estuarine, marine, and anadromous fishes. Among them are various flatfish, surfperch, gobies, sculpin, silversides, pipefish, sharks, and rays. Common flatfish are English sole, speckled sanddab, starry flounder,

and California halibut. Other common bottom fish include bay goby, Pacific staghorn sculpin, white croaker, and plainfin midshipman.

Northern anchovy, a pelagic marine species, occurs year-round. Anchovies serve as an important food source for many fish and bird species such as salmon, halibut, pelicans, terns, and grebes. Pacific herring is also an important forage food. Herring enter the estuary in the winter and early spring to spawn, particularly in rocky areas, along aquatic vegetative covered substrates, and on pilings (COE and Port of Oakland 1994).

Among the dominant species in the deep dredged channel in the Outer Harbor were plainfin midshipman, staghorn sculpin, bay goby, and speckled sanddab, as well as shiner perch and topsmelt. The shallow subtidal areas along the Outer Harbor were dominated by English sole, starry flounder, bay goby, Northern anchovy, and shiner perch (Appendix K.2).

The deep dredged channel in the Inner Harbor was dominated by English sole, bay goby, northern anchovy, speckled sanddab, white croaker, and plainfin midshipman. Pacific tomcod was abundant in both the Inner Harbor and Outer Harbor areas, but only in the spring (Appendix K.2). A list of all fish and decapod crustaceans present in the Inner Harbor and Outer Harbor is provided in Appendix K.2 (Table K-3).

Pacific herring (*Clupea pallasi*) is a commercially, recreationally, and ecologically important fish species that enters San Francisco Bay and other bays in fall and winter to spawn, as summarized in Barnhart (1988). In most years, spawning takes place in Richardson Bay and Raccoon Strait, in west-central San Francisco Bay. Eggs are adhesive and deposited directly onto firm substrates. A favorite spawning substrate is eelgrass, but the alga *Gracillaria* is also frequently used in this bay. Herring will apparently not spawn on muddy bottoms, but are known to deposit eggs on pilings, riprap, and even on sandy beaches (Eldridge and Kaill 1973, cited in Wang 1986). In the 1980s and early 1990s, the main herring schools often spawned on the Oakland and San Francisco waterfronts (personal communication, R. Tasto). It is likely that spawning adults will return in some years to Oakland Harbor. The small eelgrass patch near the U.P. Mole in Middle Harbor may be used by herring, as would the many submerged pilings in this area, but these substrates are of very limited distribution compared to the abundant riprap and pilings throughout the harbor.

The abundant young herring collected in the sampling effort in Oakland Harbor and vicinity in the spring of 1997 (Entrix 1997b) were possibly, but not necessarily, produced from local spawning. Sampling methods were not suited to capturing newly hatched larvae. The fish taken were mostly 30-50 mm juveniles, with some approximately 25 mm postlarvae (Entrix, unpublished data), and therefore one to several months old at the time (as judged by post-hatching sizes in Purcell et al. 1987). Juvenile herring are frequently abundant in widespread areas of San Francisco Bay (Barnhart 1988), and so evidently spread rapidly from spawning centers.

*Aquatic Birds*

A total of 43 bird taxa were sighted during the winter surveys, mostly over open water. By far, the greatest numbers were seen over the Outer Harbor shoal, where thousands of diving ducks (especially scaups and scoter) and hundreds of grebes of various species were counted. The grebes were also abundant in the deep dredged areas (Appendix K.2). A total species list for all birds sighted in the Inner Harbor and Outer Harbor is provided in Appendix K.2 (Table K-4).

During the summer surveys, 27 bird taxa were observed, but only a few hundred individuals, which is less than 4 percent of the number of individuals seen during the winter surveys. Most of the species and over 30 percent of the total birds were seen in the Inner Harbor channel. Western gulls were the most abundant species overall. The highest counts by site were the western sandpiper (the Inner Harbor channel), double-crested cormorant (the Outer Harbor shoal), and western gull (the Outer Harbor channel) (Appendix K.2). Special status aquatic bird species potentially occurring in the study area are discussed in the following section.

*Special Status Species*

Special status species that have the potential to occur in the proposed dredge area and vicinity are listed in Table 4.4-1. None of the species presented in Table 4.4-1 are known to nest or breed in the proposed dredge area, though several species are known to use adjacent areas for nesting activities and are addressed in this section.

**Table 4.4-1. Special Status Species that Have the Potential to Occur within the Proposed Dredge Area and Vicinity**

| Common Name<br>*Scientific Name* | *Status* | *Likely Habitat Use* |
|---|---|---|
| **California seablite**<br>*Suaeda californica* | FE | NL |
| **Winter-run chinook salmon**<br>*Oncorhynchus tshawytscha* | FE / CE | FS |
| **Central California steelhead**<br>*Oncorhynchus mykiss* | FT / CSMS | FS |
| **Double-crested cormorant**<br>*Phalacrocorax auritus* | SSC | FS / FI / R |
| **California least tern**<br>*Sterna antillarum browni* | FE / CE | FS / R |
| **California brown pelican**<br>*Pelecanus occidentalis californicus* | FE / CE | FS / R |
| **Western snowy plover**<br>*Charadrius alexandrinus nivosus* | FT / SSC | FI / R |
| **American peregrine falcon**<br>*Falco peregrinus anatum* | FE / CE | FT / FO / R |
| **California sea lion**<br>*Zalophus californicus californianus* | MMPA | FS |
| **Harbor seal**<br>*Phoca vitulina* | MMPA | FS |

KEY

Status:
- CE = Listed as Endangered under the California Endangered Species Act
- CSMS = California Special Management Species
- FE = Listed as Endangered under the Federal Endangered Species Act
- FT = Listed as Threatened under the Federal Endangered Species Act
- MMPA = Protected under the Marine Mammal Protection Act
- SSC = California State Species of Special Concern

Likely Habitat Use:
- FI = Forages in intertidal aquatic habitats
- FO = Forages opportunistically in various habitats
- FS = Forages in subtidal aquatic habitats
- FT = Forages in terrestrial habitats
- M = Migration route
- NL = Not likely to occur
- R = Roosts or perches within project area

Occurrence at the proposed project site for each of the special status species follows.

Several other special status species were reviewed for this evaluation and are listed in Table L-1 of Appendix L; they are not addressed in the body of this text because they are unlikely to occur within the proposed dredge area or vicinity, as further detailed in that table.

**California seablite** *(Suaeda californica)*. California seablite is a federally listed endangered species. It is a shrub-like succulent perennial member of the goosefoot family (Chenopodiaceae). It occurs in the upper intertidal zone of coastal salt marshes and swamps. It was once found in the salt marshes of several San Francisco Bay counties including: Alameda, Santa Clara, San Mateo and Contra Costa (Appendix L). These Bay Area populations have likely been extirpated by alterations of marsh habitat. The CNPS reports the only extant population of California seablite as occurring in areas of Morro Bay, San Luis Obispo County, California. Although rare plant surveys were not conducted, it is unlikely that California seablite occurs within the proposed dredge area and vicinity due to the lack of suitable habitat. The intertidal habitat within the proposed dredge area consists primarily of steep-sided, riprap armored channel margins.

**Winter-run chinook salmon** *(Oncorhynchus tshawytscha)*. The chinook salmon is recognized to have four distinct breeding populations or races which are unique to the Sacramento-San Joaquin River system. These races are segregated by the seasonality of their spawning activities and include spring, fall, late fall, and winter races or runs. Each race has been afforded its own management status and, currently, only the winter-run chinook salmon is listed by the state and federal government as an endangered species.

Winter-run chinook salmon are anadromous (they migrate from the ocean to upper reaches of rivers to reproduce), and young fish (smolts) migrate downstream to the ocean 5 to 10 months after hatching. There, they spend 2 to 4 years before completing their lifecycle. Winter-run chinook salmon begin their migration from the ocean between the months of November and June (Herbold et al. 1992).

Adult and juvenile winter-run chinook salmon may occasionally stray into the proposed dredge area and vicinity from their migration corridor to the north and may engage in limited foraging activities. However, chinook salmon of any race are rarely encountered in the proposed dredge area. Only two chinook salmon were captured during the 1997 habitat evaluation surveys conducted by Entrix and these were most likely fall-run fish (Appendices K.2 and L). The presence of fall-run chinook salmon in this area is strongly indicative of the possibility that other runs (namely the winter-run chinook salmon) might also use this area to a limited extent.

**Central California steelhead** *(Oncorhynchus mykiss)*. Central California steelhead are listed by the federal government as a threatened species and by the CDFG as a California Special Management Species. Steelhead historically ranged throughout the north Pacific Ocean from Baja California to the Kamchatka Peninsula. Currently, their range extends from Malibu Creek in southern California to the Kamchatka Peninsula (NMFS 1997b). Steelhead are anadromous (they migrate from the ocean to upper reaches of rivers to reproduce), and young fish (smolts) generally migrate downstream to the ocean as 2 year olds. There, they spend 2 to 3 years before beginning an upstream spawning migration. Spawning runs typically occur from December through May. Unlike salmon, steelhead are iteroparous, meaning they are capable of spawning more than once before they die.

Steelhead were not collected within the proposed dredge area during the 1997 habitat evaluation surveys conducted by Entrix (Appendix K.2). They are known to use the San Francisco Bay as a migratory route to and from the ocean and for limited foraging activities, but they are not likely to use habitats within the proposed dredge area to any great extent.

**Double-crested cormorant** *(Phalacrocorax auritus)*. The double-crested cormorant is a CDFG species of special concern. It is a year-long resident along the entire coast of California and is known to frequent inland lakes, fresh, salt, and estuarine waters. It is fairly common within the San Francisco Bay.

Fish comprise the bulk of the double-crested cormorant's diet, while crustaceans and amphibians are known to be taken as food items to a lesser degree. The double-crested cormorant is a diving bird which pursues its prey underwater and can remain submerged for about 30 seconds. It feeds diurnally and is known to roost beside water on offshore rocks, islands, steep cliffs, trees, or manmade structures (wharves, jetties, bridges). Nests are built in similar habitats as those used for roosting with the further requirement that the area be inaccessible by predators and within 8 to 16 km (5 to 10 miles) of a foraging area with a dependable food supply.

Double-crested cormorants are common within the proposed dredge area and vicinity. They have been observed foraging in a variety of habitats and resting upon manmade structures within the Port of Oakland (Appendix L). A large nesting colony, estimated at well over 1,000 individuals during the 1997 Entrix/Biological Field Services bird surveys (Appendix L), exists on the east span of the Bay Bridge. The close proximity of the cormorant breeding colony and the associated high energy demands of chick rearing likely makes nearby open water areas which support a dependable food supply, including portions of the proposed dredge area, important foraging habitat for this species.

**California least tern** *(Sterna antillarum browni)*. The California least tern is listed by the state (CDFG) and federal government (USFWS) as an endangered species and by CDFG as a fully protected species. California least terns are migratory and usually arrive in California in April and May. They feed diurnally, and their diet is likely to consist of anchovy (*Engraulis sp.*), silversides (*Atherinidae*), and shiner surfperch (*Cymatogaster aggregata*). Prey is taken near the water surface after a short plunging dive. Breeding colonies are generally located in abandoned salt ponds and along estuarine shorelines that are relatively free of predators and human disturbance. Nests are arranged in loose colonies on barren to sparsely vegetated substrate (usually sand and gravel) near the shoreline. Nesting colonies typically break up in late July to mid-August.

California least terns are common in the proposed dredge area and vicinity from April to mid-August. A large breeding colony (approximately 210 nests in 1997) is established each year at the western margin of Alameda Island, within the former NAS Alameda and is located approximately one mile to the south of the proposed dredge area. Though least terns are known to forage in the proposed dredge area, surveys conducted by Entrix and Biological Field Services during the 1997 nesting period indicate that foraging activity seems to be concentrated to the south of Alameda Island (Entrix 1997b). These findings are consistent with the findings of previous foraging surveys conducted for the U.S. Navy and Port of Oakland (1997a) and indicate that the proposed dredge area is not likely critical foraging habitat for the California least tern.

**California brown pelican** *(Pelecanus occidentalis californicus)*. The California brown pelican is listed by the state and federal government (USFWS) as an endangered species and by CDFG as a fully protected species. The California brown pelican is found in estuarine, marine nearshore, and

marine pelagic waters along the entire California coast and is known to range inland to the Salton Sea. It breeds in the California Channel Islands from March to early August, and the population is concentrated within 12 miles of those islands. The California brown pelican does not breed in northern California. There, they are most common along the coast from June to November, though individuals have been cited during every month of the year. The maximum breeding population has been estimated at 55,000 to 60,000 pairs (Appendix L) though this number may be significantly lower or higher as population estimates are difficult to obtain. Fish comprise the bulk of its diet, though crustaceans and carrion are known to be taken as food items to a lesser degree.

California brown pelicans are known to forage and rest in the proposed dredge area, but sightings are infrequent, as most of the foraging is concentrated in the central and western portions of San Francisco Bay (Entrix 1997). The most frequently used pelican roost within the Bay is located on the former NAS Alameda breakwater, approximately 1.5 miles to the south of the proposed dredge area.

**Western snowy plover** ***(Charadrius alexandrinus nivosus).*** The western snowy plover is listed by the federal government as a threatened species and by the state of California as a state species of special concern. This small shorebird typically occupies sandy beaches and intertidal areas of marine and estuarine habitats, but is known to occur in some inland areas. Along the Pacific Coast, snowy plovers are distributed on the mainland and offshore islands from southern Washington to southern Baja California, Mexico. Nests are usually established in sparsely-to non-vegetated areas of sandy beaches and estuaries. Prey items consist of intertidal and supratidal invertebrates, and feeding is diurnal.

Western snowy plovers are known to winter in the San Francisco Bay Area, and an estimated 250 individuals have been recorded in the Bay during the breeding season (Appendix L). However, no snowy plovers were observed within the proposed dredge area during the bird surveys conducted by Entrix and Biological Field Services during the winter and summer of 1997 (Appendix L). This probably reflects the absence of suitable foraging and nesting habitat within the proposed dredge area for this species. Although snowy plovers may forage in the general vicinity, it is unlikely the project area provides critical habitat for this species.

**American peregrine falcon** ***(Falco peregrinus anatum).*** The American peregrine falcon is listed by the state and federal government as an endangered species. Distribution is throughout North America and within a wide variety of habitats. Prey items typically consist of other bird species, though mammals, insects, and fish are known to comprise a portion of its diet. The American peregrine falcon typically breeds near wetlands, lakes, rivers, or other water bodies and establishes its nests on high cliffs, banks, dunes, mounds, or man-made structures.

American peregrine falcons are known to reside (as breeding pairs) and winter (as migratory individuals) in the San Francisco Bay Area. One breeding pair and a nesting female falcon were observed on the western and eastern spans (respectively) of the Bay Bridge during bird surveys conducted in June-July 1997 (Appendix L). One or two of the falcons were observed by Biological Field Services to take California least terns from the NAS Alameda breeding colony adjacent to the proposed dredge area. Peregrine falcons were occasionally observed within the proposed dredge area (Appendix L) during the winter and summer of 1997 and have been observed perching upon Port structures (U.S. Navy and Port of Oakland 1997a). These peregrine falcons and other seasonal migrants are expected to occasionally forage and temporarily perch within the proposed dredge area.

**California sea lion** ***(Zalophus californicus californianus).*** The California sea lion is afforded legal protection under guidelines established through the Marine Mammal Protection Act. These mammals range from Vancouver Island to Nayarit (western Mexico). They are common in California, and are typically found nearshore on the open outer coast, but are also frequent visitors of bays and estuaries. Breeding occurs from Mazatlan, Mexico in the south up to the Channel Islands in California. A few pups are born on islands farther north, including the Farallon Islands (Nowak 1991). Juveniles and adults are known to migrate north from these rookeries as far as Vancouver Island.

The California sea lion commonly forages in the San Francisco Bay and delta and has established regular haulouts at Pier 39 in San Francisco. It has been documented in the proposed dredge area (personal observation, C. Herrala 1997) and is known to occasionally forage in the vicinity. It is unlikely that sea lions use the proposed dredge area to any great extent and this area is not considered critical habitat.

**Harbor seal** ***(Phoca vitulina).*** The harbor seal is afforded legal protection under guidelines established through the Marine Mammal Protection Act. The harbor seal is non-migratory and can be found along shorelines and in estuaries throughout North America, Europe, and Asia. It is generally a solitary animal, though it is known to congregate at regular haul-outs and in breeding colonies. The seal is a fairly common year-long resident in coastal California and within the San Francisco Bay. It has established regular haul-outs at the Castro Rocks near the Richmond-San Rafael Bridge, Corte Madera Marsh, and on lower Tubbs Island in San Pablo Bay (LTMS 1996). Its diet consists primarily of fish, though crustaceans comprise a large component of the diet of newly weaned pups (Nowak 1991).

Harbor seals have been documented in the proposed dredge area (Appendix L) and are known to forage in the vicinity; a harbor seal was observed with a captured adult salmon near the NAS Alameda during July 1997 biological surveys conducted by Entrix (Appendix L). Though the proposed dredge area supports limited foraging activities, it is not considered a critical habitat since it does not support regular haul-out areas or rookeries.

*Sensitive Habitats*

The proposed dredge area supports one sensitive habitat, eelgrass beds (*Zostera marina*). Eelgrass beds have been afforded special management considerations by CDFG, USFWS, NMFS, and the Golden Gate Audubon Society (Entrix 1995). They have also been the subject of several restoration and rehabilitation efforts (Thayer 1984) because they are generally regarded as a highly productive habitat that supports a rich assemblage of fish species. Eelgrass habitat typically provides a refuge area for larval and juvenile fishes (Hoffman 1986) and supports foraging activities for birds and other animals; however, the recent habitat evaluation studies conducted by Entrix (Appendix K.2) did not establish a significant difference in species composition, species richness, or abundance between this habitat and other shallow subtidal habitats within the vicinity of the proposed dredge area. Fish assemblages between habitats displayed a high degree of overlap, with the exception that Bay pipefish and black perch were generally more abundant within the eelgrass bed habitat.

Eelgrass is a flowering grass-like plant with both perennial and annual populations. Perennial plants propagate primarily through vegetative growth, extending rhizomes (lateral roots) through the substrate to form new shoots and, as a result, help to stabilize and bind sediments; annuals

propagate primarily through seed dispersal at the end of the growing season and germinate the following spring to re-establish the bed.

Eelgrass beds generally occur in shallow (0.0 foot to -6 feet MLLW) subtidal areas with mixed sand and silt substrate (Kitting 1994). Key factors influencing the establishment and persistence of eelgrass beds include substrate, available light, salinity, and temperature (U.S. Navy and Port of Oakland 1997a).

One eelgrass bed is located within the proposed dredge area it is at the western margin of the Union Pacific Mole between the Middle Harbor and the Inner Harbor approaches (Appendix K.2, [Figure K-3]). It is situated in 2 to 8 feet of water MLLW, is of limited spatial extent (approximately 100 feet by 200 feet), and of patchy distribution and about 10 percent coverage (Entrix 1998).

A second eelgrass bed is thought to be located upon the shoals adjacent the Outer Harbor ship channel at the foot of the eastern approach to the Bay Bridge. Limited sonar surveys and snorkel surveys did not confirm the presence of such a bed (personal observation, C. Herrala). The substrate in this area consists of small boulders and debris interspersed with sand and mud bottom (nearshore) and is not likely to support an extensive or highly productive eelgrass bed. This area is outside the proposed dredge area and is not likely to be disturbed or otherwise directly affected by dredge activities.

Eelgrass is also present off the western tip of the NAS Alameda.

### 4.4.2 Possible Reuse/Disposal Options

***Vision 2000 Upland Area***

The proposed fill area is situated in the eastern-most portion of the Middle Harbor. A portion of the currently maintained dredged aquatic habitat between the former FISCO finger piers would be filled and brought up to grade with the proposed terminal facilities that would be constructed as part of the construction of Berths 55 through 58 which will occur prior to the proposed channel deepening as described in section 1.2. The baseline conditions for this location will be an upland rehandling facility with minimal or no biological resources.

***New Berth 21***

*Aquatic Resources*

The proposed New Berth 21 fill area is situated in the eastern-most portion of the Outer Harbor channel. This is currently a partially enclosed embayment which is surrounded by existing berths 10, 20, and 21, and is of limited utility to the Port of Oakland in its present configuration.

Data on the aquatic communities were collected in the western half of the deep dredged channel and not in the immediate area of New Berth 21. However, since the data were collected close to the proposed berthing area, the existing biological conditions are likely to be similar to the Outer Harbor deep dredged channel and the piling area in the Middle Harbor (section 4.4.1).

*Planktonic Community*

The planktonic community in the New Berth 21 area should be similar to that of the Outer Harbor area, as discussed for the proposed dredge area (section 4.4.1).

*Benthic Community*

As with the species noted on the Middle Harbor pilings, the dominant species in the area include Bay mussels (*Mytilus* sp.), along with a variety of filter feeding macroinvertebrates that are also found in the rocky intertidal. A complete listing of all the species observed is in Appendix K.2 (Table K-6, in the Middle Harbor Benthic Community section). The benthic community in the Outer Harbor deep dredged area was not sampled due to high levels of frequent disturbance. Because of the frequent disturbance, the benthic community in that area is considered unstable.

*Fish*

Examples of high abundance fish species, averaged over the three sampling periods in the deep dredged channel include plainfin midshipman, staghorn sculpin, bay goby, and speckled sanddab, as well as shiner perch and topsmelt. Northern anchovy experienced a high abundance in spring, low in summer, and rebounded to a strong presence in fall. Fish abundance, averaged over the three sampling periods, was highest in summer. The overall diversity of the fish in the deep dredged channel is not as great as in the shallow subtidal.

*Aquatic Birds*

The winter and summer bird surveys conducted in the Port had a site which had basically the same footprint as the proposed New Berth 21 location. In the Habitat Evaluation Report (summarized in Appendix K.2), these data were not included because it did not overlap with the aquatic habitat sites, but it was included in the database. A special query was performed to provide the bird results presented here.

As mentioned in the previous discussions of the Outer Harbor, the birds were significantly more abundant in the winter than in the summer. Dominant birds in the area include California and western gull; American coot; horned, western and Clark's grebes; and surf scoter. In the summer, the dominant birds were gulls, surf scoter, and barn swallow. In the winter, only two barn swallows were observed.

*Special Status Species*

Only one special status species, the double-crested cormorant, was documented within the proposed New Berth 21 area during biological surveys conducted by Entrix in 1997 (Appendices K.2 and L). The double-crested cormorant was observed resting upon pilings in 6 of the 12 sightings documented over two seasonal surveys and was observed over open water within the disposal site in the remainder of the 12 sightings. Although the double-crested cormorants use the proposed New Berth 21 area, usage is low even though a large breeding colony is established on the adjacent Bay Bridge. The proposed New Berth 21 area is not thought to provide critical habitat to double-crested cormorants because it is a highly trafficked, industrialized embayment which presents marginal open water habitat that is relatively isolated from the surrounding Bay. Because of its relative isolation, it is not likely to support a highly productive fish fauna (the primary forage

for double-crested cormorants) on a regular or sustained basis. In other respects, the discussion of special status species in section 4.4.1 is applicable to this site as well.

***Middle Harbor Enhancement Area***

*Plankton Community*

For a discussion of the planktonic community, refer to the discussion in section 4.4.1.

*Benthic Community*

The benthic habitat sampled in the Middle Harbor included coarse grain beach, shallow subtidal, pier pilings, and deep dredged channel. The habitat descriptions are the same as those for the Inner Harbor and Outer Harbor (section 4.4.1). Considering the dynamics of the Bay infaunal populations, the trends in dominant taxa can vary from year to year. For example, Entrix (1989) documented a 98 percent infaunal species dissimilarity between years 1988 and 1989 in a 2-year benthic study in San Pablo Bay.

The Berth 55-58 project will alter the existing habitat observed during the 1997 habitat evaluation sampling. The piling habitat will be removed and in its place will be a containment dike with a gradual slope of sandy material along the upper slope down to approximately 7 feet below MLLW, and a steeper engineered slope below that depth. Therefore, the new habitat may be similar to what was observed on the sandy beach habitat in Middle Harbor.

There were 14 taxa observed in the sandy beach habitat which is slightly higher than other similar beaches in the area (6 at Emeryville Flat/3 at NAS Beach). A small subset of the samples taken were identified to the species level. Some of the species observed included: the polychaetes *Eteone californica* and *Lumbrineris* sp., the amphipod *Corophium insidiosum*, and the bivalve *Gemma gemma* (Appendix K.2). In the shallow subtidal, the number of species found was slightly greater than that observed in the same habitat in the Outer Harbor. Some of the species included the polychaetes *Eteone californica* and *Glycinde polygnatha*, the amphipod *Corophium heteroceratum*, and the bivalve *Potamocorbula amurensis*. Eight taxa were observed in the deep dredged channel in the Middle Harbor (Appendix K.2, Table K-5).

A large portion of piling habitat that existed during 1997 will be removed as part of the Berth 55-58 project; however, pilings may remain at both Point Arnold and Port View Park in Middle Harbor. Pilings sampled in the Middle Harbor were dominated by Bay mussels (*Mytilus* sp.). This unnatural habitat is unusual in the Bay in that it provides filter-feeding macroinvertebrates access to water relatively free of suspended sediment. Associated with the mussels is a "fouling" community that has much in common with the invertebrate of the rocky intertidal. Of the 24 or so species identified from pile scrapings only three, the hydroid *Obelia*, the entoproct *Barentsia*, and the tunicate *Botryllus*, were not noticed in the riprap surveys (Appendix K.2, Table K-6).

As part of the benthic survey sampling efforts in Oakland's Middle Harbor, a Sediment Profile Imaging (SPI) survey was conducted in May, 1997 to delineate sediment type and biological community characteristics (EVS 1998). A total of 55 stations were sampled (photographed) over a two-day field effort: 35 stations were located in Middle Harbor, 7 stations along the Oakland Outer Harbor berths, 5 stations in the Upper Dog Leg area, 6 in the vicinity of Bay Farm Island, and 2 at Crown Beach. The purpose of the survey was to document existing benthic habitat conditions in the vicinity of Middle Harbor and at existing eelgrass beds (Bay Farm Island, Crown

Beach) so that the potential benefits of the proposed Middle Harbor Habitat Enhancement could be more thoroughly assessed. This analysis focuses on the results from Middle Harbor only.

Findings of the SPI survey in Middle Harbor are similar to those of surveys in other nearshore urban estuaries (EVS 1996; Valente et al. 1992). Most of the area is characterized by fine-grained sediments with relatively high water content. While a few stations showed pockets of organic enrichment as darker sediments at depth, indicating a high sediment-oxygen demand, the pervasive low organism sediment index found throughout the site correlated with the relatively shallow mean apparent redox potential discontinuity depths and early infaunal successional stages also found throughout the site. The numerous storm-drain outfalls located in Middle Harbor and adjacent slips (EVS 1998), combined with the vessel traffic associated with this area, result in frequent disturbances, which are reflected in the sediment profile images. While the images from the main navigation channel showed evidence of sediment transport (surface ripples) either from bottom currents during tidal exchange or from propeller wash, the images collected in Middle Harbor showed no evidence of recent erosion or sediment transport.

Except for the images collected from the shallow subtidal habitat just off the UP mole, the images from the harbor indicate areas with relatively low faunal densities and diversity; these indications are confirmed by the results of the more quantitative habitat evaluation done in this area as part of the habitat restoration studies (Entrix 1997b). As far as benthic habitat resources value, the present conditions in the deeper portions of Middle Harbor are just one step above an azoic bottom and do not appear to hold much value as a supporting habitat for higher trophic levels. Overall, the SPI evidence indicates that the habitat quality of Middle Harbor is typical for a nearshore, fine-grained-bottom, urban, industrial harbor: low shear-strength muds showing low biological diversity and low faunal abundance, with early successional stage communities concentrated at or near the sediment-water interface. The observed conditions in the shallow-water bottom just off the UP mole suggest that the habitat value in Middle Harbor will only improve by restoring this area to its original shallow subtidal setting.

*Fish Community*

Fish in the Middle Harbor were sampled in conjunction with the sampling events in the Outer Harbor, as discussed previously (section 4.4.1). Three habitats were sampled: sandy beach, shallow subtidal, and deep-dredged channel. The sandy beach held the highest number of fish taxa in summer with topsmelt being the dominant species over all three seasons. After top smelt the dominant species in spring was staghorn sculpin, in summer it was dwarf surfperch, and in fall it was arrow goby. These data indicate that, aside from top smelt, the predominant species vary from season to season.

The shallow subtidal habitat was inhabited predominantly by speckled sanddab, northern anchovy, bay goby, and English sole in the spring. The abundance of speckled sanddab was significantly higher than in any of the other sites during both surveys. In the summer, the fish abundance in the shallow subtidal appeared to be less than in the spring. The same species were abundant with the exception of the decline in northern anchovy and an increase in shiner perch. In the fall the dominant species are bay goby, northern anchovy and shiner surfperch. The species composition in summer and fall were similar; however, the abundance of bay goby and shiner surfperch was greatest in the summer. The abundance of northern anchovy was greatest in the fall.

The most abundant fish in the deep dredged channel in the Middle Harbor was the bay goby followed by plainfin midshipman, white croaker, and starry flounder. Bay goby and plainfin midshipman were more abundant in this area than at any other site sampled during the summer. In the fall starry flounder was the most abundant behind bay goby; however the starry flounder was present in spring and summer, but not in high numbers. White croaker was more abundant in the Middle Harbor deep-dredged channel than in other sites. A complete listing of the species collected is provided in Appendix K.2, Table K-7.

*Aquatic Birds*

Grebes and gulls were the most abundant birds in the Middle Harbor during the winter. Grebes were more abundant in this area than in any of the other observation areas with the exception of the Outer Harbor shoal area. Gulls were more abundant in the Inner Harbor deep dredged channel.

Less than 60 birds total were observed in the Middle Harbor during the summer. The dominant species included the western gull and the rock dove. Only one additional rock dove was observed outside the Middle Harbor, and it was sighted over the deep dredged channel of the Inner Harbor. All birds observed in the Middle Harbor were also sighted in one or more other locales of the project area.

*Special Status Species*

Refer to section 4.4.1 for a general discussion of special status species that may occur in Oakland Harbor. The double-crested cormorant, California least tern, and a chinook salmon (most likely a fall-run fish; see discussion in section 4.4.1) were documented within the proposed MHEA during surveys conducted in the winter, spring, summer, and fall of 1997 (Appendices K.2 and L).

Double-crested cormorants were documented resting on pilings and over open water during the above mentioned surveys. The close proximity of a large breeding colony which was established on the east span of the Bay Bridge during the 1997 breeding season likely makes this important foraging habitat for this species, as they generally rely upon productive open water foraging areas, such as exists in the MHEA, that are within 5 to 10 miles of established rookeries.

Only five sightings of the California least tern were documented within the MHEA during the winter and summer bird surveys of 1997 (Appendices K.2 and L). Though a large breeding colony (see discussion in section 4.4.1) is located approximately 1 mile south of the proposed MHEA, the 1997 field surveys revealed that foraging activity seems to be concentrated to the south of Alameda Island (Appendix L). This conclusion supports findings of prior foraging surveys conducted for the U.S. Navy and Port of Oakland (1997a), and indicates that the proposed MHEA is not likely a critical foraging habitat for the California least tern and affords only limited foraging opportunities.

The winter-run chinook salmon and Central California steelhead, though not documented as using the proposed enhancement area during the above mentioned biological surveys, are likely to occasionally stray from their migration corridor and to occasionally use portions of the proposed enhancement area for limited foraging activities. This is not deemed critical habitat for winter-run chinook salmon.

The American peregrine falcon and the California brown pelican were not documented in the proposed habitat enhancement area during the 1997 biological surveys, but were documented using adjacent areas for foraging and roosting and are, therefore, likely to use portions of this area on an intermittent basis. Transient occurrence of Central California steelhead in the proposed enhancement area is also possible.

***Former NAS Alameda***

The sediment stockpiling facility would be located at the north-west corner of the former NAS Alameda adjacent to existing runways 7 and 13 and, as proposed, would consist of a dewatering cell and a stockpile area. The site is adjacent to the Oakland Inner Harbor (described in section 4.4.1).

*Terrestrial Vegetation and Wildlife*

NAS Alameda is located on Bay fill. The area that would be used is bordered on the north by the Oakland Inner Harbor (described in section 4.4.1). The waterfront area consists of rock breakwaters and riprap that are devoid of vegetation, but provide perching sites for waterbirds. Interior areas where the dewatering cell and stockpile site would be located are either developed or consist of mowed grassland dominated by non-native annuals.

Grassland areas on NAS Alameda provide nesting and foraging habitat for a variety of grassland birds. Species reported to nest in the vicinity include northern harriers, killdeer, horned larks, and burrowing owls (reference to be provided). Mourning doves, black-tailed hares (*Lepus californicus*), and California ground squirrels (*Spermophilus beechyi*) are also present and are preyed upon by red-tailed hawks, northern harriers, peregrine falcons, white-tailed kites, American kestrels, and other avian predators.

*Sensitive Habitats*

Eelgrass beds are located in the shallow waters off the west end of the site and provide a productive habitat for fishes and invertebrates which, in turn, provide food resources for diving birds that include double-crested cormorants, California least terns, and California brown pelicans.

The paved airfield south of the stockpile is also a sensitive habitat by virtue of the fact that it supports a large nesting colony of California least terns (see below).

*Special Status Species*

Special status species known to occur at the proposed sediment stockpiling facility at the former NAS Alameda or vicinity are listed in Table 4.4-2. Specific information on the conservation status, distribution, abundance, seasonality, and life history of the winter-run chinook salmon, central California steelhead, double-crested cormorant, California least tern, California brown pelican, Western snowy plover, American peregrine falcon, California sea lion, and harbor seal is presented in section 4.4.1. Specific occurrence and likely habitat utilization within the proposed stockpiling facility for each of these species is described below.

The winter-run chinook salmon and central California steelhead may occasionally forage in waters adjacent to the proposed stockpiling facility on a limited and seasonal basis.

Double-crested cormorants are known to nest on the nearby Bay Bridge understructure and the close proximity of this nesting colony (less than 3 miles) probably makes waters adjacent to the proposed stockpiling facility an important foraging habitat.

A large California least tern nesting colony is established on the airfield approximately half a mile to the south of the proposed stockpiling facility. In recent years the Navy has protected this area from disturbance and limited predator access by fencing. The dewatering/stockpile area is likely to be overflown and could be used by terns for resting. Based on the 1997 Entrix study (Appendix L, Biological Assessment — Executive Summary), the Inner Harbor waters immediately adjacent to the site account for 4 percent of the least tern foraging around NAS Alameda.

California brown pelicans have established a large roost on the former NAS Alameda breakwater approximately 1.25 miles to the south of the stockpiling facility and are likely to roost nearby.

**Table 4.4-2. Special Status Species that have Potential to Occur within the Proposed Former NAS Alameda Disposal Site and Vicinity**

| *Common Name* | *Scientific Name* | *Status* | *Likely Habitat Use* |
|---|---|---|---|
| Winter-run chinook salmon | *Oncorhynchus tshawytscha* | FE / CE | FS |
| Central California steelhead | *Oncorhynchus mykiss* | FT | FS |
| Double-crested cormorant | *Phalacrocorax auritus* | SSC | FS / FI / R |
| California least tern | *Sterna antillarum browni* | FE / CE | FS / R / N |
| California brown pelican | *Pelecanus occidentalis californicus* | FE / CE | FS / R |
| Western snowy plover | *Charadrius alexandrinus nivosus* | FT / SSC | FI / R / N |
| American peregrine falcon | *Falco peregrinus anatum* | FE / CE | FT / FO / R |
| California horned lark | *Eremophila alepstris actia* | SSC | FT |
| Northern harrier | *Circus cyaneus* | SSC | FT |
| Burrowing owl | *Speotyto cunicularia* | FSC / SSC | FT |
| Alameda song sparrow | *Melospiza melodia pusillula* | FSC / SSC | FT |
| Merlin | *Falco columbarius* | SSC | FT |
| Loggerhead shrike | *Lanius ludovicianus* | FSC / SSC | FT |
| California sea lion | *Zalophus californicus californianus* | MMPA | FS |
| Harbor seal | *Phoca vitulina* | MMPA | FS |

KEY

Status:
- CE = Listed as Endangered under the California Endangered Species Act
- CSMS = California Special Management Species
- FE = Listed as Endangered under the Federal Endangered Species Act
- FSC = Federal Species of Concern
- FT = Listed as Threatened under the Federal Endangered Species Act
- SSC = California State Species of Special Concern
- MMPA = Protected under the Marine Mammal Protection Act

Likely Habitat Use:
- FI = Forages in intertidal aquatic habitats
- FO = Forages Opportunistically in various habitats
- FS = Forages in subtidal aquatic habitats
- FT = Forages in terrestrial habitats
- M = Migration route
- NL = Not likely to occur
- R = Roosts or perches within project area

The western snowy plover was observed nesting within the California least tern colony during the early 1980s; however, neither the least tern colony nor the proposed stockpiling facility is designated critical habitat for the western snowy plover.

American peregrine falcons are known to forage in the grasslands and ruderal areas between the runways of the NAS Alameda and have been observed to take least terns at the adjacent NAS Alameda nesting colony (Appendix L).

California sea lions and harbor seals are known to occasionally forage in waters adjacent to the proposed stockpiling facility.

Additional special status species that are reported to occur at the stockpiling facility and vicinity include the California horned lark, northern harrier, burrowing owl, Alameda song sparrow, merlin, and loggerhead shrike. As these species have not been previously addressed, a brief account of the conservation status, distribution, abundance, seasonality, life history, and occurrence at this site is included in Appendix K.2.

*San Francisco Deep Ocean Disposal Site (SF-DODS)*

*Plankton Community*

Based on various studies performed along the central California coast and Gulf of the Farallones, phytoplankton expected to be present within the ocean disposal area include various diatoms, coccolithophores, dinoflagellates, and silicoflagellates (Hatfield 1983; Tasto et al. 1981; and Bence et al. 1992) as reported in EPA (1993a). Abundances and productivity are expected to be lower in the vicinity of the ocean disposal area, which is located in deep waters along the continental slope and rise, than in shallower nearshore waters. Diatoms that have been observed off the California coast and that tend to bloom during upwelling events include *Chaetoceros* sp. and *Rhizosolenia* sp. Dinoflagellates such as *Ceratium* sp. and *Peridinium* sp. are predominant during non-upwelling periods.

Zooplankton serve as an important food source for various organisms including other zooplankton, squid, fish, seabirds, and marine mammals. Zooplankton are divided into two types: holoplankton (i.e., organisms that are planktonic throughout their life span) and meroplankton (larval stages of crabs and fish [ichthyoplankton]). The former includes various copepods (e.g., *Calanus* sp., *Neocalanus* sp., *Eucalanus* sp., and *Acartia* sp.), arrow worms (chaetognaths such as *Sagitta* sp.), and salps (Thaliaceans such as *Thalia democratica* and *Doliolum denticulatum*). Pelagic mollusks likely to be present include the gastropods *Limacina helicina, Clio pyramidata,* and *Corolla spectabilis.*

Meroplankton within the area include fish larvae, such as rockfish larvae, which are most likely to have high abundances in winter and spring, and immature stages of crabs (*Cancer* sp. *zoeae*).

The National Marine Fisheries Service (NMFS) conducted monitoring surveys of pelagic species including zooplankton at SF-DODS periodically during 1996 (EPA 1998a). During the first survey (February/March), zooplankton, including the small early life stages of planktonic fish, were collected during daylight hours. Larger juvenile fish and euphausiids were collected at nighttime. Similarly, during the survey conducted in June 1996, zooplankton were collected during daylight hours and pelagic fish and macroinvertebrates were collected at night. Abundances of zooplankton tended to be higher inside the disposal site relative to the surrounding area. However, the abundance and distribution of zooplankton in the area appeared to be more influenced by region-wide oceanographic conditions (e.g., temperature, salinity) than by disposal of dredged material at the disposal site.

*Benthic Community*

Surveys were conducted in 1990 and 1991 in the vicinity of the SF-DODS for the EPA's LTMS program Ocean Studies Plan for dredging and disposal (EPA 1993a). This study area is located along the continental slope and rise, and incorporates the SF-DODS, which is located at depths of 2,800 to 3,050 m at the southwest corner of the chemical munitions dumping area. A total of 385 infaunal species were collected, comprising 48 percent polychaetes, 32 percent crustaceans, 8 percent mollusks, and 12 percent miscellaneous taxa. The taxa tended to be typical of deep-sea infaunal communities, including carnivorous or scavenging aplacophoran mollusks (shell-less, worm-shaped mollusks), tube-dwelling pogonophorans (tentaculate, worm-like, deep dwelling organisms), and detrital-feeding crustaceans such as desmosomatid isopods and tanaidaceans. Densities ranges from 4,970 to 9,870 individuals/$m^2$ in 1990, and from 750 (Station B-5, Alternative Site 5) to 7,540 individuals/$m^2$ in the 1991 survey. Species diversities were also higher in 1990 than in 1991. This study area tended to have lower infaunal densities than shallower areas surveyed. This is consistent with trends of decreasing density with depth in continental slope environments (EPA 1993a; SAIC 1992e; Blake et al. 1987).

Bottom photographs taken within SF-DODS revealed a lumpy bottom near Station B-5 in the 1991 survey, suggesting a local disturbance. This station had the lowest density of benthic organisms observed throughout the survey. The disturbance might be related to a turbidity flow and implies that natural disturbances occur within SF-DODS.

Beam and otter trawl tows were also conducted within the study area in 1991, primarily between depths of 2,300 m and 3,200 m. Although densities were low (range of near zero to 270 individuals per trawl), a total of 95 megafaunal invertebrate taxa were collected, including five previously unknown species. Dominant taxa included sea cucumbers (*Molpadia intermedia* and *Paelopadites confundeus*), brittlestars (*Amphiura carchara*), seastars, and cnidarians (coelenterates).

Monitoring surveys were conducted following disposal of dredged material from Navy base projects and from the Oakland Harbor 42-foot deepening project at SF-DODS (U.S. Navy 1995h and SAIC 1997; summarized in EPA 1998a). In general, sediment vertical profile images indicated that there were smothering impacts at the center of the site, with apparent azoic sediments occurring along the northwest-southeast axis running through the center of the site following the Navy base sediment disposal. However, large organisms continued to feed underneath the dredged material at other locations near the center of the disposal site. In addition, Stage III infauna, which represent a high-order successional stage typically found in low-disturbance regimes, were present at the site center following disposal of the Oakland Harbor sediments. Following these disposal events, the benthic organisms were recolonizing the dredged material, and in the thinner deposits at the flank, were actively bioturbating the material into the ambient sediment. No adverse impacts were expected outside of the site boundary, as deposit thicknesses were less than the 5 cm threshold. Disposal impacts to the benthic infaunal community at SF-DODS are discussed further in section 5.4.3.

*Fish*

Fish trawl surveys were conducted in 1991 and 1992 by the U.S. Navy within a study area that encompassed the SF-DODS disposal site (U.S. Navy 1993a). Fish densities were low in 1991 (e.g., 207/ha), and the dominant demersal (bottom dwelling) species were rattails, eelpouts, and morids such as finescale codling (*Antimora microlepis*). These species were also dominant in 1992. Mesopelagic and bathypelagic (midwater) fish collected during the surveys included lantern fishes, deep-sea smelts, hatchetfishes, and viperfishes. Among the commercially valuable fish

collected were juvenile shortbelly and yellowtail rockfish (*Sebastes jordani* and *Sebastes flavidus*, respectively), boccacio (*Sebastes paucispinis*), rex sole (*Glyptocephalus zachirus*), and Pacific hake (*Merluccius productus*). Adult Pacific hake and Pacific herring (*Clupea harengus*) were also collected within the study area.

During pelagic monitoring surveys conducted by the NMFS in 1996, more pelagic fishes and larger juvenile fish were collected during the nighttime hours relative to daytime hours (EPA 1998a). Abundances of the taxonomic groups of fish in midwater trawls were similar within the disposal site and outside of the site, although juvenile fish species appeared to avoid the area during disposal (USFWS 1998; EPA 1998a). Five fish species were more abundant inside the disposal site than outside the site. Two species, blue lanternfish (*Tarletonbeania crenularis*) and California headlightfish (*Diaphus theta*), appeared to be in better physiological condition in the disposal site (based on dry weight measurements) although, based on otolith growth measurements, Pacific hake appeared to be growing more slowly in the disposal site than at reference locations (USFWS 1998; EPA 1998a). However, there appeared to be a greater influence of oceanographic conditions in the region on the distribution and abundance of fish than impacts associated with disposal of dredged material at the disposal site (EPA 1998a).

*Marine Mammals and Birds*

Several surveys of bird populations were conducted by various groups off the California coast and in the general vicinity of SF-DODS. These include surveys reported in Ainley and Allen (1992) and conducted by the PRBO during April and June 1985-1991, in the general vicinity of the study site, and during July 1991 in the immediate vicinity of the study site. Other surveys occurred during an LTMS program study conducted seasonally between August 1990 and October 1991 (Jones and Szczepaniak 1992).

Table 4.4-3 indicates the relative densities of the most common bird species observed within the study site. The species listed include both migratory species and those that are present year round. Because the study site is located near the Farallon Islands, many species that use the islands as a breeding site may be found foraging near or within the study site. Common species within the study site during the summer included sooty shearwaters, Cassin's auklets, and red-necked phalaropes. The common murre, which breeds in the Farallones, exhibited moderate to high densities within the study area during the spring, but moved to shallower waters closer to shore in the summer (U.S. Navy 1993a). Species such as the red-necked phalarope and Sabine's gulls were observed in the area during migration and as a result tended to be abundant for a relatively short time in the area. Because the study site is located in deeper waters along the continental slope, slope and pelagic species such as the ashy storm petrel and rhinoceros auklet are common within the study area (U.S. Navy 1993a).

Marine mammal surveys were conducted concurrent with the PRBO bird surveys. Up to 27 species of marine mammals including cetaceans (whales, dolphins, and porpoises), pinnipeds (seals and sea lions), and fissipeds (sea otters) were observed off the central California coast in the general vicinity of the SF-DODS (U.S. Navy 1993a). These included both migrant and resident species. The most common cetaceans observed within the site were the Pacific white-sided dolphin and Dall's porpoise (Dohl et al. 1983; EPA 1993a; U.S. Navy 1993a). A gray whale and Risso's dolphin were also sighted within the vicinity of the SF-DODS. Migrating species found off the California coast that may pass through the study area include gray, humpback, minke, and blue whales.

**Table 4.4-3. Densities of Marine Mammals and Key Marine Bird Species within Study Area 5 (EPA 1993a)**

| | STUDY AREA 5 | | |
|---|---|---|---|
| | *A* | *B* | C |
| **Bird Species** | | | |
| Ashy storm-petrel | M | L | N |
| Western gull | L | L | L to M |
| Common murre | M to H | M | N |
| Sooty shearwater | M to H | M | L |
| Cassin's auklet | L to H | M | L |
| Rhinoceros auklet | L to H | L to M | L |
| Pink-footed shearwater | * | N | L |
| Tufted puffin | L | N | N |
| **Cetacean Species** | | | |
| Pacific white-sided dolphin | * | L | L |
| Dall's porpoise | * | N | L |
| **Pinniped Species** | | | |
| California sea lion | * | N | L |
| Northern elephant seal | * | L | N |
| Steller sea lion | * | N | L |
| Northern fur seal | * | L | N |

*Notes:* N = None observed
L = Low density
M = Medium density
H = High density
* = No data collected

*Sources:* Data from A (Ainley and Brockelheide 1990); B (Ainley and Allen 1992); and C (Jones and Szczepaniak 1992).

Pinniped species observed within the study area include the California sea lion, northern elephant seal, Stellar sea lion, and northern fur seal. The California sea lion and northern fur seal are primarily in the vicinity of the SF-DODS during migration and while foraging (U.S. Navy 1993a). The other pinnipeds observed (harbor seal, elephant seal, and Stellar sea lion) breed in the central California coast region.

In order to monitor the effects of dredged material disposal on marine birds and mammals, H.T. Harvey & Associates and the PRBO conducted regional and periodic surveys from November 1995 to September 1996 (EPA 1998a). Regional surveys were conducted concurrent with the NMFS pelagic monitoring cruises (see *Fish*, above), which included transects through the disposal site as well as through adjacent reference areas. In addition, 29 periodic surveys were conducted from tugs that towed scows loaded with dredged material to and from San Francisco Bay and the disposal site. Overall, disposal of dredged material at the SF-DODS did not appear to affect the distribution or feeding behavior of marine birds and mammals. Variations in occurrence of some of the bird and mammal species appeared to be more related to regional climate variations than to disposal of dredged material at the SF-DODS. Dredged material disposal impacts to marine birds and mammals are described further in section 5.4.3.

*Special Status Species*

Special status species known to occur at the San Francisco Deep Ocean Disposal Site (SF-DODS) and vicinity are listed in Table 4.4-4. None of the species presented in Table 4.4-4 are known to

breed at this site, though several species are known to use adjacent areas for nesting and breeding activities and are thus addressed in this section. A detailed account of the conservation status, distribution, abundance, seasonality, life history, and occurrence at the SF-DODS is presented in Appendix K for each of the following special status species because of the unique location of this site and the broadly different life history information associated with species already addressed in the proposed in-Bay dredging and reuse/disposal options. For species previously discussed, the conservation status, life history, and regional abundance is described in Appendix K.

***Winter-run chinook salmon*** *(Oncorhynchus tshawytscha).* Winter-run chinook salmon typically remain nearshore during the ocean phase of their lifecycle, but are known to occasionally range widely and are therefore expected to transit the SF-DODS and vicinity on occasion (Allen and Hassler 1986). Likely use includes foraging and migratory movements associated with changes in food availability. Utilization of the SF-DODS is therefore thought to be intermittent and limited.

***Central California steelhead*** *(Oncorhynchus mykiss).* The distribution and migration patterns of central California steelhead are not well defined for the ocean phase of their life cycle (Barnhart 1986). They are generally believed to use ocean waters over the continental shelf, though they may occasionally range into pelagic waters. Likely use of the SF-DODS is probably limited to foraging and migratory movements associated with changes in food availability. Use of the SF-DODS is therefore thought to be intermittent and limited.

***Double-crested cormorant*** *(Phalacrocorax auritus).* Double-crested cormorants are known to nest and forage at the Farallon Islands. Small (1994) notes that a rookery of approximately 200 individuals is established in the Farallones, and Cogswell (1977) states that the birds nest on Southeast Farallon Island. The double-crested cormorant typically feeds in shallow waters (Zeiner et al. 1990) and is therefore not expected to range as far as the SF-DODS to forage. Occurrence at this site is therefore unlikely.

***California brown pelican*** *(Pelecanus occidentalis californicus).* A large seasonal population of pelicans roosts on the Farallon Islands between the months of July and October and uses surrounding areas for foraging activities. Pelicans are known to range widely when foraging (they regularly occur as far as 109 miles offshore in southern California, Appendix L) and the close proximity of the SF-DODS to the Farallon Islands (approximately 25 nmi west of the Farallon Islands) likely allows the pelican to use portions of the SF-DODS or vicinity for foraging activities as changes in food availability dictate. This site is not deemed critical habitat and foraging activities are not likely to be either sustained or concentrated because the forage (typically anchovies, Pacific mackerel, and Pacific sardine) are not likely to concentrate in this area on a sustained basis.

**Table 4.4-4 Special Status Species that have Potential to Occur within the Proposed San Francisco Deep Ocean Disposal Site (SF-DODS) and Vicinity**

| Common Name<br>*Scientific Name* | *Status* | *Likely Habitat Use* |
|---|---|---|
| Winter-run chinook salmon<br>*Oncorhynchus tshawytscha* | FE / CE | M / F |
| Central California steelhead<br>*Oncorhynchus mykiss* | FT / CSMS | M / F |
| Double-crested cormorant<br>*Phalacrocorax auritus* | SSC | F / R |
| California brown pelican<br>*Pelecanus occidentalis californicus* | FE / CE | F / R |
| American peregrine falcon<br>*Falco peregrinus anatum* | FE / CE | F |
| California sea lion<br>*Zalophus californicus californianus* | MMPA | F |
| Steller (northern) sea lion<br>*Eumetopias jubatus* | FT / MMPA | F |
| Humpback whale<br>*Megaptera novaeangliae* | FE / MMPA | F / M |
| Blue whale<br>*Balaenoptera musculus* | FE / MMPA | F / M |
| Fin whale<br>*Balaenoptera physalus* | FE / MMPA | F / M |
| Sperm whale<br>*Physeter macrocephalus* | FE / MMPA | F / M |

*KEY*

Status:
- CE = Listed as Endangered under the California Endangered Species Act
- CSMS = California Special Management Species
- FE = Listed as Endangered under the Federal Endangered Species Act
- FT = Listed as Threatened under the Federal Endangered Species Act
- MMPA = Protected under the Marine Mammal Protection Act
- SSC = California State Species of Special Concern

Likely Habitat Use:
- F = Foraging
- M = Migration
- NL = Not likely to occur
- R = Roosts or perches within project area

***American peregrine falcon*** *(Falco peregrinus anatum).* American peregrine falcons historically maintained breeding sites on the Farallon Islands. Currently the falcons are relatively rare in the region with no known nesting sites on the Farallon Islands. Approximately five to eight falcons have been observed wintering on the islands in recent years. These birds use the ocean cliffs for perching and feed almost exclusively near the islands on other bird species (LTMS 1996). The American peregrine falcon is not likely to range as far as the SF-DODS for foraging activities, and its presence there is unlikely.

***California sea lion*** *(Zalophus californicus californianus).* The California sea lion is known to use the Farallon Islands as a rookery and for foraging (Nowak 1991). The animal typically forages nearshore and is rarely encountered more than 10 miles out to sea. Therefore, it is not likely to forage within the SF-DODS with any frequency.

***Steller (northern) sea lion*** *(Eumetopias jubatus).* The Steller sea lion commonly forages in waters adjacent the Farallon Islands and, though known to range broadly during non-breeding periods, only one Steller sea lion has been observed near the SF-DODS in recent years (LTMS 1996). The species is not likely to use the site with any frequency.

***Humpback whale*** *(Megaptera novaeangliae).* Humpback whales may use the SF-DODS for limited foraging activities associated with migration to and from summer and wintering areas. They are not thought to use this area on a frequent basis as no sightings were documented in surveys conducted between 1985 and 1991 (LTMS 1996).

***Blue whale*** *(Balaenoptera musculus).* Surveys conducted in the Gulf of the Farallones (adjacent to the SF-DODS) from 1986 through 1988 documented 179 blue whales, the majority of which were sighted in the summer and early fall. Surveys conducted at the SF-DODS in 1990 and 1991 failed to detect any blue whales (LTMS 1996). Blue whales may use the SF-DODS for limited foraging activities associated with migration to and from summer and wintering areas but are not thought to use this area on a frequent basis as no sightings were documented in the above mentioned surveys.

***Fin whale*** *(Balaenoptera physalus).* Fin whales were not observed during surveys conducted in 1990 and 1991 within the SF-DODS (LTMS 1996), but may use the site for limited foraging activities associated with migration to and from summer and wintering areas.

***Sperm whale*** *(Physeter macrocephalus).* The sperm whale is relatively common in the Gulf of the Farallones and four individuals were sighted at the SF-DODS in 1983 (LTMS 1996). They are likely to use the SF-DODS and vicinity with some frequency for both foraging and breeding activities.

***Hamilton Wetlands Restoration***

This description is based in part on the Draft EIS on Disposal and Reuse of the Hamilton Army Airfield (COE 1995a), and a 1-day field investigation and follow-up discussion with the Corps and USFWS to insure common understanding of the proposed use of the site and other available data. Existing biological resources are described for the Hamilton Army Airfield (HAAF) and the Hamilton Antenna Field (also known as the State Lands parcel). Depending upon the ultimate design for the Hamilton Restoration effort, and the volume of material to be used, either or both parcels could receive dredged material from the proposed dredging project.

The HAAF consists of five discrete habitat types that are described in the following sections: grasslands, coastal salt marsh, perimeter drainage ditch, seasonal wetlands, and a mitigation wetland. Wetlands historically covered much of HAAF. Construction of levees along San Pablo Bay and the subsequent draining of historic marshland resulted in the conversion of hundreds of acres of coastal wetland into farmland. Following the establishment of HAAF, portions of the site naturally converted to grassland, while low-lying areas were colonized by wetland vegetation.

The HAAF and State Lands parcel are located on historic tidal salt marsh that had been leveed and drained prior to development. The topography at both sites is fairly level. At the airfield site, construction of the airfield created a nearly flat expanse where ground elevation slopes vary slightly upward to the south and west edges of the airfield. As a result of subsidence at both sites, nearly all of the land now lies below sea level. The State Lands parcel is partially separated from the airfield by an existing levee and includes abandoned communications facilities but is otherwise grassland. Surrounding vegetation on both sites is predominantly ruderal grassland,

including scattered shrubs and some patches of seasonal wetland habitat. Due to the less aggressive drainage practices on the State Lands parcel, larger areas of shallow seasonal wetlands form during the winter rainy season. Drainage ditches constructed along the west edge of the airfield and crossing the State Lands parcel in various locations also support fresh- or brackish-water wetlands.

East of the main levee that protects the airfield and State Lands parcel, the property includes a shoreline band of mid- to upper-intertidal marsh that descends eastward to low-intertidal mudflats. At the foot of the levee abutting this habitat is a narrow zone of transitional habitat that supports a high-marsh community. These habitats are of extreme high value to native plants and animals, including a number of special status species.

Beyond the north and south property boundaries are other diked off areas that remain in agricultural or residential use. At the west end of the airfield property, a 12.5-acre freshwater marsh has been constructed, and bordering scrub and woodland vegetation planted as mitigation for the construction of the airfield's Landfill 26. As a part of the BRAC remediation project, there is a flooded borrow pit near the center of the runway which provides wetland habitat value. This borrow pit was dug to obtain cover material for Landfill 26, and filled with rainwater and probably groundwater.

The grassland community that dominates the project site is characterized by weedy, non-native species that are regionally abundant on agricultural lands and disturbed sites. Over time, this community would be expected to spread into areas formed when old facilities and pavement are removed. This ruderal habitat has lower value to wildlife due to an over-abundance of weeds that provide little cover or food resources, including yellow star-thistle (*Centaurea solstitialis*), ripgut brome, ox-tongue (*Picris echioides*), and black mustard (*Brassica nigra*). Regionally common wildlife species typical of upland grassland habitats have been observed on the site (COE 1995a).

Seasonal wetlands have been mapped by Jones & Stokes as Corps-jurisdictional wetlands habitats within the airfield (COE 1995a). However, a jurisdictional wetlands determination has not been conducted for the State Lands parcel. As a part of the restoration project, the jurisdictional determination will be updated. The seasonal wetland areas generally occur in low spots that are inferred to be seasonally inundated or saturated as a result of surface runoff. They support a greater prevalence of herbaceous wetland species (Reed 1988) than do surrounding areas, but many of the constituent species occur in both wetland and non-wetland habitats.

*Vegetation*

GRASSLANDS. Two types of grassland communities occur throughout most of the unpaved portions of the airfield, on levee slopes, and in the active Petroleum, Oil and Lubricants (POL) site. Annual grassland, dominated by naturalized Mediterranean grasses, is the most widespread grassland community. Fescue grassland, which is dominated by naturalized perennial forage grasses (saltgrass, fescue, coyote bush, and California rose), occurs mostly in low areas around the east and north margins of the air field. Grasslands are actively drained and pumped at the airfield site, and lack seasonal wetland characteristics. However, pumping does not completely prevent flooding. The pump is not adequate under some circumstances, e.g., during extensive rain storms, there has been some flooding on the runway.

COASTAL SALT MARSH. Many of the salt marsh plant communities were once part of San Pablo Bay and have been altered by the construction of the levees. A 65-acre strip of tidal salt marsh occurs

outboard of the levee at the east end of the airfield. A small area of nontidal salt marsh, approximately 0.5 acre, occurs between the northwest end of the runway and Ammo Hill. The isolated pickleweed marsh drains westward into a saltgrass marsh and eventually into a small basin dominated by cattails.

SEASONAL WETLANDS. The Hamilton airfield site has its groundwater actively pumped and drained, and flooding is prevented by the drainage ditches and pumping operations, but shallow ponding may occur briefly following storms. Areas likely to be determined as mostly or entirely seasonal wetlands at the Hamilton airfield include the majority of the low areas throughout the airfield. Though most of these areas are dominated by upland weeds, many of the areas are capable of supporting predominantly hydrophytic vegetation.

DRAINAGE DITCH HABITATS. A drainage ditch surrounds most of the airfield between the perimeter road and the north, east, and southeast levees. The ditch varies in size, but averages approximately 5 feet deep and 25 feet wide. The ditch is lined with concrete for most of its length. It has been periodically cleared of sediment and vegetation. Dominant vegetation between ditch clearing episodes includes alkali bulrush (*Scirpus maritimus*), cattails (*Typha* spp.), and water-plantain (*Alisma plantago-aquatica*).

At the airfield, patches of seasonal wetland vegetation occur where the concrete lining of the ditch is broken, covered with sediment, or absent. Cattail (*Typha* spp.) is the dominant plant in these areas.

MITIGATION WETLANDS. In addition to wetlands that have colonized topographic depressions, approximately 12.5 acres of wetland were created at the northwestern end of the runway to mitigate for the loss of 4.1 acres of wetland at Hamilton during a previous Army remediation effort.

*Wildlife*

GRASSLANDS. At the Hamilton airfield site, the wildlife value of the grassland community is enhanced due to its proximity to oak woodlands and marsh habitats. The taller fescue grassland also provides habitat for many of the species found in the annual grasslands; however, unlike the annual grasslands, fescue grassland is not periodically mowed.

Among the reptiles observed in annual grasslands during field surveys were the gopher snake (*Pituophis melanoleucus*) and western fence lizard (*Sceloporus occidentalis*). Turkey vulture (*Cathartes aura*), red-tailed hawk (*Buteo jamaicensis*), American kestrel (*Falco sparverius*), California quail (*Callipepla californica*), ring-necked pheasant (*Phasianus colchicus*), savannah sparrow (*Passerculus sandwichensis*), and western meadowlark (*Sturnella neglecta*) were among the birds observed in the grasslands. Mammals included black-tailed jackrabbit (*Lepus californicus*), black-tailed deer (*Odocoileus hemionus*), coyote (*Canis latrans*) and raccoon (*Procyon lotor*).

COASTAL SALT MARSH. Among the birds observed in the salt marsh during field surveys were double-crested cormorant (*Phalacrocorax auritus*), great blue heron (*Ardea herodias*), great egret (*Casmerodius albus*), American coot (*Fulica americana*), killdeer (*Charadrius vociferus*), the CDFG Species of Special Concern northern harrier (*Circus cyaneus*), and the federal Candidate San Pablo song sparrow (*Melospiza melodia samuelis*).

Other wildlife observed or expected to occur in the salt marsh at HAAF include raccoon, double-crested cormorant, great blue heron, great egret, American coot, killdeer, northern harrier, and San Pablo song sparrow.

DRAINAGE DITCH HABITATS. The drainage ditches provide habitat for some aquatic reptiles and amphibians that are not known to occur at the Hamilton site, such as the federally proposed endangered red-legged frog (*Rana aurora draytonii*), and western pond turtle (*Clemmys marmorata*). In addition, the grassy banks, brambles, and patches of cattail marsh provide cover and food for many birds and mammals. Barn swallow (*Hirundo rustica*), savannah sparrow, red-winged blackbird (*Agelaius phoeniceus*), lesser goldfinch (*Carduelis psaltria*), house finch (*Carpodacus mexicanus*), and black-tailed deer were observed in the ditch habitats during field surveys. Harriers have been observed foraging along portions of the Antenna Field ditches.

*Special Status Species*

Sixty-nine special status species occur or potentially occur at HAAF based on information obtained from the U.S. Fish and Wildlife Service (1997b), California Natural Diversity Data Base (CDFG 1996), California Native Plant Society (Skinner and Pavlik 1994) and previous environmental documents and field surveys (COE 1989; COE 1995; COE 1996a). Only 13 of the 69 identified special status species occur or potentially occur in areas that may be affected by the actions considered by this project. The remaining 56 special status species were determined to be absent from potentially affected areas based on a review of existing information, including species distributions and habitat and life history requirements, and the results of field surveys (COE 1989; 1995). Special status species that were determined to be absent from HAAF based on the results of field surveys include California red-legged frog, California horned lizard, California suaeda, Marin dwarf-flax, Petaluma popcornflower, fragrant fritillary, Mason's quillwort, soft bird's beak, Point Reyes bird's beak, Sonoma alopecurus, Suisun thistle, and swamp harebell.

Although portions of critical habitats for the marbled murrelet and the winter-run chinook salmon have been designated in Marin County, neither of these habitats are present in the project area and neither would be affected by the proposed action.

SPECIAL STATUS PLANTS. No site-specific assessments have been completed for special status plants on the Hamilton airfield site. Preliminary assessments are based on available information and a brief examination of the habitats in the field at the site. In general, the likelihood of special status plants being present at the site appears to be low. However, the plant species that have the potential of occurring on the Hamilton airfield site are described in Table 4.4-5.

SPECIAL STATUS WILDLIFE. The wildlife species that could be affected by the project are:

CALIFORNIA CLAPPER RAIL. The California clapper rail is a federally and state-listed endangered species. It is a year-round resident of the salt marshes of northern California. California clapper rails have been documented in the salt marsh adjacent to the eastern end of HAAF (COE1996a). Three or four clapper rails were detected in 1994 during systematic surveys (COE 1995a). In addition, the coastal salt marsh bay-side of the eastern levee at HAAF is considered to provide high-quality habitat for this species. As a part of the restoration project, the project sponsor will conduct a clapper rail survey.

SALT MARSH HARVEST MOUSE. This species is found in suitable habitat throughout the San Pablo Bay area and has been documented in the salt marsh adjacent to the southern end of the Hamilton airfield (Schaub 1971). In addition, the coastal salt marsh bay-side of the eastern levee at the Hamilton airfield is considered to provide high-quality habitat for this species. Therefore, based on the presence of high-quality habitat and the documented historic occurrence of the species in the area, we have assumed that salt marsh harvest mice may currently inhabit tidal and nontidal marshes at the Hamilton airfield, including the small, isolated wetland south of the southern levee.

**Table 4.4-5. Hamilton Site: Special Status Plants Potentially Occurring**

| *Common Name/ Scientific Name* | *Status*[a] | *Habitat* | *Proximity to Hamilton Site* |
|---|---|---|---|
| Soft bird's-beak *Cordylanthus mollis* ssp. *mollis* | C1, R, 1B | Coastal salt marsh | San Antonio Creek and Petaluma Marshes |
| North coast bird's-beak *Cordylanthus maritimus* ssp. *palustris* | C2 | Coastal salt marsh | San Antonio Creek and Petaluma Marshes |
| Petaluma popcornflower *Plagiobothrys mollis* var. *vestitus* | C2, 1A | "Valley flats" (seasonal wetlands) | Near Petaluma; last seen 1888 |
| Marin knotweed *Polygonum marinense* | C2, 3 | Coastal salt marsh | Burdell Island, Larkspur |

*Notes:* a. Status definitions:
C1 = Category 1 candidate for federal listing.
C2 = Category 2 candidate for federal listing.
R = Listed as rare under the California Endangered Species Act.
1A = Considered by CNPS to be "presumed extinct in California."
1B = Considered by CNPS to be "rare, threatened, or endangered in California."
3 = Considered by CNPS to be a plant "about which we need more information; to determine appropriate status.

CALIFORNIA BROWN PELICAN. The California brown pelican is a federally and state-listed endangered species. They have been observed near the airfield, but do not breed there (U.S. General Services Administration 1980; COE 1991). They could use the southern end of the airfield for perching or roosting.

CALIFORNIA BLACK RAIL. The California black rail is a state-listed threatened species. This species is found chiefly in pickleweed or tule wetlands and is more often found in tidal sloughs (Grinnell and Miller 1944; Manolis 1978).

In the San Francisco and San Pablo bays of Marin County, black rails breed from Corte Madera Marsh north to Petaluma Marsh (Shuford 1993). The coastal salt marsh is considered high-quality habitat for this species, and they were heard in the airfield salt marsh in 1994 (COE 1995a).

SALTMARSH COMMON YELLOWTHROAT. The saltmarsh yellowthroat is a state species of special concern. This bird has been observed in the woody swamp, willow riparian, and cattail/willow freshwater marsh that occur on the northern and eastern sides of Ammo Hill, adjacent to the project site (Berg-Revoir 1987). The salt marsh on the south end of the runway and Pacheco Pond provides suitable wintering habitat for saltmarsh yellowthroats. None were seen during the 1991 and 1994 field surveys.

SAN PABLO SONG SPARROW. The San Pablo song sparrow is a state species of special concern. Several San Pablo song sparrows were observed along the levee area and in the coastal saltmarsh near the airfield (COE 1995a).

SHORT-EARED OWL. The short-eared owl is a species of special concern in California (Remsen 1978). The coastal marsh at the airfield is suitable breeding and wintering habitat for this owl, and it has been observed near the airfield (U.S. General Services Administration 1980; COE 1991).

NORTHERN HARRIER. The northern harrier is a species of special concern in California (Remsen 1978). The coastal marsh at the airfield is suitable breeding and wintering habitat for harriers. Two harriers were observed foraging in the coastal marsh habitat, and one harrier was observed nesting on the airfield parcel during the 1994 field surveys.

BURROWING OWL. The burrowing owl is a species of special concern in California (Remsen 1978). Burrowing owls nested along the airfield runway and along the levees through 1993 (COE 1991, 1995a), but were not found there during the 1994 field survey.

AMERICAN PEREGRINE FALCON. The American peregrine falcon is federally and state-listed as endangered and forages in open areas, including grasslands and wetlands, in the San Pablo Bay area. American peregrine falcons have been observed migrating across and foraging in the vicinity of HAAF (COE 1997c). However, no suitable nesting habitat occurs in the area and no roosting peregrine falcons have been observed at the site despite numerous biological surveys (personal communication, S. Granholm).

CALIFORNIA RED-LEGGED FROG. The California red-legged frog is Federally listed as threatened and State-listed as a species of special concern and historically occurred throughout Marin County as well as much of the rest of California (Jennings and Hays 1994). Intensive surveys for California red-legged frog have been conducted at and in the immediate vicinity of HAAF, no red-legged frogs have been discovered within five miles of the project (April 1997, LSA Associates prepared for COE Sacramento District). Due to the consistently documented absence of red-legged frogs, as well as the common presence of red-legged frog predators—including bullfrogs, crayfish, bass, and catfish—near to and on HAAF as determined through field surveys, LSA Associates (1997) concluded that California red-legged frog is not present at the airfield and would not be affected by the proposed project.

*Antenna Field*

The Hamilton antenna field consists of grassland, much of which is seasonally inundated and provides seasonal wetland habitat value. As a part of the restoration project, a jurisdictional wetlands determination will be conducted. No site-specific assessments have been completed for special status plants or animals on this site. The vegetation on the Antenna Field is a result of the artificially modified topography and hydrology of the site. None of the vegetation is native to the site. The vegetation on the site is defined in terms of eight types: ruderal herbaceous (97 percent), ruderal scrub (0.29 acre), trees (0.38 acre), dry perennial grassland (0.22 acre), dry pickleweed (0.03 acre), cattail-rush marsh (0.45 acre), deep ditches (1.7 acre), and shallow ditches (2.56 acre). Two additional vegetation types, wet perennial grassland and tidal salt marsh, are present adjacent to the site. No systematic survey has been conducted of wildlife use of the Antenna Field. Casual observations indicate that the site supports a relatively high population of black-tailed jackrabbits and other small mammals, which in turn support a relatively high population of raptors. In general the likelihood of special status plants at the site appears to be low. The patchy distribution

of pickleweed and the small scale of its occurrence suggest that the antenna field is unlikely to provide habitat for the endangered salt marsh harvest mouse. The site also contains substantial wetland and upland areas that provide habitats for shorebirds, raptors, and mammals.

*Montezuma Wetlands Restoration*

The description of biological resources at the Montezuma Wetlands site is based on the Draft EIR/S for the Montezuma Wetlands Project (MWP) (COE and Solano County 1994), and on the USFWS Coordination Act Report to the COE for the Richmond Harbor deepening project (USFWS 1995). Separate sections are provided below for plant communities and wildlife habitats, fisheries, special-status taxa, and special-status communities/habitats.

*Plant Communities and Wildlife Habitats*

About 301 species, subspecies, and varieties of plants occur in the Montezuma Wetlands project area. These plants occur in two broad groupings, separated mainly by their elevation with respect to high tide. An upland community, which is less saline and drier, is primarily located on the hills at the eastern edge of the site and on levees and other fill areas within the site. These areas are dominated by introduced and native species of annual and perennial grasses, and native herbaceous species. A lowland community occupies most of the other portions of the site, principally diked and drained areas below high tide, including areas of permanent and seasonal standing waters, and consists of primarily halophytic and hydrophytic plant species. Predominant halophytic species include pickleweed, saltgrass, and alkali heath.

Within these general groupings is a mosaic of 23 different plant patch types (COE and Solano County 1994). These patch types reflect individual site elevations, levels of salinity and moisture, and cattle grazing pressure. Nearly all of the plant patch types identified presently support some wetland species. Descriptions and a detailed breakdown of patch types present within each phase of the MWP is provided in Appendix K of the MWP Draft EIR/S (COE and Solano County 1994). Most of the Phase I impacted area consists of seasonal wetland dominated by grassland vegetation. Remaining vegetation can be grouped into four cover types (USFWS 1997b): (1) saline basins, which are more permanently flooded than seasonal wetlands and include brackish pond, seasonal pickleweed marsh, seasonal salt grass, and alkali vernal pool patch types; (2) uplands consisting of herbaceous vegetation as well as thickets along levees; (3) non-tidal emergent marsh, including areas of open water and brackish marsh that are established in ditches; and (4) tidal emergent marsh on the outer levee slopes.

Birds that occur at Montezuma Wetlands include waterfowl, shorebirds, raptors, and passerines. Of the 89 species identified at the site in recent surveys, 10 were breeding on site, and 45 were migratory species.

Waterfowl and shorebird use of the Montezuma site is concentrated in saline basins and is generally less than in managed wetlands of the Suisun Marsh to the west, although abundances vary according to whether the season is wet or dry. The most common shorebirds were the long-billed dowitcher, western sandpiper, and dunlin. During wet years, migratory waterfowl such as the northern pintail, northern shoveler, gadwall, and mallard were abundant (COE 1994b; USFWS 1995). Although no threatened or endangered bird species were observed on the Montezuma site, special status bird species were observed at or near the site (e.g., American white pelican, California gull, and burrowing owl). These species are listed and discussed more fully in the MWP EIR/S.

Avian species richness is fairly even across avian habitat groupings, with the greatest number of bird species found in the saline basins and levee thickets. The grassland areas harbor common landbirds such as horned lark, meadowlark, and savannah sparrow. Seasonality of flooding in these areas provides distinctly different habitat types in the wet versus the dry seasons. During the wetter periods, these areas support a large array of raptors, migratory waterfowl, shorebirds, and passerine species.

The quality and wildlife use of seasonal wetlands at the site varies from year to year. In Phase I, which would receive the dredged material from the deepening of the Oakland project, avian surveys conducted during relatively dry water years (1991 and 1992) revealed no aquatic foragers. Standing water in these years was not surveyed, but was likely limited to less than 38 acres (i.e., total of open water brackish marsh, seasonal pickleweed marsh, brackish pond, and alkali vernal pool).

Conversely, at least 150 acres of Phase I grassland displayed shallow flooding in two April 1995 visits to the site by USFWS and COE biologists. Seven separate flooded areas were identified for this phase, ranging from a few to up to 100 acres. Ducks and wading birds were seen using these areas, which appeared to persist long enough to support abundant algal growth and insect forage. Between 700 and 1,500 birds were noted on these occasions; the most abundant species were ducks (pintail, teal, widgeon, gadwall, mallard), and wading birds (dowitchers, least sandpiper, water pipet, and others).

Thickets and scattered riparian vegetation around the perimeter levee of the site (outside the fill boundary) support an array of upland passerine species. Burrowing owls, a state species of special concern, are known to breed on site along the interior levees and drainage canals. Western pond turtles, another State Special Concern species, occur in drainage ditches on the site.

Mammals seen at the site include the California vole, California ground squirrel, coyote, raccoon, striped skunk, black-tailed hare, and Audubon cottontail rabbit. River otters have also been seen adjacent to the site in Montezuma Slough. Several small mammals also exist on site, including the federally listed endangered salt marsh harvest mouse (*Reithrodontomys raviventris*).

*Fish*

A full description of the aquatic community in the project area is provided in the MWP EIR/S (COE and Solano County 1994). The following summarizes information on fish species, several of which are special-status taxa, that are associated with the site.

Because the Montezuma site was diked and drained, it generally lacks permanent water. Consequently, it has little fishery value (USFWS 1995). However, the Montezuma Slough adjacent to the site is an important rearing and nursery area for salmon and striped bass. Twenty species of fish were collected in the Montezuma Slough during trawl surveys conducted by CDFG from 1962 to 1974. The delta smelt (*Hypomesus transpacificus*), a federally listed threatened species, was among the fish captured (CDFG 1975, as cited in USFWS 1995). The smelt enter sloughs and channels to spawn between February and June. Similarly, the Sacramento splittail (*Pogonichthys macrolepidotus*), a minnow, spawns during the same period, and may be found in the sloughs of the Delta, such as Montezuma Slough (USFWS 1995). The splittail is a federally proposed threatened species, and is a California species of special concern. Two other species that are not state or federally listed but that may be considered threatened or endangered (Moyle et al. 1995),

the longfin smelt and green sturgeon, potentially may also be found in the project area, although the green sturgeon tends to prefer smaller river systems (COE 1994b).

*Threatened, Endangered, and Sensitive Species*

Five federally listed endangered species, the bald eagle (*Haliaeetus leucocephalis*), American peregrine falcon, salt marsh harvest mouse, Contra Costa wallflower (*Erysimum capitatum* var. *angustatum*), and Antioch Dunes evening-primrose (*Oenothera deltoides* ssp. *howellii*) may be found in the area (USFWS 1993). Two listed threatened species, the delta smelt and valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*), may also be found in the vicinity. The delta smelt is found in Montezuma Slough as well as the proposed threatened Sacramento splittail (*Pogonichthys macrolepidotus*). The Montezuma Slough may also provide rearing habitat for the winter-run chinook salmon (state and federally listed as endangered).

The salt marsh harvest mouse (state and federally listed as endangered) is found only in saline emergent wetlands of San Francisco Bay. The northern subspecies is found only on the Marin Peninsula; in Petaluma, Napa, and Suisun Bay marshes; and in northern Contra Costa County. Primary threats to this species are thought to be the losses of *Salicornia* marsh habitat due to extensive development in the Bay area. It is present in areas of the Montezuma Wetlands project site where pickleweed is a dominant or co-dominant species; about 119 acres of the site are considered good-quality habitat, and about 405 acres are considered lesser-quality mouse habitat.

The delta smelt (state Species of Special Concern; federally listed as threatened) is a slender-bodied, translucent, planktivorous fish known to occur in and around Montezuma Slough. The delta smelt typically has a 1-year life span. Adults enter dead-end sloughs and channel edge-waters of the Sacramento-San Joaquin Delta to spawn between about February and June. Spawning occurs in open water, and the adhesive, demersal eggs attach to hard substrates such as rocks, tree roots, gravel, and submerged branches and vegetation. Fecundity is low, usually ranging between 1,400 and 2,800 eggs per female. Adults typically die after spawning. Eggs hatch in 10-14 days, and the planktonic larvae and juveniles are transported downstream to the estuarine mixing zone that, depending on outflow, may be located from Suisun Bay to the confluence of the Sacramento and San Joaquin rivers. Juvenile delta smelt also feed on zooplankton.

Although the delta smelt was one of the most common fish in the Delta as recently as the 1970s, it has undergone roughly a ten-fold decline in the past 10 years (from several million to several hundred thousand). In 1993, the smelt was listed as threatened under the federal Endangered Species Act. Factors that are believed to have contributed to the decline in population are (1) low Delta outflow that results in placement of the mixing zone upstream within the "zone of influence" of the Central Valley Project/State Water Project pumps, and confines the geographic distribution of the smelt; (2) acute toxicity caused by influences of irrigation drain water; and (3) competition for food sources with recently introduced species such as the inland silverside and the Asiatic clam.

The Sacramento splittail (state Species of Special Concern; federally listed as threatened) is a large (up to 40 cm) minnow endemic to the San Joaquin Valley. The species has been restricted to a small portion of its former range and is now found primarily in the Sacramento River and the Delta, Suisun Bay, Suisun Marsh, and Napa Marsh. The splittail is easily distinguished from other minnow species by the enlarged upper lobe of its caudal fin. It is tolerant of brackish water conditions, and can often be found in Suisun Bay, San Pablo Bay, and the Carquinez Strait

following winter high-flow periods, when water in these areas is relatively dilute. Splittail feed primarily on benthic invertebrates. Spawning requirements appear to be similar to those of delta smelt, in that both species congregate for spawning in the dead-end sloughs of the Delta. Splittail apparently spawn on flooded streamback vegetation or on beds of aquatic plants.

The 1982-1992 decline in splittail abundance is concurrent with hydrologic changes within the Delta, such as increases in water diversions during the spawning period of January through July, and dams that limit upstream migration. Diversions, entrainment due to Central Valley Project/State Water Project pumping, dams, and reduced outflow, coupled with severe drought years, introduced aquatic species, and loss of wetlands and shallow-water habitat (CDFG 1992) appear to have reduced the species' capacity to reverse its decline.

Additional sensitive species that may be present are discussed by COE and Solano County (1994) and USFWS (1995). Species that may be impacted are discussed in section 5.4.3.

*Special-Status Communities/Habitats*

Of the 786 acres contained within Phase I of the MWP, 724 acres, 576 of which are within the footprint of fill, are mapped as jurisdictional wetlands by the COE. Phase I areas are dominated by seasonally wet habitats supporting herbaceous vegetation, with lesser areas of saline basins, non-tidal emergent marsh, and tidal emergent marsh (USFWS 1995).

***Various Landfills***

Existing biological resources at the three landfills would not be impacted by dredged material disposal from the proposed project, so they are not described here.

## 4.5 CULTURAL RESOURCES

Cultural resources include prehistoric and historic archaeological sites, districts, and objects; standing historic structures, buildings, districts, and objects; and locations of important historic events, or sites of traditional/cultural importance. The analysis of cultural resources can provide valuable information on the cultural heritage of both local and regional populations.

The identification and evaluation of cultural resources by a federal agency with jurisdiction over a federal, federally assisted, or federally licensed project is required by the National Historic Preservation Act of 1966 (NHPA) (16 USC 470f, as amended) to ensure their consideration during project planning. The regulations implementing Section 106 of the NHPA (36 CFR Part 800) require a determination of significance using the criteria of the National Register of Historic Places (NRHP) (36 CFR Part 60.4) and require affording the Advisory Council on Historic Preservation an opportunity to comment on actions that may indirectly or directly affect resources on or eligible for listing on the NRHP.

The NRHP is a listing of a wide range of historic property types reflecting the diversity of the nation's history and culture. Generally, a project that will have a "substantial adverse change" on a NRHP property or a NRHP-eligible property is regarded as having a significant adverse effect on the environment. A resource is considered eligible for NRHP listing if it exhibits the following:

1. Is at least 50 years, unless of exceptional historical significance;

2. Retains integrity of location, design, setting, materials, workmanship, feeling, and association; and

3. Has one of the following characteristics:

   A) Is associated with events that have made a significant contribution to the broad patterns of our history;

   B) Is associated with the lives of persons significant in our past;

   C) Embodies the distinctive characteristics of a type, period, or method of construction; represents the work of a master, possesses high artistic values, or represents a significant and distinguishable entity whose components may lack individual distinction; or

   D) Has yielded, or may be likely to yield, information important in prehistory or history (36 CFR 60.4).

Archaeological resources generally are evaluated as eligible on the basis of scientific value (Criterion D), although other values may apply in certain cases. Architectural resources usually require evaluation on both architectural attributes as well as their relationship to historic events and/or persons (Criteria A, B, and C). Both archaeological and architectural resources are evaluated in terms of their national, state, and local importance. Traditional cultural properties are evaluated through consultation with the affected group. A traditional properties eligibility for listing on the NRHP is determined by its association with the cultural practices or beliefs of a living community that are part of its history and are important in maintaining the continuing

cultural identity of the community. Other NRHP criteria also may apply, depending on the circumstances (see Parker and King n.d.).

The Archaeological and Historic Preservation Act (AHPA) and the Archaeological Resources Protection Act (ARPA) also may impose additional requirements if the project involves archaeological values or if it will occur on either federal or Indian land. The American Indian Religious Freedom Act (AIRFA) affirms the right of Native Americans to have access to their sacred places and promotes consultation to determine if a project will affect places of traditional religious and cultural importance.

The California Environmental Quality Act (CEQA) also requires review to determine if a project will have a significant effect on archaeological sites or a property of historic or cultural significance to a community or ethnic group listed or eligible for inclusion on the California Register of Historic Resources. CEQA Appendix K (Archaeological Resources) states that an important, or significant, archaeological resource is one that:

A. Is associated with an event or person of:

   1) Recognized significance in California or American history; or

   2) Recognized scientific importance in history.

B. Can provide information that is both of demonstrable public interest and useful in addressing scientifically consequential and reasonable or archaeological research questions;

C. Has a special or particular quality, such as oldest, best example, largest, or last surviving example of its kind;

D. Is at least 100 years old and possesses substantial stratigraphic integrity; or

E. Involves important research questions that historical research has shown can be answered only with archaeological methods.

### 4.5.1 Cultural Setting

The proposed project is located within the San Francisco Bay and San Pablo Bay region. This region is part of the Coast Range geomorphic province, and San Francisco Bay marks the division between the North and South Coast ranges. This region of central California is characterized by a variety of ecological settings and has a long history of human occupation ranging from 10,000 B.C. to the present. Ecological zones available for use by the native populations during the prehistoric period included bayshore, estuary, and riparian settings; valley floor and associated wetlands; riverine and upland areas (Moratto 1984).

*Prehistoric Period*

Prior to 3,000/2,500 B.C., use of the San Francisco Bay region appears to have been intermittent and sparse, so little information is available. Evidence of early occupation along the bayshore may have been obscured by rising sea levels from 13,000 to 5,000 B.C. or buried under sediments caused by Bay marshland infilling along estuary margins from 5,000 B.C. onward (Moratto 1984). Early groups probably focused on hunting and gathering along with shellfish collection. A tripartite

sequence of development has been used to document local and regional cultural change in prehistoric central California from 2,500 B.C. onward (Lillard et al. 1939). This classification scheme of three horizons – Early, Transitional, and Late – was modified by Beardsley (1948, 1954) who renamed the sequence the Central California Taxonomic System. Recent chronological placement of the divisions suggests that the Early Horizon dated to ca. 2,500 to 1,500/1,000 B.C., the Middle Horizon to ca. 1,500 B.C. to A.D. 500, and the Late Horizon to ca. A.D. 500 to 1850 (Moratto 1984).

The *Early Horizon* is the most poorly known of the periods. Early Horizon traits include hunting and fishing for subsistence and the presence of milling stones for vegetal food processing; use of a throwing board (atlatl); and a relative absence of fire-altered rock, greasy midden (soil affected by human use and waste disposal), charcoal, and ash in the middens. Early Horizon cultures practiced elaborate burial rituals and placed numerous grave goods with the dead. Extensive trade networks with other areas of the Pacific Coast and Sierra Nevada were also developed by this time. It is believed that the initial occupation of central California was by Hokan-speaking peoples.

*Middle Horizon* sites are more common and are relatively better known than Early Horizon sites. These sites usually have deep deposits containing large quantities of ash and charcoal; fire-altered rock, fish, bird, and mammal faunal remains; and evidence suggestive of a growing reliance upon gathered plant foods as opposed to hunted animal foods. The aboriginal populations were unchanged from Early Horizon peoples. Burials were usually flexed (folded in a fetal-like position). Only a small proportion had artifacts present, and these were usually utilitarian. An increase in violence is suggested by the number of Middle Horizon burials found with projectile points embedded in the bones or with other marks of violence. The appearance of stone mortars and pestles in significant numbers appears to indicate a shift toward the processing of vegetal foods.

The *Late Horizon* emerges from the Middle Horizon with the continued use of many early traits and the introduction of several new ones. Late Horizon sites are the most numerous and are composed of rich, greasy midden with bone and fire-altered rock. Use of the bow-and-arrow, flexed interments, "killed" grave offerings, and occasional cremation of the dead are among the known traits of this horizon. Dietary emphasis on acorn and seed gathering is evident in this horizon. Trade with surrounding and other areas was well established for various raw materials. Physical types change to groups short in stature with a finer bone structure than the earlier peoples. Physical anthropological and archaeological data suggest the replacement of original Hokan settlers by Penutian speaking groups by A.D. 500 in the Bay Area.

Archaeologists have assumed that the population of the prehistoric Bay Area increased slowly but steadily from the Early Horizon to the Late Horizon. The available archaeological data have been interpreted as reflecting an increasing population due to more efficient resource procurement, storage, and increasing political complexity. Overviews and regional prehistoric information are presented in Elsasser (1978), C. King (1978a-b), Moratto (1984), and Stewart (1981, 1982).

*Native Peoples*

The Port area is either within the *Chochenyo* territory of the Costanoan Indians (Kroeber 1925:465; Levy 1978:485) or within *Huchiun* territory (Milliken 1995). The *Chochenyo* were one of the northernmost Costanoan language groups, and research indicates that the Port was part of the area occupied by either the *San Antonio* tribelet, or the *Wekemnayon* tribelet (Levy 1978:485,

Bennyhoff 1977). Linguistic evidence suggests that the Penutian speaking Costanoans moved into the Bay Area around A.D. 500 and replaced the original Hokan speaking population.

The Native American groups who may have used the project area generally occupied a specific home territory, defined by physiographic features, with usually one or more permanent villages surrounded by a number of temporary, seasonal camps. The tribelets were politically autonomous groups of 50 to 500 individuals who followed an annual round of subsistence activities focused on gathering plants, collecting riparian and shoreline resources, and hunting both land and marine animals. Trade was common with other groups either adjacent or in the Central Valley and Sierra Nevada.

The Native American lifeway ceased in the early 1800s due to its rapid disruption by introduced diseases, a declining birth rate, and the impacts of the mission system, which included a large decrease in the Indian population. The Native American peoples were transformed from hunters and gatherers into agricultural laborers who lived at the missions and worked with formerly neighboring Native American groups. After the secularization of the missions by Mexico in 1834, the majority of Native Americans gradually moved to ranches to work as agriculturalists and manual laborers. People of Costanoan descent now generally prefer to be known as Ohlone.

***Historic Period***

The Historic Period is divided into the Hispanic period (ca. 1769 to 1848), the American period (ca. 1848 to 1876), and the Contemporary period (ca. 1876 to 1940s).

*Hispanic Period*

Between 1769 and 1776, a number of Spanish exploring expeditions passed through the various project areas but did not explore within the vicinity of these areas (Cook 1957; Levy 1978; Beck and Haase 1974; Hart 1978). After the initial period of exploration (between 1769 and 1821), the Spanish focused on the founding of presidios, missions, and secular towns, with the land held by the Crown; whereas, the later Mexican policy stressed individual ownership of the land. Four institutions were used to settle the land: the missions, the presidios, the pueblos, and the ranchos. Of the four, the missions were the most successful. Starting in 1769, 21 missions were established by the Franciscans along the California coast between San Diego and Sonoma. The first task of the missions was to Christianize the natives, but they also became the main force behind the economic development of Spanish California. Only three presidios were established because of the difficulty of recruiting soldiers for these remote outposts. Missions in the main project area included *San Francisco de Asis* (1776) (also known as San Francisco Dolores) and *San Jose* (1797).

After the secularization of the missions by Mexico in 1833-1834, vast tracts of mission lands were granted to individual citizens. Prior to the Mexican take over, only three Spanish "concessions" or ranchos were granted within the current boundaries of what now constitute the Bay Area counties. Only one of these, Luis Maria Peralta's *Rancho San Antonio* situated along San Francisco Bay between San Leandro and El Cerrito Creeks, was located in Alameda County, and it included the Port of Oakland (Hendry and Bowman 1940:753). None of the rancho-associated dwellings or structures was located in the vicinity of the project area (Hendry and Bowman 1940).

By the 1840s, a boat landing known as the *Embarcadero de San Antonio* projected from the Oakland Estuary's north shore in the shallow eastern basin. From here the Peraltas shipped hides and tallow across the Bay to Yankee traders at anchor in Yerba Buena cove. The Estuary retained its

Spanish name, slightly anglicized as San Antonio Creek or San Antonio Slough, through the turn of the century.

*American Period*

During the Gold Rush of the late 1840s and early 1850s, tens of thousands of people arrived by ship in San Francisco Bay. The mercantile hamlet of San Francisco, formerly known as Yerba Buena, was suddenly transformed into a city of 50,000 residents. As a population center with a deep-water waterfront, San Francisco became the premier port on the Bay, retaining this dominance for over a century.

During the 1850s, several small settlements sprang up on the east side of the Bay along the shores of the Oakland Estuary. Oakland was the principal town on the north shore; Alameda occupied the peninsula to the south (which later became an island). The City of Oakland was incorporated in 1852 by Horace W. Carpentier without the knowledge or permission of the Peralta family (Hart 1978). Rudimentary landings on both sides of the Estuary supported maritime traffic, primarily ferry steamers that hauled passengers and freight between the East Bay and San Francisco. The ferries were dependent on the tides, and it was not uncommon for vessels to run aground on the bar (i.e., the current Bar Channel).

The first railroads were built in Oakland and Alameda in the early 1860s. These lines were acquired by the Central Pacific and, in 1869, transcontinental train service commenced with Oakland as the western terminus. The Central Pacific, reorganized in the 1880s as the Southern Pacific, controlled Oakland's entire waterfront through its subsidiary, the Oakland Waterfront Company. The railroad's freight and ferry wharf, built in 1870-1871, extended into deep water on San Francisco Bay off Oakland's western waterfront. This remained Oakland's principal shipping terminal in the 19th and early 20th centuries.

*Contemporary Period*

Throughout the late 19th century, rancho and other lands were subdivided as the result of population growth. During the later American period and into the Contemporary period, Oakland developed as a major industrial center, particularly for machinery manufacture, chemical production, and food processing (Hart 1978), with the growth of the study area dependent on transportation networks. Even though the railroad monopolized most of the waterfront until 1910, Oakland functioned as a major port and shipbuilding center, surpassing even San Francisco. Oakland continues its functions as a transportation hub, government center, and industrial focus for the East Bay.

Agricultural activities predominated during the American period and into the Contemporary period in the reuse/disposal option areas. The development of regional rail and road networks and the introduction of the refrigerator railcar in the 1880s had major impacts, allowing the transport of agricultural produce to distant markets. In recent decades this agrarian land use pattern gradually has been displaced by residential housing developments, military bases, commercial centers, recreational areas, and the development of light industrial facilities.

### 4.5.2 Proposed Dredge Area

The area of potential effect (APE) within the Port area for cultural resources has been defined as 4 miles of shoreline from the Howard Terminal (in the inner part of Inner Harbor) to the Bay Bridge

Terminal, and it includes the Oakland Bar Channel and Approach, Outer Harbor Channel and Turning Basin, Inner Harbor Channel and Turning Basin, and parallel land corridors (Township 1 South, Range 3 West [T1S, R3W], U.S. Geological Survey, Oakland West, Calif.[ornia], 7.5' quadrangle topographic map, 1980 Unsectioned).

The identification of cultural resources consisted of the compilation and review of archival information from various sources, a records review of the Port area and adjacent areas by the California Historical Resources Information System, Northwest Information Center (CHRIS/NWIC), Sonoma State University, Rohnert Park (File No. 97-290); a field review; and a request for information from locally knowledgeable parties.

*Native American Resources*

Previous environmental documents (e.g., U.S. Navy and Port of Oakland 1997a,b; Maniery et al. 1996) and research conducted for the 50-foot project (Busby et al. 1997) identified no Native American resources including sites, areas, and materials important to Native Americans for religious, spiritual, economic, or traditional uses. No areas used for gathering, collecting, or conducting ceremonies by either groups or individuals on land within or adjacent to the Port area appear to be present. No information about the spiritual significance of the Port area or proposed disposal locations was located in the anthropological literature.

*Research Investigations and Results*

The majority of the available archaeological and architectural survey data for the Port area has been compiled as a result of cultural resources compliance requirements and the Oakland Cultural Heritage Survey (City of Oakland 1994) as well as for the Department of the Navy (EFA West) and the City of Alameda Planning Department. Seventeen separate cultural resources compliance reports and at least four Environmental Impact Statement/Reports include portions of the Port. The reuse/disposal areas are either currently permitted facilities or have been reviewed or are under review in other environmental documents (see Busby et al. 1997).

Three historic districts determined eligible for listing on the NRHP are within the Port area. These include the following: (1) Naval Supply Center Oakland Historic District (NSCO); (2) Oakland Army Base Historic District; and, (3) Southern Pacific West Oakland Shops Historic District (U.S. Navy and Port of Oakland 1997a,b). Two historic districts are adjacent to the Port and include the NAS Alameda Historic District on NAS Alameda (Woodbridge 1992) and the Southern Pacific Railroad Industrial Landscape Historic District in Oakland (U.S. Navy and Port of Oakland 1997a,b). Seven city blocks within and adjacent to the Port and four city blocks adjacent to the Port associated with the Route I-880 Replacement Project (FHWA and Caltrans 1991) each include a number of archaeological features evaluated as eligible for the NRHP under Criterion D. No other NRHP historic districts are present within the Port (Busby et al. 1997; COE and Port of Oakland 1994; JRP 1996; Maniery et al. 1996).

Two individual historic resources were identified within the Port in the City of Oakland: (1) the Oakland Inner Harbor Jetties and Federal Channel (McCarthy and Lerner 1997; Mikesell 1996) and (2) the Western Pacific Ferry Slips (McCarthy 1997). The Oakland Inner Harbor Jetties and Federal Channel are eligible for the National Register of Historic Places under Criteria A and C while the Ferry Slips are not eligible (CAL/OHP 1997). The Todd Shipyard, also known as the United Engineering Company Shipyard and the West Alameda Shops, Southern Pacific Company, is located in the City of Alameda on the Alameda side of the channel. This facility may be eligible

for the NRHP as a historic district. In addition, the Main Shop Building of this potential district, a large reinforced concrete and steel frame structure built 1910-1911 for the Southern Pacific Company, may be individually eligible for the NRHP. No other individual properties or districts potentially eligible for the National Register have been identified within the Port.

The general area centered on the Port of Oakland has been identified as possessing moderate potential for prehistoric cultural resources, although this conclusion was developed prior to the information derived from extensive cultural resources compliance research in the 1980s and 1990s (Quaternary Research Group 1976). No prehistoric sites, however, have been recorded in or adjacent to the Port. Early occupation may have been obscured by rising sea levels from 13,000 to 5,000 B.C., and the presence of extensive marshes and periodic flooding from 5000 B.C. onward appears to have limited prehistoric use. The majority of the Port is now within a filled area precluding the surface presence of prehistoric archaeological sites (Bache 1855; Thompson and West 1878; USGS 1899, 1915, 1942, 1980; Merlin 1977; U.S. Navy and Port of Oakland 1997a,b).

Research indicates that the Oakland Estuary was the location of many historic shipwrecks dating from the 19th century. In addition, many ships were abandoned in the eastern end of the Inner Harbor following the Gold Rush due to a decline in the maritime trade (COE 1984). A Works Progress Administration-sponsored project to remove obstacles to navigation was undertaken in the Inner Harbor in the 1930s with the objective of clearing navigable waters of visible obstacles. No information is available on the removal of submerged vessels and it is possible, although very unlikely, that sunken vessels are present in the harbor (COE and Port of Oakland 1994). Furthermore, dredging operations and the construction of other harbor improvements conducted since the turn of the century within the channel and Inner Harbor have undoubtedly removed any submerged vessels or fragments.

Three historic properties including one shipyard potentially eligible for the NRHP are within or partly within the Oakland Harbor Navigation Improvement Project. The Oakland Inner Harbor Jetties and Federal Channel have been determined eligible for the NRHP. This resource consists of two parallel stone seawalls placed 750 to 1,000 feet apart at the entrance to the Oakland Inner Harbor. These jetties were a component of a plan conceived by Colonel G. H. Mendell, the San Francisco District Engineer from 1871-1895, for harbor improvements to the tidal inlet between Oakland and Alameda. At the time they were built, between 1874 and 1896, the jetties extended nearly 2 miles into the open waters of San Francisco Bay and defined the federal channel. Disposal of dredged material beginning in 1877 and continuing to the present, as well as extensive land fill projects initiated during World War II, have since created hundreds of acres of maritime-related landscape on both the north and south shores adjacent to the jetties. The jetties are owned by the Corps and have been determined eligible for the NRHP at the state level of significance under Criteria A and C. The other resource, commonly known as the Todd Shipyard, may be eligible for the NRHP. The facility played a part in the transportation history of the San Francisco Bay Area from 1910 – 1963. Within the shipyard, the Main Shop Building, built between 1910-1911, appears eligible for listing in the NRHP as a separate property under Criterion A as an impressive reminder of an important episode in Bay Area transportation history and under Criterion C as a fine example of an early 20th century industrial building in size (460 x 200 feet), quality of construction, and character of skylit spaces (sawtooth roof). The SHPO is currently reviewing the shipyard's eligibility for the NRHP.

The other historic resource within the Port area in the City of Oakland consists of marine facilities formerly associated with the Western Pacific Railroad mole and ferry system on the Oakland Estuary. These facilities have been determined not eligible for the NRHP (Wall and Delgado 1985;

McCarthy 1997). None of the buildings associated with the Alameda Facility and Alameda Annex of the Fleet and Industrial Supply Center, Oakland (FISCO) were determined eligible for the NRHP and the facilities were not determined eligible as a district by the SHPO (JRP Historical Consulting Services 1996; Widell 1996).

Historic properties adjacent to the Port include one NRHP-listed property, the USS POTOMAC, and two determined eligible districts, the Southern Pacific Railroad Industrial Landscape District and the NAS Alameda Historic District on the Alameda side of the channel.

### 4.5.3 Possible Reuse/Disposal Options

Three of the eight proposed dredged material reuse/disposal options – the Vision 2000 Upland area, New Berth 21, and Middle Harbor Enhancement Area – are included within the Port area (i.e., the lands and open water encompassed by the Inner, Outer and Approach channels) and, as such, are addressed in section 4.5.2. The site at the former NAS Alameda is adjacent to the southern boundary of the proposed navigation improvements. Three disposal areas – the SF-DODS, the Hamilton site, and the Montezuma site – have been previously reviewed (COE and Port of Oakland 1994; COE 1996a; COE and Solano County 1994).

No eligible historic properties are present within three of the four proposed off-site reuse/disposal areas: the SF-DODS, the former NAS Alameda area, the Hamilton Wetlands Restoration site, and the three landfills (Altamont, Vasco Road, and Redwood) (COE and Port of Oakland 1994; COE 1996a; JRP 1996). The Montezuma Wetlands site has one prehistoric site and 13 historic sites associated with the American period present. None of the Montezuma resources appear to have been evaluated for the NRHP (COE and Port of Oakland 1994).

*Former NAS Alameda*

The reuse/disposal site considered on the former NAS Alameda is immediately northwest of the NAS Alameda Historic District. No NRHP-eligible historic properties are present or immediately adjacent to this site (JRP 1996; Maniery et al. 1996).

*San Francisco Deep Ocean Disposal Site (SF-DODS)*

No NRHP historic properties are located at the SF-DODS (COE and Port of Oakland 1994).

*Hamilton Wetlands Restoration*

The following environmental setting is summarized from the *Hamilton Army Airfield Disposal and Reuse Final EIS* (COE 1996a).

A number of studies have evaluated the cultural resources located on the airfield as part of the airfield closure environmental assessment (EA) (Jones & Stokes Associates 1991) and an EA prepared for the conveyance of outparcel properties to the New Hamilton Partners (COE 1996a). These studies have identified two periods of historical significance at Hamilton Field: one between 1931 and 1935, when permanent airfield facilities were constructed and the air base was established as a strategic component of west coast air defense; and the other between 1938 and 1946, when the air base was substantially expanded to serve as a staging area for World War II air transport and a post-war re-entry facility. Components of the air base constructed during these periods have been identified as the Hamilton Historic District because they have retained, to varying degrees, integrity

of location, setting design, workmanship and materials, and feeling or association with the time between 1931 and 1946. As a result, they have been determined eligible for the NRHP under 36 CFR 60.4 criteria.

The conveyance of outparcels to the New Hamilton Partners was considered to be an adverse effect on the Hamilton Historic District. A memorandum of agreement was executed between the Army and the State Historic Preservation Officer (SHPO) in 1994 and includes numerous mitigations to reduce the adverse effect to less than significant levels

*Montezuma Wetlands Restoration*

The Montezuma Wetlands site is within an area of the San Joaquin River Delta that has been subject to extensive archaeological and historical research. The earliest known populations occupied the area approximately 5,000 years ago, and numerous archaeological sites have been found that date between 1,500 and 500 years ago (COE and Solano County 1994).

The earliest historic use of the property dates from the large livestock ranching and wheat cultivation operation of Emery Upham (1865-1897). A period of intensive land reclamation, including levee construction, was begun by Upham and continued into the early 20th century (1875-1930) to increase arable land area and reduce flooding hazards. Subsequent to Upham's death, his holdings were subdivided. One of these parcels, owned by A.M. Merrill, was called the Montezuma Ranch. After experimentation with various crops, Merrill devoted his ranch to cattle raising and stockyard (1912-1970s), which were made economically feasible by construction in 1913 of the Oakland-Antioch-Eastern Railroad Company rail line from Sacramento to Oakland. Over the years, the Montezuma Ranch changed ownership while maintaining the stockyard activity. At its peak, up to 50,000 head of cattle were penned annually at the Collinsville facility (COE and Solano County 1994).

An intensive cultural resource investigation of the project site included review of existing archaeological records at the California Archaeological Inventory, Northwest Information Center, Sonoma State University and determined that one prehistoric village site (CA-SOL-34) had been previously destroyed by historic grading (COE and Solano County 1994). Field inventory identified one additional prehistoric site and 13 historic sites.

The prehistoric site (CA-SOL-365) consists of an obsidian projectile point and Tule elk remains and is considered to date from between 2,500 to 150 years ago (COE and Solano County 1994). All surface remains were collected.

Six of the historic sites date from the Upham Ranch period (ca. 1865-1897), four date from land reclamation and levee construction (ca. 1875-1930s), two date from the Montezuma Ranch (ca. 1929-present), and one is associated with the Oakland-Antioch-Eastern Railroad and Montezuma Station (1913-1927) (COE and Solano County 1994). These historic deposits include residential refuse (glass bottles and fragments, ceramics, tin cans, bones), structural elements (pumphouse, wood, concrete pads, railroad tracks, trestles), and agricultural implements (hay bailer, thrasher) that illustrate the changing land uses within this site over time.

The proposed disposal area contains two of these resources: an historic artifact scatter dating from the Upham Period, and railroad depot remains (CA-SOL-377H) associated with the Oakland-Antioch-Eastern Railroad Company that extended service to the Montezuma Ranch stockyard operation in 1913.

The two historical sites are associated with a major use of the area in the 20th century and are representative of a regional development during this time in the Sacramento Valley. Archival research would be required to determine whether these surviving remains are unique to the region. The subsurface extent of the prehistoric archaeological site (CA-SOL-365) is unknown. The three sites are considered potentially significant under NRHP criteria A, B, C, or D, and CEQA Appendix G(j) and Appendix K criterion A, pending evaluation and consultation with the California State Historic Preservation Office (SHPO).

***Various Landfills***

No NRHP historic properties are present in the areas proposed for dredged material disposal.

## 4.6 SOCIOECONOMICS

This section describes salient socioeconomic characteristics of the Port of Oakland, the region surrounding the Port, and the disposal sites that are not within or adjacent to the Port.

### 4.6.1 Regional Context

The regional maritime industry encompasses a 16-county region comprising Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma counties in the San Francisco Bay area; Placer, Sacramento, Sutter, Yolo, and Yuba counties in the Sacramento area; and San Joaquin and Stanislaus counties in the Stockton area (see Figure 4.6-1). The ports of Oakland, San Francisco, Redwood City, and Richmond are located on San Francisco Bay, and the Sacramento and Stockton ports are located in the Delta adjoining San Francisco Bay.

San Francisco Bay and its adjoining Delta constitute one of the largest natural harbors in the world. The ports of the San Francisco Bay and the adjoining Delta ports are a major center for foreign trade. The region's ports handled foreign trade valued at approximately $34 billion in 1992 (COE and Port of Oakland 1994). The Bay Area ports export cargo from local, regional, and national markets, and they import cargo from many countries throughout the world.

Ships from six publicly used ports, 11 military installations, and several proprietary installations, including petroleum terminals, use the 11 navigable waterways in the San Francisco Bay and Delta. It is estimated that $5.4 billion of economic activity is directly dependent upon deep and shallow draft navigation channels in the San Francisco Bay and Delta regions (Ogden Beeman 1990, cited in EPA 1993a). Commercial shipping supports up to 35,000 full-time jobs, excluding those jobs supported by Navy activities (EPA 1993a).

The Port of Oakland is a regional facility and its operations affect an extensive portion of the Bay Area and its economy. The following description of socioeconomic characteristics focuses on population, employment, income, and housing factors for the region served by the Port.

Extensive regional background information for socioeconomic conditions in the project area was presented as part of the FISCO/Vision 2000 Disposal and Reuse Final EIS/R (section 3.2 and Appendix F in that document) (U.S. Navy and Port of Oakland 1997b), and is incorporated herein by reference. The background information in the FISCO/Vision 2000 Final EIS/R addresses socioeconomic conditions from 1980 through 1990. The following discussion updates population, employment, income, and housing information from that report.

***Population***

The Bay Area region is the fourth largest metropolitan area in the United States; with a population of 6 million residents in 1990. The population of the Bay Area is expected to increase to 6.9 million in 2000 and to 7.5 million in 2010 (ABAG 1994). Table 4.6-1 shows, by county, the distribution of the region's 1990 population and projected rates of population increase from 1990 through 2010.

As indicated in Table 4.6-1, Alameda and Santa Clara counties include the two largest concentrations of population, comprising approximately 46 percent of the region's total population. The forecasts for future population growth indicate that Solano, Sonoma, and Contra

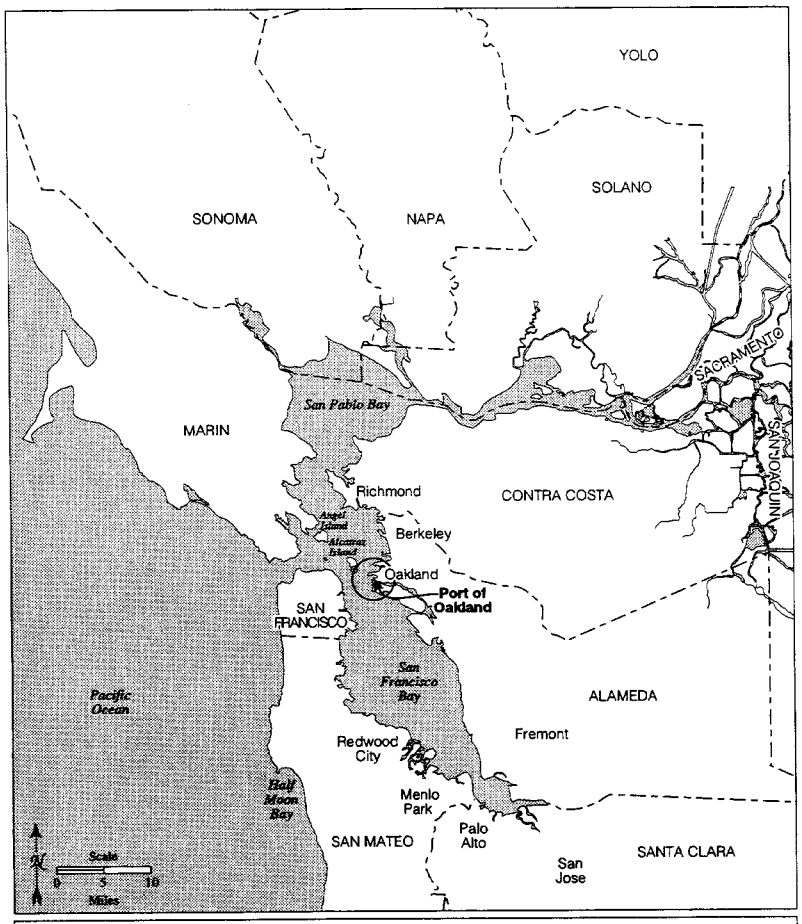



**Figure 4.6-1**

**COUNTIES IN THE SAN FRANCISCO BAY AREA**

**Table 4.6-1. Population of the San Francisco Bay Region**

| County | Actual 1990 | Projected 2000 | Projected 2010 | % Increase |
|---|---|---|---|---|
| Alameda | 1,276,702 | 1,413,300 | 1,547,000 | 21 |
| Contra Costa | 803,732 | 968,700 | 1,104,700 | 37 |
| Marin | 230,096 | 253,600 | 270,300 | 17 |
| Napa | 110,765 | 129,200 | 143,300 | 29 |
| San Francisco | 723,959 | 784,400 | 819,000 | 13 |
| San Mateo | 649,623 | 713,000 | 749,400 | 15 |
| Santa Clara | 1,497,577 | 1,689,600 | 1,813,100 | 21 |
| Solano | 340,421 | 454,700 | 546,800 | 61 |
| Sonoma | 388,222 | 468,900 | 539,600 | 39 |
| Region | 6,021,097 | 6,875,400 | 7,533,200 | 25 |

*Source*: ABAG 1994.

Costa counties are expected to lead the region in both population and household growth (growth in the number of households) between 1990 and 2010. Approximately 60 percent of the region's population growth will be in these three counties during this period (ABAG 1994).

***Employment***

An evaluation of regional employment conditions by ABAG (Association of Bay Area Governments) indicates that there were 3,037,950 jobs in the Bay Area during 1990. The distribution of jobs within the region and their projected changes in 2000 and 2010 are shown in Table 4.6-2.

**Table 4.6-2. Existing and Projected Jobs of the San Francisco Bay Region**

| County | Actual 1990 | Projected 2000 | Projected 2010 | % Increase |
|---|---|---|---|---|
| Alameda | 617,320 | 655,090 | 796,240 | 29 |
| Contra Costa | 305,140 | 342,160 | 430,120 | 41 |
| Marin | 102,240 | 111,390 | 129,540 | 27 |
| Napa | 47,590 | 57,610 | 72,260 | 52 |
| San Francisco | 582,010 | 595,370 | 667,570 | 15 |
| San Mateo | 319,120 | 367,180 | 393,540 | 23 |
| Santa Clara | 864,110 | 899,450 | 1,046,360 | 21 |
| Solano | 119,300 | 140,480 | 194,760 | 63 |
| Sonoma | 153,600 | 190,260 | 240,990 | 57 |
| Region | 3,110,430 | 3,358,990 | 3,971,380 | 28 |

*Source*: ABAG 1994.

A review of the jobs distribution for the region in 1990 reveals that approximately 47 percent (a total of 1,481,430) of the jobs in the Bay Area were located in Santa Clara and Alameda counties. The majority of the total jobs in all nine counties, roughly 33 percent, were in the service industry. Retail trade and manufacturing industries accounted for 17 and 16 percent of regional jobs, respectively, in 1990. The remaining 34 percent of area jobs were distributed among the following industry categories: agriculture, forestry and fisheries; mining; construction; transportation; wholesale trade; finance, insurance, and real estate; and government.

*Income*

The mean household income for the Bay Area in 1990 was $56,000. Table 4.6-3 shows the 1990 mean household income levels for the region by county, the projected levels for 2000 and 2010, and the percent increase from 1990 to 2010.

**Table 4.6-3. Existing and Projected Mean Household Income for the San Francisco Bay Region (1990 dollars)**

| | ACTUAL | PROJECTED | | |
|---|---|---|---|---|
| *County* | *1990* | *2000* | *2010* | *% Increase* |
| Alameda | 48,993 | 51,400 | 61,400 | 25 |
| Contra Costa | 59,433 | 62,900 | 71,500 | 20 |
| Marin | 73,419 | 82,800 | 103,500 | 29 |
| Napa | 49,910 | 53,600 | 64,700 | 30 |
| San Francisco | 49,360 | 53,500 | 62,900 | 27 |
| San Mateo | 63,683 | 71,400 | 84,900 | 33 |
| Santa Clara | 62,439 | 66,500 | 79,600 | 27 |
| Solano | 46,868 | 48,800 | 60,500 | 29 |
| Sonoma | 47,970 | 53,800 | 62,900 | 31 |
| Region | 56,000 | 60,200 | 71,300 | 27 |

*Source:* ABAG 1994.

The 1990 mean household income for the overall region is expected to increase 27 percent, to $71,300 by 2010. Projected mean household income (in 2010) for Alameda, Napa, San Francisco, Solano, and Sonoma counties would be below the anticipated regional mean household income. The expected mean household incomes for Contra Costa, Marin, San Mateo, and Santa Clara counties are anticipated to match or exceed the regional 2010 mean household income.

***Housing***

The number of Bay Area households totaled 2,246,242 in 1990. Table 4.6-4 presents the distribution of households throughout the region by county. In addition, the table provides ABAG estimates for household growth within the region for 2000 and 2010. Over the 20-year forecast period from 1990 to 2010, total Bay Area households are anticipated to increase by 24 percent. The greatest increase in household growth is expected to occur in Solano and Sonoma counties (58 and 40 percent, respectively), while Contra Costa County is expected to grow by 38 percent over the 20-year period. The total proportion of households in both Alameda and Contra Costa counties would remain relatively stable at 35 percent of the regional households for the same period. ABAG estimates a minimum housing need of 546,000 new dwelling units by 2010.

### 4.6.2 Proposed Dredge Area

Nationally, the Port of Oakland is the fourth largest port on the West Coast in terms of volume of container cargo loaded and fifth largest in terms of cargo handled annually. The Port has more than 680 acres of marine terminal facilities, 29 deepwater berths, and 31 container cranes, 12 of which are Post-Panamax size. Thirty-two shipping lines call at the Port. The harbor area includes Army and Navy installations, plus railroad operations (COE and Port of Oakland 1994).

**Table 4.6-4. Existing and Projected Households in the San Francisco Bay Region**

| County | Actual 1990 | Projected 2000 | Projected 2010 | Percent Projected Change |
|---|---|---|---|---|
| Alameda | 479,518 | 520,540 | 575,970 | 20 |
| Contra Costa | 300,288 | 358,800 | 414,020 | 38 |
| Marin | 95,006 | 103,250 | 111,930 | 18 |
| Napa | 41,312 | 47,940 | 54,410 | 32 |
| San Francisco | 305,584 | 323,400 | 342,300 | 12 |
| San Mateo | 241,914 | 259,530 | 275,340 | 14 |
| Santa Clara | 520,180 | 576,010 | 629,600 | 21 |
| Solano | 113,429 | 144,860 | 179,590 | 58 |
| Sonoma | 149,011 | 177,940 | 208,870 | 40 |
| Region | 2,246,242 | 2,512,270 | 2,792,030 | 24 |

*Source:* ABAG 1994.

In 1995, the Port generated approximately $1.3 billion in business revenue from its maritime operations. The Port provided 8,800 direct jobs and 5,300 induced jobs, generating a total of $702 million in personal income. Direct jobs are those jobs generated by business directly involved with the movement of goods through Port marine terminal facilities. Table 4.6-5 indicates the distribution of direct jobs by industrial sectors. Table 4.6-6 shows the distribution of direct port employment by county of residence. Induced jobs are those generated by the spending of income by people who have direct jobs.

**Table 4.6-5. Employment Related to Port Operations (1990-1995)**

| *Economic Sector and Business Category* | *Direct Jobs (1990)* | *Direct Jobs (1995)* |
|---|---|---|
| Surface Transportation Sector | | |
| Railroads | 570 | 370 |
| Trucking | 1,550 | 2,170 |
| Maritime Services Sector | | |
| Terminal Operators/Stevedores | 410 | 280 |
| ILWU | 570 | 730 |
| Freight Forwarders* | 560 | 1,080 |
| Warehousing/Container Repair and Leasing** | 950 | 1,290 |
| Shipping Agents and Ocean Carriers | 470 | 510 |
| Government Agencies/Military*** | 990 | 1,590 |
| Chandlers/Surveyors | 30 | 100 |
| Pilots/Support | 10 | 50 |
| Harbor Assists | 30 | 20 |
| Linehaul Towing/Bunkering | 30 | 30 |
| Ship Repair/Marine Construction | 150 | 210 |
| Port of Oakland | 200 | 150 |
| Port-Dependent Users | 100 | 190 |
| Banking and Insurance | 80 | 30 |
| **Total** | **6,700** | **8,800** |

*Notes:* * Includes customhouse brokers and third-party carriers.
** Includes CFS and transloading operations.
*** Includes the Oakland Army Base, the Fleet and Industrial Supply Center - Oakland, and the Military Sealift Command

**Table 4.6-6. Distribution of Direct Employment Impact by County of Residence 1995**

| *County* | *Percent of Direct Jobs* |
|---|---|
| Alameda | 39.3 |
| City of Oakland | 11.8 |
| City of Alameda | 2.2 |
| San Francisco | 19.4 |
| Contra Costa | 13.6 |
| San Mateo | 9.2 |
| Solano | 5.2 |
| Santa Clara | 2.9 |
| Marin | 2.4 |
| Sonoma | 0.9 |
| Napa | 0.4 |
| Other | 6.7 |
| Total | 100.0 |

*Note:* Rail employees are not included since a majority of the rail impact occurs with crewmen who reside throughout the U.S.

State, county, and local taxes generated by maritime activity totaled $89million in 1995. The federal government received approximately $400 million in revenue from U.S. Customs collections on cargo imported over the Port of Oakland facilities. In addition, the Port of Oakland provided $8.7 million to the City of Oakland in fiscal year 1996 for various services.

In 1995, the baseline year for economic impacts, 1,649 vessels called at the Port of Oakland, and the Port handled about 849,000 containers; 23 percent of these were sent to or from the Port by rail (COE 1997b). The Port's Terminal Activity Report shows 1,692 vessel calls and 820,000 containers handled at the Port in 1996.

### 4.6.3 Possible Reuse/Disposal Options

The socioeconomic environment for disposal sites that are not within or adjacent to the Port of Oakland is described below.

*SF-DODS*

Socioeconomic resources in the SF-DODS vicinity include commercial and recreational fisheries and shipping. Relatively few commercial fishery resources are found. The primary recreational fisheries are for pelagic species, such as certain rockfishes, salmon, and tuna (EPA 1993a).

***Hamilton Wetlands Restoration***

*Population*

Hamilton restoration site is located within Marin County in the Novato sphere of influence. Marin County's population as of January 1, 1997, was 242,200, an increase of 5.3 percent in the past 7 years (California Department of Finance, 1997).

*Employment*

Marin County is primarily a residential county, with nearly half of the employed residents commuting to jobs in San Francisco or other Bay Area locations (California Employment Development Department 1992). Most of the commercial and industrial development within the county is located along the U.S. Highway 101 corridor that links communities within the county to San Francisco.

Marin County contained an estimated 103,000 part-time and full-time jobs in 1990, accounting for 3.3 percent of the jobs located in the nine-county Bay Area. An estimated 19,000 jobs were in the Novato sphere of influence, representing 19 percent of Marin County's employment. Employment in the county has grown slowly in recent years, with employment growth averaging 3.3 percent per year between 1980 and 1990. By comparison, employment in neighboring Sonoma County has grown at a rate of 5.0 percent since 1980 (ABAG 1992). As of January 1, 1997, the labor force totaled 132,700, with an unemployment rate of 3.0 percent (California Employment Development Department 1997).

Marin County is expected to add 30,900 jobs between 1990 and 2010. Employment within the Novato sphere of influence, which is projected to total 36,000 by 2010, would account for more than half of new employment growth in the county.

*Income*

On a per capita basis, Marin County is California's wealthiest county. The county ranked first in the state in per capita personal income every year from 1981 through 1994. Marin County's per capita personal income stood at $43,318 in 1995, compared to $24,090 statewide in 1995. Household incomes in Novato are somewhat lower than the average in Marin County. In 1990, mean household income in Novato was estimated at $64,100, compared to $73,400 in the county. In constant 1990 dollars, mean household income in the county is projected to increase to almost $100,000 by 2010 (ABAG 1992).

***Montezuma Wetlands Restoration***

The socioeconomic setting for this site is based on the *Draft EIR/S for the Montezuma Wetlands Project* (MWP) (COE and Solano County 1994). Economic uses of the Montezuma Wetlands site now include grazing, recreational hunting, and limited industrial activity (the Jerico Towing Company). No information on the economic value of these uses of the site is contained in the MWP Draft EIR/S; that document instead focuses on the potential future development of this area for a variety of uses, including industrial development and port development.

At the end of the 1987-88 fiscal year, Solano County ran a general fund deficit. As a result, the county implemented a 5-year financial plan that incorporates severe budget cuts, wage control, and one-time revenue sources to balance the general fund (Recht-Hausrath 1991). Paramount among the county's problems is the fact that throughout the latter 1980s, it has ranked among those counties that exceeded the statewide average of 55 percent of general purpose revenues as expenditures for state-mandated programs. (The extensive use of local general purpose revenues on state-mandated programs results in severe limitations on revenues available for other local service expenditures from general purpose funds. This has a direct effect on the level of services provided by the County.) From the 1984-85 fiscal year to 1987-88, Solano County led all counties in the percentage increase in share of general purpose revenue devoted to such programs.

While the county continues to experience a stagnating revenue base in the face of increasing county-wide costs brought about by growth in its cities, its ability to increase its revenue base is limited by Proposition A. In simplified terms, Proposition A limits the county's ability to change the General Plan designation of agricultural and open space land in the unincorporated area and directs growth to cities, which are able to annex the land and pursue development. The new development places an additional burden on the county's ability to provide county-wide services.

The Collinsville Water-Dependent Industrial District, which includes part of the Montezuma Wetlands site, is one of the county's long-term prospects for revenue enhancement through development, because it is already zoned for industrial development.

***Various Landfills***

Three landfill sites could be used for the disposal of the most contaminated sediments and debris generated by the Port's proposed dredging activities. The Altamont, Redwood, and Vasco Road landfills are existing commercial disposal sites which could accept contaminated dredged materials as part of ongoing operations at these facilities. Altamont and Vasco Road landfills are located in Alameda County; Redwood Landfill is located in Marin County. The socioeconomic conditions associated with these two counties are presented above in sections 4.6.2 and 4.6.3.

## 4.7 TRANSPORTATION

This section describes the transportation setting for the proposed project. Separate sections are provided for both vessel transportation (section 4.7.1) and ground transportation (section 4.7.2) since both would be affected by the project. Each of these sections is divided into the following three subsections: Regional Setting, Proposed Dredge Area, and Possible Reuse/Disposal Options. For all of the reuse/disposal sites except the Various Landfills option, the dredged material would be transported over water to the site.

### 4.7.1 Vessel Transportation

The vessel transportation analysis focuses on commercial vessels; issues associated with recreational boating are addressed under Land Use (sections 4.12 and 5.12).

*Regional Setting*

The Ports and Waterways Safety Act of 1972 authorized the U.S. Coast Guard to establish, operate, and maintain vessel traffic services for ports, harbors, and other waters subject to congested vessel traffic. As a result, in 1972 the Coast Guard established the Vessel Transportation Service (VTS) for San Francisco Bay and designated traffic lanes for inbound and outbound vessel traffic, specified separation zones between vessel traffic lanes, and set up rules to govern vessels entering and leaving ports. The VTS, which is located on Yerba Buena Island, controls marine traffic throughout the Bay Area. Although some small and private vessels are not required to coordinate their movements by contacting the VTS, the Coast Guard monitors all commercial, Navy, and private marine traffic within San Francisco Bay and local coastal waters.

West of the Golden Gate Bridge in the Gulf of the Farallones, approach lanes to the entrance of San Francisco Bay have been established from the north, west, and south, as shown in Figure 4.7-1. Each approach lane from seaward is composed of a 1-mile-wide inbound traffic lane and a 1-mile-wide outbound traffic lane with a 1-mile-wide separation zone between the traffic lanes. Outside these lanes, the U.S. Navy has designated areas for submarine operations within which barge operations are precluded. The approach lanes lead to an offshore light station with a rotating beacon that marks the beginning of the main channel to the Golden Gate Bridge. The beacon, which is located 10 miles west of Point Bonita, is in the center of a precautionary area where all ships leaving and entering port converge. This is the area where many ships take on or discharge San Francisco Bar Pilots.

Piloting in and out of the Bay and adjacent waterways is compulsory for all vessels of foreign registry and U.S. vessels under enrollment not having a federally licensed pilot on board. San Francisco Bar Pilots provide these services for vessel movements to and from all terminals in the Bay and tributaries to the Bay, including the Carquinez Strait.

Ships bound for the San Francisco Bay and the Port of Oakland proceed in an easterly direction toward the Golden Gate Bridge through a narrow channel, which consists of inbound and outbound traffic lanes with a separation zone between them. These traffic lanes are 600 yards wide with a separation zone of approximately 150 yards. The channel is marked on either side with a series of buoys through a shoal area, approximately half-way between the rotating beacon and a line drawn from Point Bonita to Point Lobos. The water is usually more than 90 feet deep

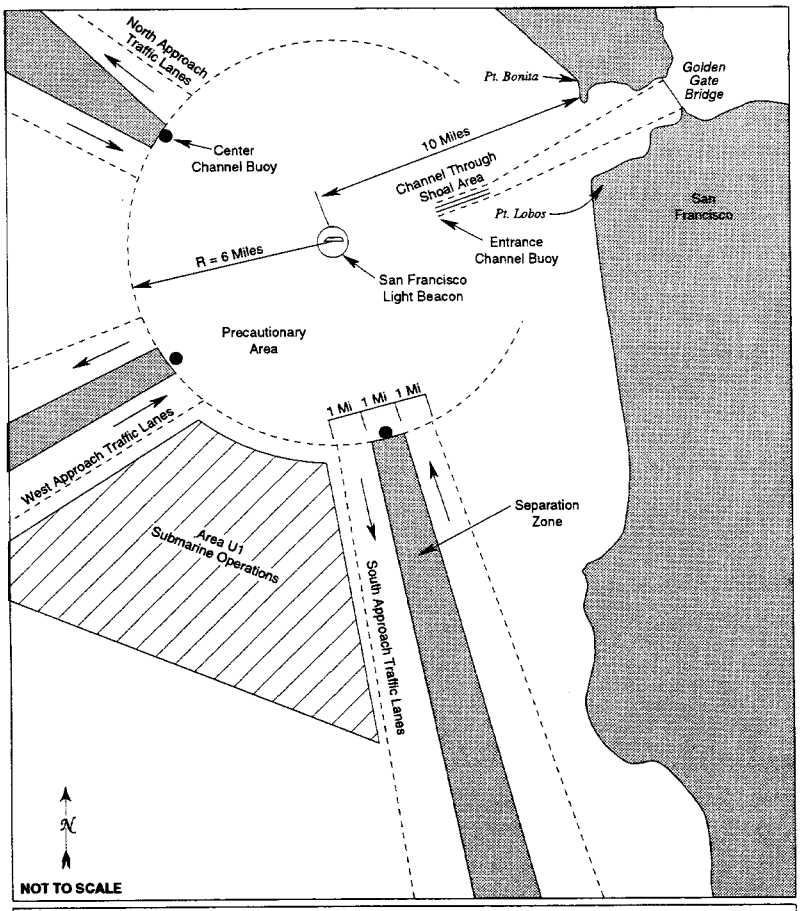



**Figure 4.7-1**

**APPROACH LANES AND SEPARATION ZONES IN THE GULF OF THE FARALLONES**

throughout this area, with the exception of shoal areas. A navigation channel through the shoal is maintained at a depth of 55 feet. Shoal waters less than 30 feet deep exist on either side of this narrow channel. Standard aids to navigation such as horns, bells, and lights are provided at appropriate locations near submerged rocks and points of land.

*Regulated Navigation Areas*

Within San Francisco Bay, the U.S. Coast Guard has established RNAs (Regulated Navigation Areas) as depicted in Figure 4.7-2. The RNAs increase navigational safety by organizing traffic flow patterns; reducing meeting, crossing, and overtaking situations between large vessels in constricted channels; and limiting vessel speed. The RNAs, which were established in 1993 with input from the Harbor Safety Committee, modified the previous voluntary traffic routing measures to better conform to International Maritime Organization (IMO) traffic routing standards. The 1993 modifications added a Golden Gate precautionary area, a deep water traffic lane separation zone north of Harding Rock, and an expanded Central Bay precautionary area. It also eliminated the former traffic lanes in the North Ship Channel and the San Pablo Strait.

RNAs apply to "large vessels" (defined as power-driven vessels of 1,600 or more gross tons, or tugs with a tow of 1,600 or more gross tons). When navigating within the RNAs, large vessels follow specific guidelines. They must have their engines ready for immediate maneuver, must operate their engines in a control mode and on fuel that allows for an immediate response to any engine order, and must not exceed a speed of 15 knots through the water.

SAN FRANCISCO BAY RNA

The first RNA encountered by inbound ships is the San Francisco Bay RNA, which extends from the precautionary zone east of the Golden Gate Bridge to Alcatraz Island (see Figure 4.7-2). Because of the large number of vessels entering and departing San Francisco Bay, traffic lanes were established under the Golden Gate Bridge and in the Central Bay to separate opposing traffic and reduce vessel congestion. The lanes are located where voluntary traffic lanes previously existed. Use of these lanes and adherence to the indicated direction of travel is required for large vessels and recommended for all other vessels.

Due to the presence of shoals and rocks in the Central Bay, the Central Bay Two-Way Deep Water Traffic Lane (DWTL), located north of Harding Rock, provides the best water depth safety margin for inbound vessels with a draft of 45 feet or greater, and for outbound vessels with a draft of 28 feet or greater. These deep draft vessels are required to use the DWTL. It is recommended that all other vessels use the Central Bay Traffic lanes so that vessel traffic in the DWTL is kept to a minimum.

The DWTL is sufficiently narrow so that meeting, crossing, and overtaking restrictions are necessary to reduce the likelihood of collision. The regulations provide that a large vessel shall not enter the DWTL when another large vessel is navigating therein when either vessel is carrying certain dangerous cargo (as defined in 33 CFR 160.203), or bulk petroleum products, or is a tank vessel "in ballast" (a tank vessel carrying only ballast, no cargo), if such entry could result in meeting, crossing, or overtaking the other vessel.

Since vessels are converging or crossing in such a manner that one-way traffic flow patterns, although desired, cannot be established, two precautionary areas were established in this RNA. They are the Golden Gate Precautionary Area, which encompasses the waters around the Golden

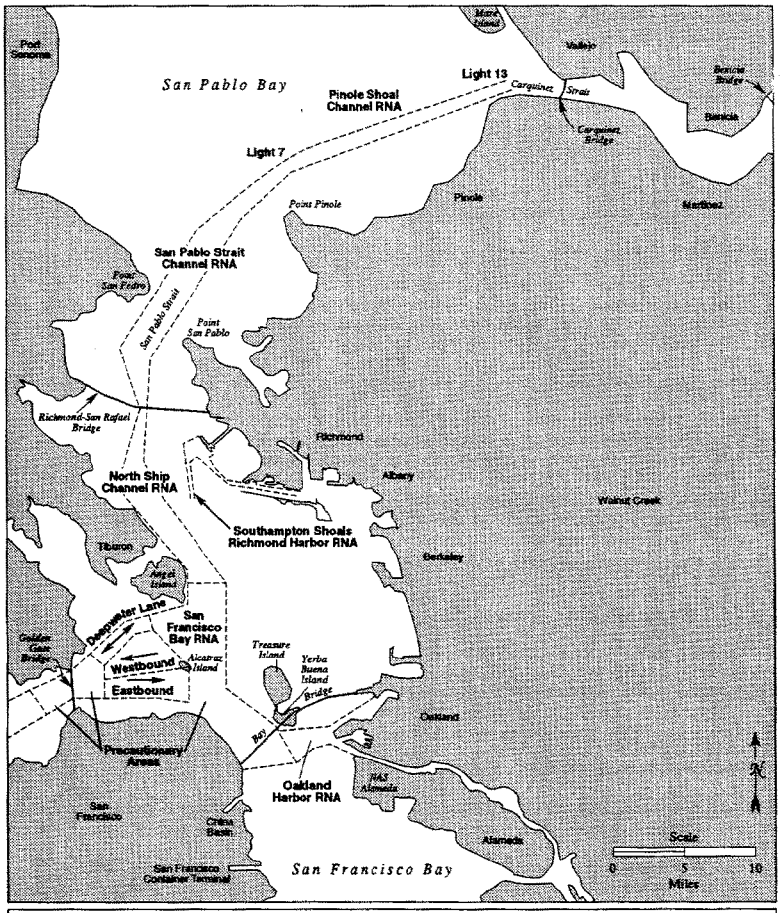



**Figure 4.7-2**

**REGULATED NAVIGATION AREAS IN SAN FRANCISCO BAY**

Gate Bridge between the Golden Gate and the Central Traffic Lanes, and the Central Bay Precautionary Area, which encompasses the large portion of the Central Bay and part of the South Bay.

OAKLAND HARBOR RNA

The Oakland Harbor RNA (Figure 4.7-2) encompasses the Oakland Bar Channel, Oakland Outer Harbor Entrance, Middle Harbor, and Inner Harbor Entrance channels. A power-driven vessel of 1,600 or more gross tons, or tug with a tow of 1,600 or more gross tons, cannot enter this RNA while another vessel or tug meeting these same criteria is navigating within its boundaries, if such an entry would result in meeting, crossing, or overtaking the other vessel.

NORTH SHIP CHANNEL RNA AND SAN PABLO STRAIT CHANNEL RNA

The North Ship Channel and San Pablo Strait Channel RNAs consist of the existing charted channels and delineate the only areas where the depths of water are sufficient to allow the safe transit of large vessels. The strong tidal currents in these channels severely restrict the ability of large vessels to safely maneuver to avoid smaller vessels.

PINOLE SHOAL CHANNEL RNA

The Pinole Shoal Channel RNA is a constricted waterway, the use of which is currently restricted to vessels with a draft greater than 20 feet, or towboats with tows drawing more than 20 feet. Because of the narrow width of the channel and the draft of vessels using the channel, further meeting, crossing, and overtaking restrictions are necessary to reduce the likelihood of collision. The regulations provide that a large vessel shall not enter the Pinole Shoal Channel RNA, which extends from approximately Light 7 to Light 13 of the Pinole Shoal Channel, when another large vessel is navigating therein and when either vessel is carrying certain dangerous cargo (as defined in 33 CFR 160.203) or bulk petroleum products, or is a tank vessel in ballast, if such entry would result in meeting, crossing, or overtaking the other vessel.

SOUTHERN PACIFIC RAILROAD BRIDGE RNA

The Southern Pacific Railroad (SPRR) Bridge RNA consists of a small circular area, 200 yards in radius, centered on the middle of the channel under the SPRR Bridge. The limited horizontal clearance results in a greater chance of vessel collisions with the bridge. This risk of collision is significantly increased when there is poor visibility. The regulation precludes large vessels from transiting the SPRR Bridge RNA when visibility is less than 1,000 yards.

*Hazards to Navigation*

Hazards to navigation can be divided into five categories: (1) shoals and islands, (2) bridges and other structures, (3) fog and inclement weather, (4) vessel traffic, and (5) tides and currents.

There is a shoal area just west of the Golden Gate Bridge and north of the main entry channel to the Bay. This area, commonly known as the 4-fathom bank or potato patch shoals, is a potential navigation hazard for any vessel with a draft greater than 24 feet. Once inside the Golden Gate, islands and shallow areas around such islands as Alcatraz, Angel Island, Treasure Island, and Yerba Buena Island are hazards to navigation and, when combined with other elements including fog, traffic, or malfunctioning radar equipment, can present an extreme hazard.

Meteorological conditions that contribute to navigation difficulties include fog during the warmer months and storms in the winter. Fog occurs much of the time during the summer months, blowing in through the Golden Gate in the late afternoon and typically burning off by late morning. Some types of commercial vessels, including tankers carrying hazardous materials such as fuel oil, have been restricted from transiting the Bay during periods of intense fog. Fog by itself does not pose a serious problem if ship navigation radar is in good condition, but coupled with other vessel traffic, the severe tides and currents in the Bay, and the possibility of other ships straying from the traffic lanes, navigation can be extremely difficult. In the past, serious collisions have occurred due to a combination of many factors, including bad weather.

The greatest hazard to vessel navigation is other vessel traffic. Large commercial and naval vessels are required by U.S. Coast Guard regulations to use designated traffic lanes when traveling in inland waterways. Smaller commercial vessels (i.e., tugboats, ferryboats, and private vessels) often do not navigate within specific traffic lanes, but rather travel in the most direct route. These vessels can pose hazards to navigation, particularly if other circumstances such as fog are present. Private vessel traffic is heaviest during weekend days and can pose hazards to dredge scows under tow. Tugboats may have trouble controlling their tows. Sporadic incidents as towing bridles that break and barges that run aground can be found in many U.S. Coast Guard vessel traffic reports.

Tidal action causes extremely strong currents throughout the Bay during periods of maximum ebb and maximum flood tides. Currents above 2 knots are considered strong and potentially hazardous if not properly "corrected for" during slow speed maneuvering. The greatest currents occur at the Golden Gate with the average maximum flood being 3.3 knots and the maximum ebb being 4.5 knots. There are also strong currents all along San Francisco's city front from the Golden Gate Bridge to the Bay Bridge and around Treasure Island on the east and west sides. These currents, combined with the strong winds sometimes encountered, make maneuvering large vessels at slow speed hazardous without the aid of tugboat assistance. Even as far south as Hunter's Point, there are currents of 2.2 knots at maximum ebb.

*Vessel Traffic in San Francisco Bay*

Ship traffic density has increased from approximately 87,000 movements in 1987 to an estimated 97,900 in 1995 (personal communication, P. Downey 1997). Ferry vessel traffic represents approximately 68 percent of this total. This is noteworthy in that ferries are highly maneuverable. They operate on regular schedules and routes and their masters are intimately familiar with the waterborne traffic on the Bay.

The VTS collects detailed reports of every vessel incident in the Bay. Review of the VTS records indicates that from 1991 through 1996 the total reported incidents were 71, 41, 65, 33, 87, and 85, respectively. The categories of incidents include collisions, near-misses, vessel grounding, noncompliance (not listening to the VTS or acting contrary to their instructions), non-participation (turning the vessel radio off), hindering navigation (e.g., a sail boat passing in front of a commercial vessel confined to narrow channels or fairways), and loose barges (the tow line breaks and the barge is set adrift or the tugboat loses power). During the same years (1991-1996), the total incidents involving dredge vessels (either self-propelled or non-self-propelled vessels) were 0, 0, 1, 0, 3, and 3, respectively. None of the barge incidents involved collisions and only two (one in 1995 and one in 1996) caused a delay of commercial vessel traffic (personal communication, P. Downey 1997).

*Proposed Dredge Area*

The Inner and Outer Harbor channels are being dredged to -42 feet. The Entrance Reach, the approach into the Oakland Outer Harbor, and the Outer Harbor turning basin are all being widened as well as deepened. Studies performed for the dredging project indicated that the existing channel widths are adequate for the current one-way traffic that operates in the Outer Harbor. A new 1,200-foot turning basin is also being constructed as part of the 42-foot project at the site of the enlarged Inner Harbor turning basin proposed for the 50-foot project. The turning basin that is currently being used while the new basin is under construction is near the Ninth Avenue Terminal. Consistent with the findings of the Inner Harbor Hydrodynamic Study, several San Francisco Bar Pilots have expressed concern over the existing Inner Harbor Channel width at the westernmost approach where the channel transitions from the Entrance Reach to the Inner Harbor (COE 1997a). Strong cross-currents and exposure to wind at this location require higher operating speeds and make entering the channel a difficult navigational maneuver.

The areas that are to be dredged are identified as "narrow channels or fairways" by the U.S. Coast Guard, and subject to Rule 9 of the International and Inland Rules of the Road. Under this rule, vessels and powerboats less than 20 meters (approximately 65 feet), all sailboats, and vessels engaged in fishing shall not impede the passage of a vessel that can safely navigate only within a narrow channel or fairway. Additionally, a vessel shall not cross a narrow channel or fairway if such crossing impedes the passage of a vessel which can safely navigate only within that channel or fairway. The term "shall not impede" means that a small craft must keep well clear and not hinder or interfere with the transit of larger vessels. Small craft and fishing vessels shall not anchor or fish in narrow channels if large vessels or barges being towed are transiting. Rule 9 also states that vessels shall avoid anchoring in a narrow channel "if the circumstances of the case admit."

Nearly 1,700 vessels called at the Port of Oakland during 1996, of which 1,630 were container vessels. Approximately 50 percent of the vessel calls were by ships with a design draft of 38 feet or greater. Twenty-five percent had a design draft of 40 feet or greater.

Two ferry terminals are located along the Inner Harbor Channel (see Figure 2.1-1). The Oakland terminal is located at the base of Clay Street just east of the proposed dredge area. The Alameda terminal is located on Main Street near the former NAS Alameda and just west of the Inner Harbor turning basin site. Roughly 37 ferry trips (either arrivals or departures) take place from each of the terminals on any given weekday. About 17 ferry arrivals or departures occur on the weekends from each location. Ferry service begins at 6 A.M. and ends at around 9 P.M. on weekdays. Peak hours are roughly from 6 A.M. to 9:30 A.M. and from 4:15 P.M. to 7 P.M. Hours of operation are more limited on weekends.

The Oscar Neimeth tug service currently is located in the northwestern portion of the Middle Harbor. It is scheduled for relocation elsewhere in the vicinity of the Port of Oakland in October 1999.

*Possible Reuse/Disposal Options*

This section provides vessel transportation information for each of the reuse/disposal site options that would be accessed by water. The discussion under Regional Setting above applies to the reuse/disposal sites within Oakland Harbor (Vision 2000 Upland Area, New Berth 21, and the MHEA) and the former NAS Alameda, so these sites are not discussed separately below.

*SF-DODS*

The SF-DODS is located in federal waters approximately 50 nautical miles west-southwest of the Golden Gate Bridge and approximately 25 miles west-southwest of the Farallon Islands. This location is outside of designated commercial vessel traffic lanes and away from any restricted passage areas, precautionary zones, or anchorages for commercial shipping.

*Hamilton Wetlands Restoration*

Due to shallow water along the west shore of San Pablo Bay, the Hamilton Army Airfield is not directly accessible by tugboat and barge. A dredged material offloading facility would be located offshore in western San Pablo Bay at the -16 ft mean lower low water contour. A sediment transfer pipeline would traverse San Pablo Bay from the offloading facility to the Hamilton site. The maximum expected pump-out distance from off-loading point to the northwestern corner of the airfield is approximately 5.5 statute miles or 33,500 feet. Minimum expected pump-out distance would be approximately 23,600 feet or 4.5 statute miles.

*Montezuma Wetlands Restoration*

The Montezuma Wetlands site is located along the Montezuma Slough on the north side of the Sacramento River just east of Suisun Bay. Montezuma Wetlands would be accessed from San Francisco Bay by tugboat and barge through the Carquinez Strait. The Sacramento River is used for fishing, which takes place year-round along the perimeter levee that abuts both the Sacramento River and the Montezuma Slough. Small beaches used for boat landing are located intermittently along the north shore of the Sacramento River. Recreational uses of the river are, however, infrequent due to the relatively sparse population in the area (COE and Solano County 1994).

### 4.7.2 Ground Transportation

***Regional Setting***

*Regional Highways*

A regional map of the highway transportation system near the Port of Oakland is shown in Figure 4.7-3. The project site is located near the hub of the Bay Area freeway system. Six freeways currently serve the Port, either directly or indirectly. A description of the regional highway system is provided below.

I-880 is an eight-lane freeway that serves West Alameda County, the South Bay and southern peninsula, and San Jose. Access to I-880 in the Port area is provided from ramps at Oak, Broadway, and Jackson Streets. The portion of I-880 (also known as the Cypress Freeway) that formerly served the project area collapsed during the 1989 Loma Prieta earthquake. A new six-lane I-880 connection from I-980 to I-80 is currently under construction along a new alignment shown in Figure 4.7-3. The first section of the new I-880 connection was opened in June 1997. This first phase connects I-880 (south of I-980) to west I-80 at the Bay Bridge Toll Plaza, but the only new ramps that have been opened are a partial connection at Maritime Street, where access to I-80 west and I-580 east is provided. Completion of the I-880 Cypress Freeway is scheduled for 1998. After the Cypress Freeway is completed, a new interchange complex will be provided at Union, Adeline, and Market Streets, and an interchange with ramp connections to the south will be

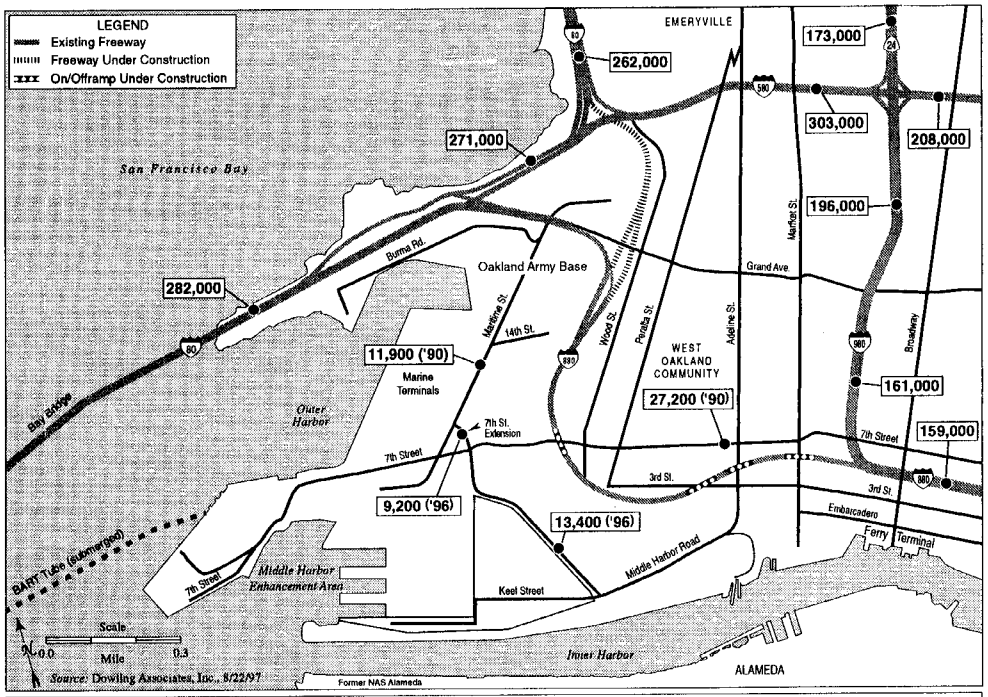



**Figure 4.7-3**

**REGIONAL HIGHWAY AND STREET SYSTEM WITH DAILY TRAFFIC VOLUMES**

provided at 7th Street. A connection to I-80 east will be provided at the north end of a frontage road that will extend from 7th Street to West Grand Avenue.

I-80 is an eight- to ten-lane freeway serving San Francisco and the West Bay as well as East Bay destinations in West Contra Costa County, Sacramento, and points to the north and east. I-80 is currently connected to the project area by freeway ramps at the intersection of West Grand Avenue and Mandela Parkway. After completion of the Cypress Freeway project, access from I-80 east will be shifted from Mandela Parkway to new interchange ramps that terminate at the West Grand Avenue/I-880 Frontage Road intersection. I-80 east is being widened to provide High Occupancy Vehicle (HOV) lanes and improved ramp connections to I-580 and the Bay Bridge. I-80, north of the Port, carries approximately 282,000 vehicles daily to San Francisco.

I-580 is an eight-lane freeway serving Northern Alameda County, Livermore, Stockton, Marin County north and I-5 south. Access to the project area is provided via the West Grand Avenue/ I-80 ramps. Improvements are currently being made to the I-580 distribution structure as part of the Cypress Freeway project. The City of Oakland has placed a heavy truck (over 4.5 tons) restriction on I-580 between Grand Avenue and 106th Avenue. Truck traffic to and from the Port must thus use alternative roadways. I-580 carries approximately 208,000 vehicles daily east of I-980. From I-238 to I-680, I-580 carries between 131,000 and 147,000 vehicles daily. East of I-680, the daily traffic volumes diminish from 164,000 at the interchange to 103,000 at the Altamont Pass.

I-980 provides access to the Oakland downtown area. I-980 has six to eight lanes and an average daily traffic volume of 196,000 vehicles. Since the collapse of the Cypress Freeway, I-980 has been the primary route for motorists traveling from the west and north and commuting to I-880 in Oakland. I-980 becomes State Highway (SH) 24 at the northern end, providing access to Contra Costa County via the Caldecott Tunnel as well as a direct connection between I-580 and I-880.

I-238 is a four-lane freeway that connects I-580 to I-880 through unincorporated San Lorenzo. I-238 provides the primary truck link between the project area and I-580 east to the Tri-Valley and Central Valley, carrying approximately 111,000 vehicles daily. I-238 is planned to be widened to six lanes.

SR 24 is an eight-lane freeway that connects the East Bay area with central and east Contra Costa County. SR 24 extends from I-980 to I-680 through the Caldecott Tunnel and carries approximately 150,000 vehicles daily just west of the Caldecott Tunnel.

*Regional Highway Conditions*

The discussion of regional highway conditions below was taken from the Level of Service Monitoring report (Alameda County CMA 1997). Traffic operating conditions are described in terms of Levels of Service (LOS). Levels of service range from LOS A, representing excellent operating conditions, to LOS F, representing very poor operating conditions. A general discussion of LOS is provided below for regional and local roadways. Additional information on LOS and background data are provided in Appendix S.

The Alameda County Congestion Management Agency (CMA) monitors congestion on area freeways by measuring the average travel speed during the P.M. peak period (4:00 P.M. to 6:00 P.M.). Speeds of 49 mph or higher indicate LOS A through C. At LOS D, traffic operating conditions become more unstable and speeds can drop as low as 41 mph. At LOS E, there are virtually no usable gaps in the traffic stream and speeds can drop as low as 30 mph. Below 30

mph, stop-and-go traffic operations often occur, and the level of service is described as LOS F. The Alameda County CMA has established LOS E as the minimum acceptable operating conditions on regional highways (Alameda County CMA 1995). Table 4.7-1 shows operations for freeway segments during the P.M. peak hour.

Recurring congestion currently occurs on the freeways serving the Port project area. During the P.M. peak period, traffic congestion occurs on most of the routes leading away from the major employment centers. I-80 operates at LOS F eastbound from the Bay Bridge to beyond the I-80/ I-580 split, and is congested westbound approaching the I-80 / I-580 split. I-880 northbound is congested south of I-238, and I-238 is congested in the eastbound direction from I-880 to I-580. Eastbound SR 24 is congested from I-580 to the Caldecott Tunnel.

During the A.M. peak period (7:00 A.M. to 9:00 A.M.), bottlenecks occur on many of the routes leading to the major employment centers. SR 24 is congested at its southbound connection to I-580. Congestion regularly occurs on westbound I-80 at the I-580 split and on the approach to the Bay Bridge toll plaza. I-238 is congested westbound from I-580 to I-880. On I-580, slowing occurs regularly in both directions between I-80 and I-980. I-980 is congested southbound from the 12th Street off-ramps to I-880 (Caltrans 1993).

It is expected that the new Cypress Freeway will improve traffic operations on I-80 between I-880 and I-580. An indication of the expected changes in traffic demand on area freeways was derived from a review of changes in traffic volumes before and after the Loma Prieta earthquake (1989). Since the collapse of the Cypress Freeway during the Loma Prieta earthquake, traffic demand has drastically increased on I-980 and has increased on I-580 more than would be expected from historical trends.

Traffic changes on area freeways from 1989 (before the Loma Prieta earthquake) to 1995 are as follows:

- I-980 — Increased 115 to 208 percent
- I-580 — Increased 35 percent
- I-80 — Increased 12 percent at the Bay Bridge
- I-880 (South of I-980) — Decreased by 26 percent

The change in traffic on I-80 at the Bay Bridge represents the historic growth in traffic over the six-year period. If traffic patterns after the Cypress Freeway opening are consistent with the patterns before the Cypress Freeway collapse, traffic volumes on I-980 could be expected to drop by about half, and traffic volumes on I-580 could be expected to drop by about 23 percent.

***Proposed Dredge Area***

*Local Roadways*

Local access is provided to the Port by West Grand Avenue, Maritime Street, Middle Harbor Road, 7th Street Extension, and 7th Street.

West Grand Avenue is a six-lane arterial with a raised center median and numerous signalized intersections from Mandela Parkway to the Oakland north central business district. West Grand Avenue has been reconstructed west of Mandela Parkway as part of the Cypress Freeway project. West Grand Avenue is now elevated from just west of Mandela Parkway to the Maritime Street intersection. In the near future, West Grand Avenue will be connected to the Cypress Freeway

**Table 4.7-1. Existing Freeway Operations – P.M. Peak Hour**

| *Freeway Segment* | *LOS* | *Speed (mph)* |
|---|---|---|
| I-80 at the Bay Bridge | | |
| Eastbound | F | 20.4 |
| Westbound | E | 32.1 |
| I-80 between I-880 and I-580 | | |
| Eastbound | F | 20.4 |
| Westbound | F | 25.7 |
| I-80 East of I-80/I-580 Split | | |
| Eastbound | F | 24.0 |
| Westbound | F | 14.7 |
| I-880 South of I-980 | | |
| Northbound | E | 39.5 |
| Southbound | E | 35.5 |
| I-880 North of I-238 | | |
| Northbound | B | 58.7 |
| Southbound | D | 44.8 |
| I-880 South of I-238 | | |
| Northbound | E | 39.8 |
| Southbound | E | 40.7 |
| I-238 | | |
| Eastbound | F | 28.0 |
| Westbound | F | 23.7 |
| I-580 East of I-238 | | |
| Eastbound | C | 51.8 |
| Westbound | C | 49.7 |
| I-580 West of I-238 | | |
| Eastbound | B | 58.0 |
| Westbound | B | 56.5 |
| I-580 East of I-980/SH-24 | | |
| Eastbound | E | 39.9 |
| Westbound | C | 51.8 |
| I-580 West of I-980/SH-24 | | |
| Eastbound | E | 39.9 |
| Westbound | E | 34.0 |
| I-980 | | |
| Northbound | E | 37.4 |
| Southbound | D | 41.3 |
| SH-24 East of I-580 | | |
| Eastbound | F | 29.5 |
| Westbound | D | 48.3 |

*Source*: Alameda County CMA 1997

system at Maritime Street and at a new elevated intersection with the Cypress Freeway frontage road. Access to I-80 west and I-580 east will be provided at the Maritime Street intersection and access to I-80 east and I-580 west will be provided at the frontage road intersection.

Maritime Street is a four-lane arterial with a center two-way left-turn lane. It is heavily used by trucks and other traffic accessing the Outer Harbor terminal, Oakland Army Base, and the SPRR and Union Pacific Railroad (UPRR) railyards. It is a primary access route to the Port of Oakland. Maritime Street is connected to the Cypress Freeway system at the West Grand Avenue intersection, where freeway ramps provide access to I-80 west and I-580 east.

Middle Harbor Road is an extension of Adeline Street as a four-lane arterial with a center two-way left-turn lane. At the eastern end of Middle Harbor Road a bridge structure carries the roadway across the SPRR/UPRR tracks. Middle Harbor Road is heavily used by trucks and other traffic accessing the Port of Oakland. It provides the primary access to I-880 and I-980 from the Port. At the north end of Middle Harbor Road, an active railroad track extends across the roadway. Slow moving Amtrak trains currently block Middle Harbor Road during times when the train car washing facility (located just east of Middle Harbor Road) is being used.

The 7th Street Extension connects Maritime Street to Middle Harbor Road as a four-lane arterial design consistent with the roadways on each of its ends. The north gated entrance to the Navy's Fleet and Industrial Supply Center, Oakland (FISCO) is located at the north end of the 7th Street Extension.

7th Street is a four-lane arterial that provides access from Middle Harbor Road to the 7th Street marine terminal and Port View Park on the west. 7th Street also serves local and cross-town access for West Oakland between Middle Harbor Road and I-980/I-880. 7th Street is currently closed between Middle Harbor Road and Wood Street due to construction of the Cypress Freeway. After completion of the Cypress Freeway, 7th Street will pass beneath this freeway and be connected to it by southbound connector ramps. Access from 7th Street to I-80 and I-580 will be provided via the Cypress Freeway frontage road.

*Local Street System Conditions*

For the local street system, the level of service (LOS) is controlled by the LOS of its major intersections. The following existing intersections, identified as having the greatest potential for traffic impacts, were selected for study:

1. Maritime Street / West Grand Avenue
2. Maritime Street / Burma Road
3. Maritime Street / 14th Street;
4. Maritime Street / 7th Street Extension
5. 7th Street / 7th Street Extension
6. 3rd Street / Adeline Street
7. 3rd Street / Market Street

The first five intersections are controlled by traffic signals. The 3rd Street / Adeline Street intersection has a traffic signal that displays flashing red signal indications in all directions. This intersection functions as an all-way stop controlled intersection. The 3rd Street / Market Street intersection is controlled by stop signs facing Market Street traffic.

Existing A.M. and P.M. peak hour traffic turning movement counts were developed at the study intersections. Traffic data were collected for the study area intersections (U.S. Navy 1995a; City of Oakland 1996b, Wiltec 1997) and were adjusted to account for the effects of construction of the I-880 Cypress Freeway. Traffic volumes for intersections at the Cypress Freeway interchanges were developed for 1998 conditions from forecasts contained in the Cypress Freeway Final EIS/R (Caltrans 1991). The resulting traffic turning movement volumes are shown in Figure 4.7-4 (A.M. peak hour) and Figure 4.7-5 (P.M. peak hour).

The level of service of an intersection is a measure of its ability to satisfy travel demand; it is defined by the average number of seconds of delay per vehicle. LOS A through LOS C indicates that the intersection is operating efficiently. Delay begins to become more noticeable at LOS D. LOS E represents substantial congestion, and LOS F is characterized by stop-and-go traffic with long-term delays. A summary of LOS definitions is contained in Appendix S. The City of Oakland has established a level of service goal of LOS D or better.

LOS analyses were performed at the study area intersections during the A.M. and P.M. peak hours. Traffic operations at the study area intersections are summarized in Table 4.7-2. The detailed LOS calculation worksheets are contained in Appendix S. All intersections, except one, in the study area currently operate at or above LOS D, the City of Oakland's LOS standard. The exception is the intersection of 3rd Street and Adeline Street, which operates at LOS E during the P.M. peak hour. This intersection currently has a traffic signal that operates with flashing red signals for all approaches, resulting in operation as an all-way stop. When the Cypress Freeway construction is completed, this signal will be operated as a conventional traffic signal.

Traffic operations at study area intersections after completion of the Cypress Freeway are summarized in Table 4.7-3. After the Cypress Freeway is completed, all intersections are expected to continue to operate at or above LOS D.

TRUCK TRAFFIC

Traffic near the project site consists of two primary components: (1) passenger car traffic generated by commuters, and (2) heavy trucks. Large trucks have a substantially greater proportional influence on traffic operations than passenger cars. To determine the relative number of passenger cars and trucks near the project site, vehicle classification counts were conducted at three locations:

- Maritime Street south of Burma Road;
- 7th Street Extension; and
- Middle Harbor Road south of 3rd Street.

A summary of vehicle classification counts during peak hours is shown in Table 4.7-4.

Variations in auto, truck, and total traffic volumes throughout the weekday for the locations shown in Table 4.7-5 are shown in Figures 4.7-6, 4.7-7, and 4.7-8.

*Commuter and Truck Haul Routes*

The commute trip distribution for Port employees was taken from the FISCO/Vision 2000 EIS/EIR (U.S. Navy and Port of Oakland 1997b). A summary of employee commute trip distribution is shown in Table 4.7-5.

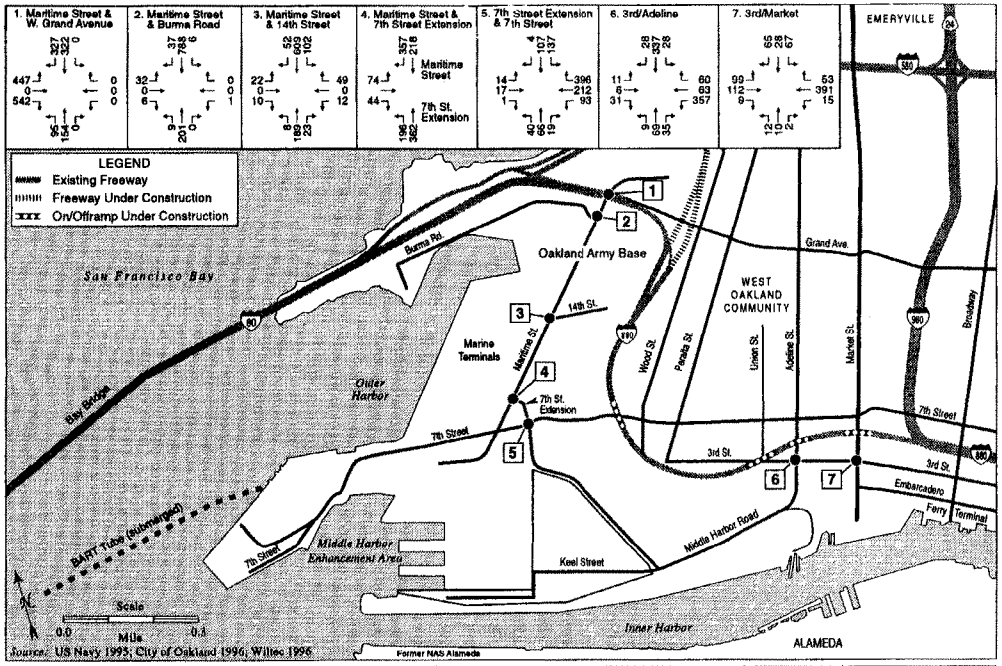
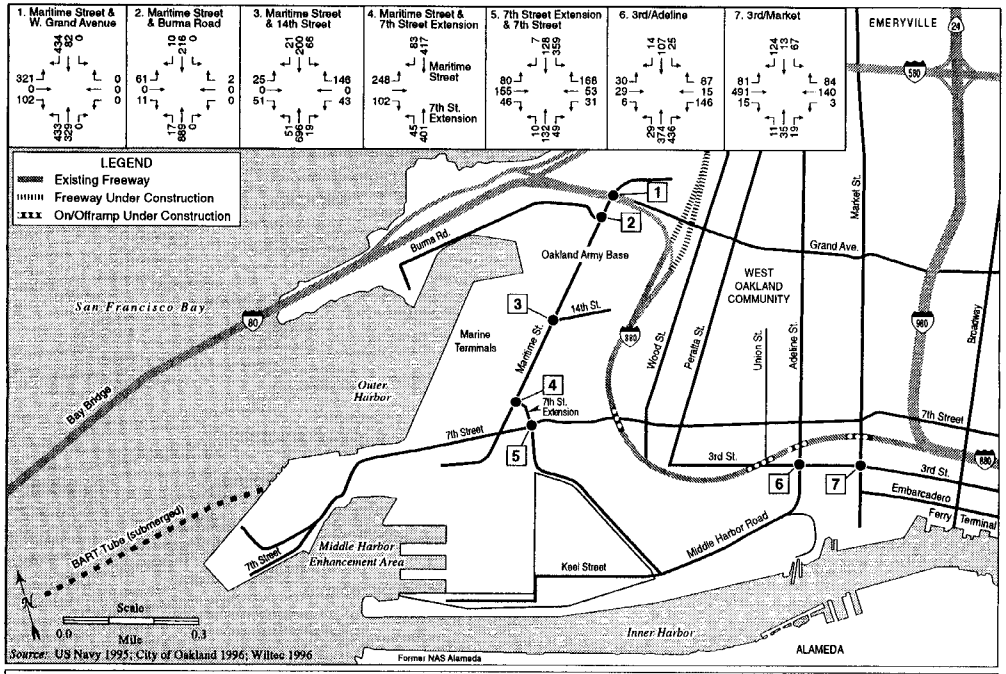



**Figure 4.7-4**

**ADJUSTED EXISTING AM PEAK HOUR TRAFFIC VOLUMES**




Source: US Navy 1995; City of Oakland 1996; Wiltec 1996

**Figure 4.7-5**

**ADJUSTED EXISTING PM PEAK HOUR TRAFFIC VOLUMES**

**Table 4.7-2. Existing Intersection Operations**

| Intersection | A.M. Peak Hour | | P.M. Peak Hour | |
|---|---|---|---|---|
| | *LOS* | *Delay*[1] | *LOS* | *Delay*[1] |
| Maritime Street / West Grand Avenue | C | 18.8 | D | 29.1 |
| Maritime Street / Burma Road | B | 10.0 | B | 10.5 |
| Maritime Street / 14th Street | B | 10.7 | B | 13.5 |
| Maritime Street / 7th Street Extension | B | 12.2 | B | 12.7 |
| 7th Street / 7th Street Extension | C | 22.9 | C | 23.5 |
| 3rd Street / Adeline Street | C | 18.5 | E | 35.4 |
| 3rd Street / Market Street | | | | |
| Northbound Left Turn | C | 11.3 | C | 13.6 |
| Northbound Through-Right Turn | B | 7.8 | B | 9.0 |
| Southbound Left Turn | C | 11.0 | C | 15.1 |
| Southbound Through-Right Turn | B | 6.3 | A | 4.4 |
| Eastbound Left Turn | A | 3.8 | A | 2.9 |
| Westbound Left Turn | A | 2.4 | A | 3.7 |

*Note:* 1. Delay in seconds per vehicle.
*Source:* Dowling Associates 1997.

**Table 4.7-3. Intersection Operations after Completion of the Cypress Freeway — 1998**

| Intersection | *AM Peak Hour* | | *PM Peak Hour* | |
|---|---|---|---|---|
| | *LOS* | *Delay*[1] | *LOS* | *Delay*[1] |
| Maritime Street / West Grand Avenue | C | 21.3 | C | 21.4 |
| Maritime Street / Burma Road | B | 10.0 | B | 10.5 |
| Maritime Street / 14th Street | B | 10.7 | B | 13.5 |
| Maritime Street / 7th Street Extension | B | 12.2 | B | 12.7 |
| 7th Street / 7th Street Extension | C | 22.9 | C | 23.5 |
| 3rd Street / Adeline Street | C | 24.0 | D | 29.8 |
| 3rd Street / Market Street | | | | |
| Northbound Left Turn | B | 6.0 | B | 6.4 |
| Northbound Through-Right Turn | A | 4.7 | A | 4.6 |
| Southbound Left Turn | B | 5.7 | B | 6.2 |
| Southbound Through-Right Turn | A | 3.9 | A | 3.4 |
| Eastbound Left Turn | A | 2.6 | A | 2.5 |
| Westbound Left Turn | A | 2.2 | A | 2.4 |
| West Grand Avenue / I-880 Frontage Rd. | C | 19.0 | C | 19.9 |
| 7th Street / I-880 SB On Ramp | A | 2.8 | B | 6.6 |
| 7th Street / I-880 NB Off Ramp | C | 16.4 | C | 16.8 |
| 5th Street/ Union St. / I-880 North Ramps | C | 16.5 | C | 15.9 |
| 5th Street/ Adeline Street | B | 12.4 | C | 19.3 |
| I-880 Off Ramp / Market Street | B | 9.7 | B | 10.4 |

*Note:* 1. Delay in seconds per vehicle.
*Source:* Dowling Associates 1997.

**Table 4.7-4. Peak Hour Vehicle Classification Counts**

| Location | A.M. Peak Hour Traffic (7:00-8:00 A.M.) | | | P.M. Peak Hour Traffic (4:00-5:00 P.M.) | | |
|---|---|---|---|---|---|---|
| | *Trucks* | *Total* | *Percent Trucks* | *Trucks* | *Total* | *Percent Trucks* |
| Maritime Street North of Burma Road | 163 | 1,160 | 14% | 262 | 1,119 | 23% |
| 7th Street Extension | 202 | 569 | 36% | 365 | 740 | 49% |
| Middle Harbor Road South of 3rd Street | 306 | 1,079 | 28% | 412 | 1,013 | 41% |

*Source:* Dowling Associates and Wiltec 1996 and 1997.

**Table 4.7-5. Port Employee Trip Distribution**

| Route | *Port Employees (In FISCO Area)* |
|---|---|
| SR 24 | 5% |
| I-80 East | 17% |
| I-80 West | 23% |
| I-580 East | 11% |
| I-880 | 30% |
| Local Streets | 14% |

*Source:* U.S. Navy and Port of Oakland 1997b.

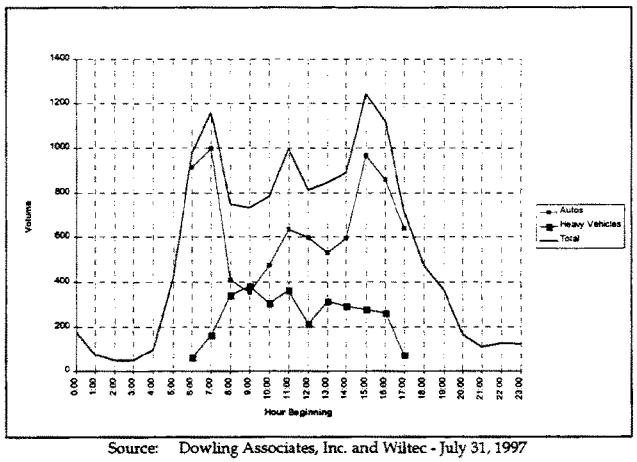
The distribution of truck traffic from the marine terminals and rail intermodal yards was derived from a 1993 truck survey conducted by the Port of Oakland (1993). A summary of truck haul routes is shown in Table 4.7-6.

*Railroads*

The Port is served by several major railroads: Burlington Northern-Santa Fe (BNSF), SPRR, UPRR, and the Oakland Terminal Railroad (OTR). The written decision to merge the SPRR and UPRR was issued on August 6, 1996, and served on August 12, 1996, under the U.S. Department of Transportation Surface Transportation Board's Finance docket No. 32760, Decision No. 44. The merger is now completed but operations of the two divisions have not been fully integrated. The discussions on SPRR and UPRR rail operations are kept separate for the purpose of this report.

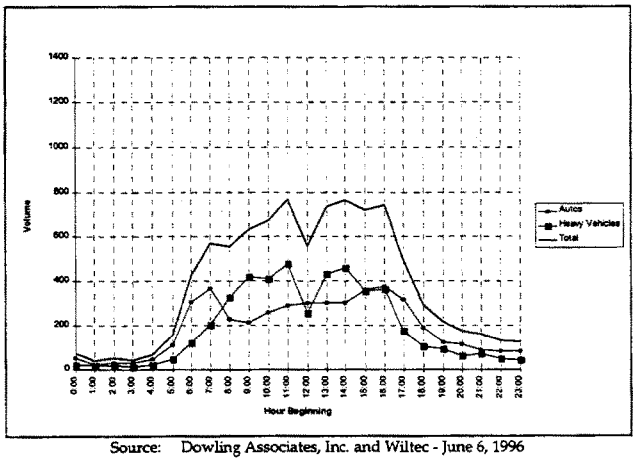
BURLINGTON NORTHERN-SANTA FE RAILROAD

The BNSF Railroad has its major Northern California railyard in Richmond, but it also has rail access to the Oakland Outer Harbor area. The BNSF Railroad has trackage rights over the SPRR between Richmond and Oakland, where it maintains a small yard facility near 34th and Wood streets. Outbound containers generally are transported from Richmond to the Port by truck. Oversize and heavy loads (like earth moving equipment on railroad flatcars) can be routed from Richmond to the Wood Street Yard via the SPRR mainline and then interchanged with the OTR for the final movement to the marine terminal. From the Bay Area, most of the BNSF's priority freight is shipped east to other points in the United States via Stockton, California, and Flagstaff, Arizona.



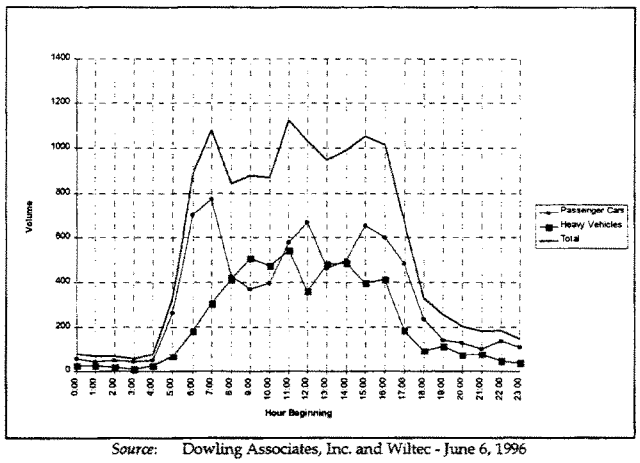

Source: Dowling Associates, Inc. and Wiltec - July 31, 1997

**Figure 4.7-6. Traffic Volumes on Maritime Street South of Burma Road**




Source: Dowling Associates, Inc. and Wiltec - June 6, 1996

**Figure 4.7-7. Traffic Volumes on 7th Street Extension**




*Source:* Dowling Associates, Inc. and Wiltec - June 6, 1996

**Figure 4.7-8. Traffic Volumes on Middle Harbor Road South of 3rd Street**

**Table 4.7-6. Truck Traffic Distribution from Marine Terminals and Intermodal Railyards**

| *Route* | *Percent Over-the-road Truck Traffic* |
|---|---|
| SR 24 | 2% |
| I-80 East | 20% |
| I-80 West | 9% |
| I-238 | 20% |
| I-580 East | 0% |
| I-880 | 32% |
| Local Streets | 17% |

*Source:* Port of Oakland 1993

SOUTHERN PACIFIC RAILROAD

The SPRR operates three routes for moving freight to and from the Bay Area. The northern route is double tracked and crosses the Carquinez Strait at Benicia en route to the Sacramento area for connections to the Pacific Northwest, Midwest, and Gulf states. This route also accommodates four daily round-trips of the *Capitol* and four daily *San Joaquin* passenger trains, operated by Amtrak for the state of California, and two congressionally designated long-haul routes – the *California Zephyr* (Oakland-Chicago) and the *Coast Starlight* (Los Angeles-Seattle). The SPRR also operates a coastal route to Los Angeles via Santa Barbara and has operating rights on the UPRR trackage to Stockton via the Altamont Pass where it connects with its Central Valley trackage. In the fall of 1998, Amtrak will add two additional trips between Sacramento and San Jose, increasing the number of trips to six round trips per day.

UNION PACIFIC RAILROAD

The UPRR serves the Bay Area on trackage to the east via Stockton and the Sierra Nevada to Salt Lake City, Utah. The UPRR operates an intermodal terminal along the Oakland Inner Harbor. At the present time most of the Oakland-related UPRR traffic travels via Salt Lake City where the UPRR's primary lines to Southern California, the Pacific Northwest, and the Midwest converge. Commuter rail service is scheduled to start in May 1998 from Stockton to San Jose. This service will be provided by the Altamont Commuter Express on the Union Pacific Railroad via Niles Canyon with two round trips a day during the workweek.

BURLINGTON NORTHERN-SANTA FE RAILROAD

OAKLAND TERMINAL RAILROAD

Historically, the OTR was an offshoot of the East Bay's inter-urban Key Line Transit system that is jointly owned by the UPRR and BNSF. The OTR is a local switching railroad that shuttles rail cars between the UPRR, the BNSF, and the Port of Oakland Marine Terminals. In addition to these interchange movements, the Oakland Terminal also serves a few industries located along its street trackage through West Oakland. The OTR's offices and track facilities are located on the northern end of the Baldwin Yard. The OTR operates on segments of trackage that pass through and are part of the Oakland Army Base. At these locations along Burma Road and Maritime Street, the OTR operating crews are required to manually open and close gates to access the Port of Oakland marine terminals. The OTR typically operates in the evening, but crews and trains can operate at any time depending on demand.

RAILROAD ACCESS TO THE PORT

The trackage for the various railroads has multiple owners and operations. BNSF owns its own tracks from Stockton to Richmond and accesses the Port area on tracks owned by the SPRR. BNSF rail cars are delivered to the Outer Harbor terminals by the OTR. The BNSF has no direct access to the Port of Oakland, while the UPRR and SPRR have access to all of the Port. The BNSF is presently not transporting containers to the Outer Harbor via rail. Union Pacific tracks enter the Port via West Embarcadero and then continue to the intermodal yard along the Oakland Inner Harbor. For rail cars destined for the Outer Harbor, the UPRR interchanges with the OTR at Magnolia Yard near Magnolia and 1st streets. The SPRR has a major railyard and intermodal terminal east of the Port that serves trackage from both the north and south. SPRR has direct

access to the Knight Yard from its own Desert Yard. Train schedules are driven by the shipper and the Port of Oakland needs.

RAILROAD/HIGHWAY GRADE CROSSINGS

Public rail/highway at-grade crossings occur at several locations around the Port. The SPRR mainline travels in the striped median of the Embarcadero from Webster Street to Clay Street. North of Clay, the mainline is in its own exclusive right-of-way, but there are perpendicular grade crossings at several cross streets. A grade crossing occurs on the SPRR line (to the 7th Street marine terminal) at Middle Harbor Road just south of 7th Street/7th Street Extension. Numerous other at-grade crossings occur for sidings and spur tracks.

***Possible Reuse/Disposal Options***

The only reuse/disposal option that would be accessed by ground transportation is the Various Landfills option.

*Various Landfills*

The landfill disposal sites under consideration include the Altamont and Vasco Road landfills in eastern Alameda County and the Redwood Landfill in northern Marin County.

ALTAMONT LANDFILL

The Altamont Landfill is located north and east of the City of Livermore. The following discussion addresses the roadway connections from the Port of Oakland to the landfill.

*Regional Highways.* A map of the regional roadways providing access between the Port and the Altamont Landfill is shown in Figure 4.7-9. Dredged material, dried at the Port of Oakland, would be transported to the Altamont Landfill along I-880 south, I-238, and I-580 east. I-880 and I-238 have been described in section 4.7.2.

I-580, east of I-238, is an eight-lane freeway serving Northern Alameda County, Livermore, Stockton, and I-5 south. From I-238 to I-680, I-580 has a truck climbing lane in addition to the normal eight lanes, and carries a total of between 134,000 and 147,000 vehicles daily. Between I-680 and the Hopyard Road interchange, I-580 has 10 through lanes. East of I-680, the daily traffic volumes diminish from 164,000 at the interchange to 102,000 at the landfill.

*Local Roadways.* Access to the Altamont Landfill is provided by an interchange at Greenville Road. The eastbound I-580 ramps intersect Southfront Road at a "T" intersection controlled by stop signs in all directions. A signalized intersection provides access from Southfront Road to Greenville Road. Southfront Road is a four-lane roadway that provides frontage access between Route 84 and Greenville Road along the south side of I-580. Vehicles traveling from the Port to the landfill would travel north on Greenville Road (an arterial roadway that has six lanes south of Southfront Road, to Northfront Road), where Greenville Road turns into Altamont Pass Road, a winding two-lane road that carries all traffic to and from the Altamont Landfill. On the return trip, vehicles traveling from the landfill would use Altamont Pass Road to Northfront Road to the westbound I-580 interchange ramps. Northfront Road is a two-lane road that provides frontage access between Vasco Road and Greenville Road along the north side of I-580.

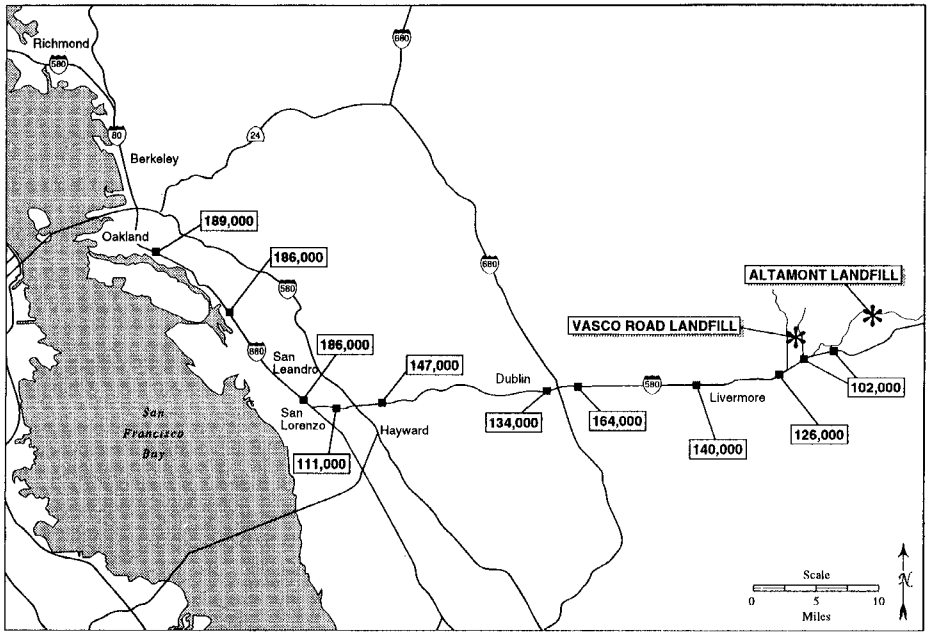



**Figure 4.7-9**

**DAILY VEHICLE TRIPS ALONG REGIONAL ACCESS ROUTES TO THE ALTAMONT AND VASCO ROAD LANDFILLS**

*Existing Traffic Conditions.* Table 4.7-7 shows traffic operating conditions for I-580 freeway segments east of I-238. The operating conditions on I-580 were determined by measuring the speed of traffic on the freeway during the P.M. peak hour (Alameda County CMA 1995).

**Table 4.7-7. Existing Freeway Operations on I-580 East of I-238**
**P.M. Peak Hour**

| *Freeway Segment* | *LOS* | *Speed (mph)* |
|---|---|---|
| I-580 from I-238 to Center | | |
| Eastbound | C | 51.8 |
| Westbound | C | 49.7 |
| I-580 from Grove to I-680 | | |
| Eastbound | B | 59.2 |
| Westbound | B | 57.5 |
| I-580 from I-680 to Santa Rita | | |
| Eastbound | E | 34.8 |
| Westbound | B | 56.3 |
| I-580 from Santa Rita to Portola | | |
| Eastbound | C | 53.5 |
| Westbound | B | 58.0 |
| I-580 from Portola to SR 84 | | |
| Eastbound | A | 60.4 |
| Westbound | A | 61.3 |
| I-580 from SR 84 to SJ County | | |
| Eastbound | A | 61.0 |
| Westbound | A | 63.4 |

*Source:* Alameda County CMA 1995

The Alameda County CMA did not identify high levels of congestion along the I-580 corridor. Nevertheless, traffic conditions can vary considerably, and motorists often encounter stop-and-go traffic in the eastbound direction during the P.M. peak hour. An analysis of level of service, based on the traffic volume and theoretical capacities (from the Highway Capacity Manual), showed that traffic operates at LOS F on much of I-580 during the peak hours. LOS F conditions were calculated for the westbound direction west of Portola Avenue in the morning, and for the eastbound direction from I-238 to Vasco Road in the evening peak hour. The analysis of project impacts was performed using the calculated levels of service, which were based on traffic counts conducted by Caltrans (Caltrans 1996b).

Traffic conditions were evaluated for the interchange area and the local roadways leading from I-580 to the Altamont Landfill. A summary of this analysis is shown in Table 4.7-8.

The analysis of existing traffic conditions for roadways leading to the Altamont Landfill showed that there is sufficient capacity along all routes, except at one location. During the P.M. peak hour, the westbound approach to the I-580 eastbound ramps at Southfront Road is shown to operate at LOS F. This is largely due to the high volume (412) of right-turning vehicles for that approach. The analysis showed that during this peak period, delays would be very high for the westbound right turning traffic (the computed delay was outside the range of the methodology). All other movements at the intersection would operate at LOS A.

*Truck Traffic.* Truck volumes were taken from Caltrans' *Average Annual Daily Truck Traffic on the California State Highway System – 1995.* Caltrans estimates that on I-580, between I-238 and SR 84,

**Table 4.7-8. Existing Traffic Operations for Roadways Serving Altamont Landfill**

| LOCATION | A.M. PEAK HOUR | | P.M. PEAK HOUR | |
|---|---|---|---|---|
| *Greenville Road Interchange* | *LOS* | *Density* [1] | *LOS* | *Density* [1] |
| I-580 Eastbound Diverge | A | 10 | D | 29 |
| I-580 Westbound Merge | B | 18 | B | 12 |
| *Intersection* | *LOS* | *Delay* [2] | *LOS* | *Delay* [2] |
| Southfront Road/ I-580 EB Ramps | A | 4.8 | F | High |
| Southfront Road/ Greenville Road | B | 13.8 | B | 12.6 |
| Altamont Pass Road/ Greenville Road | | | | |
| Northbound Left Turn | B | 5.1 | B | 6.5 |
| Northbound Right Turn | A | 2.7 | A | 3.1 |
| Westbound Left Turn | B | 5.3 | A | 2.4 |
| Northfront Road/ I-580 WB Ramps | | | | |
| Northbound Left Turn | A | 4.7 | B | 8.2 |
| Northbound Right Turn | B | 5.9 | A | 2.9 |
| Westbound Left Turn | A | 2.4 | A | 2.9 |

*Notes*: 1. Density is measured in passenger cars per mile per lane.
2. Delay is the average vehicle delay at an intersection measured in seconds.

*Source*: Dowling Associates 1997

trucks averaged between 7.8 and 9.4 percent of all vehicles (depending on location). Of these trucks, the approximate breakdown by number of axles is: 28 percent 2-axle; 8 percent 3-axle; 3 percent 4-axle; and 61 percent 5-axle.

REDWOOD LANDFILL

The Redwood Landfill is located in Marin County north of Novato, near the Marin/Sonoma County line on U.S. 101.

A map of the regional roadways providing access between the Port and Redwood Landfill is shown in Figure 4.7-10. Dredged material, dried at the Port of Oakland, would be transported to the Redwood Landfill along I-80 east, to I-580 west, to U.S. 101 north. The regional highways leading from the East Bay to the Redwood Landfill are described below. Please refer to section 4.7.1 for a description of the regional highways near the Port.

I-80 east, leading northward from the Port of Oakland, is an eight-lane freeway with full access control. I-80 east is being widened to provide High Occupancy Vehicle (HOV) lanes and improved ramp connections to I-580 and the Bay Bridge. I-80 carries approximately 237,000 vehicles daily just south of the I-80/I-580 split.

I-580 is a four to six-lane freeway connecting I-80 to I-5. There are HOV lanes on I-580 between I-80 and the Richmond-San Rafael Toll Plaza. The HOV lanes serving northbound traffic past the I-80/I-580 split are about to be constructed. Just north of the I-80/I-580 split, I-580 serves approximately 76,000 vehicles daily. I-580 has two lanes in each direction across the Richmond-San Rafael Bridge, where approximately 62,000 vehicles daily are served.

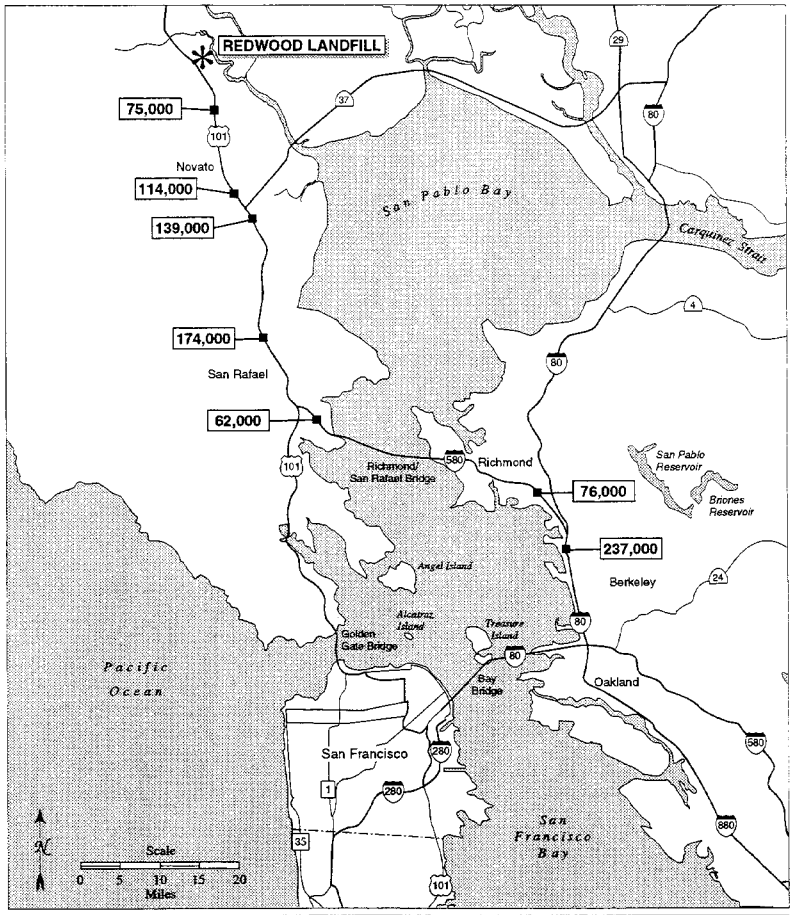



**Figure 4.7-10**

**DAILY VEHICLE TRIPS ALONG REGIONAL ACCESS ROUTES TO THE REDWOOD LANDFILL**

U.S. 101 provides regional access to the Redwood Landfill site, which is located at approximately post mile 26, about 3 miles north of Novato and 2 miles south of the Marin/Sonoma County line. U.S. 101 is a freeway with full access control, except between Novato and south Petaluma, where it is a divided expressway with a median guardrail. From SR 37 to near the Rowland Avenue interchange on U.S. 101, there are three mixed flow lanes and one commuter lane in each direction. The commuter lanes are restricted to carpools (two or more occupants) and buses in the southbound direction in the morning commute peak, and the northbound direction in the afternoon commute peak. From near the Rowland Avenue interchange to just north of the San Marin/Atherton Avenue interchange, there are three mixed flow lanes in each direction. From north of the Atherton interchange to Petaluma, there are four through lanes (two in each direction). Between Atherton Avenue and the South Petaluma Boulevard ramps, U.S. 101 is classified as an expressway, with partial access control.

*Local Roadways.* Sanitary Landfill Road, a two-lane road, carries all traffic into and out of the Redwood Landfill. The intersection with U.S. 101 is a "T" intersection, with a stop sign on Sanitary Landfill Road and no control for the U.S. 101 traffic. On U.S. 101 southbound, a left-turn deceleration lane is provided for traffic turning into the landfill, and an acceleration lane is provided for traffic turning from the landfill onto U.S. 101 southbound. From U.S. 101 northbound, traffic turning right into the landfill is provided with a wide apron that minimizes the delay to through traffic, although no separate right-turn deceleration lane is provided.

Binford Road is a stub road that comes within a few miles of Redwood Landfill. There have been proposals to extend Binford Road to the landfill to provide alternative access using the Atherton Avenue-San Marin Drive interchange.

*Existing Traffic Conditions.* The existing average daily traffic (ADT) volumes from the Port to the Redwood Landfill are shown in Figure 4.7-10. Peak hour traffic operating conditions for the roadways leading from the Port to Redwood Landfill are shown in Table 4.7-9.

This analysis showed that U.S. 101 and I-80 are congested (LOS F) southbound during the A.M. peak hour and northbound during the P.M. peak hour. During the A.M. peak hour, there is a bottleneck in Novato where SR 37 traffic making the westbound to southbound transition converges with U.S. 101 southbound traffic. The maximum queue can extend from SR 37 to the Atherton Avenue interchange.

During the P.M. peak hour, there is a bottleneck north of the Atherton Avenue interchange, where there is a reduction in the number of lanes from three to two in the northbound direction. This is further aggravated by the fact that the freeway ends here and becomes an expressway, thus reducing capacity. The maximum P.M. peak vehicle queue typically extends from-south of the Atherton Avenue interchange to about the DeLong Avenue (downtown Novato) interchange.

Traffic conditions were evaluated for the intersection of Sanitary Landfill Road and U.S. 101 during the morning and noon traffic periods. The landfill is open to the public from 7:00 A.M. to 3:00 P.M. The analysis was performed in two parts because of the unique characteristics of the intersection. The wide median and southbound acceleration lane onto U.S. 101 allows vehicles to cross the northbound U.S. 101 lanes and take refuge before entering the southbound U.S. 101 lanes.

**Table 4.7-9. Existing Freeway Operations for Routes Leading to the Redwood Landfill**

| *Freeway Segment* | *A.M. Peak Hour* | | *P.M. Peak Hour* | |
|---|---|---|---|---|
| | *LOS* | *V/C* [1] | *LOS* | *V/C* [1] |
| U.S. 101 South of Redwood Landfill | | | | |
| Northbound | C | 0.55 | E | 0.99 |
| Southbound | F | 1.13 | D | 0.77 |
| U.S. 101 North of SR 37 | | | | |
| Northbound | C | 0.56 | F | 1.00 |
| Southbound | F | 1.15 | D | 0.78 |
| U.S. 101 South of SR 37 | | | | |
| Northbound | C | 0.57 | F | 1.27 |
| Southbound | F | 1.18 | E | 0.91 |
| U.S. 101 South of San Pedro Rd. | | | | |
| Northbound | C | 0.54 | F | 1.20 |
| Southbound | F | 1.11 | D | 0.86 |
| I-580 East of Sir Francis Drake Boulevard | | | | |
| Northbound | B | 0.33 | D | 0.73 |
| Southbound | E | 0.99 | B | 0.46 |
| I-580 North of Central Ave. | | | | |
| Northbound | A | 1.23 | C | 0.51 |
| Southbound | C | 0.70 | B | 0.32 |
| I-80 South of I-580 Split (Albany) | | | | |
| Northbound | B | 0.43 | F | 1.31 |
| Southbound | F | 1.21 | E | 0.88 |

[1] V/C = Volume/Capacity measured in number of vehicles.
*Source:* Dowling Associates 1997

**Table 4.7-10. Existing Traffic Operations for the Redwood Landfill Access**

| *Location* | *A.M. Peak Hour* | | *Noon Peak Hour* | |
|---|---|---|---|---|
| *Sanitary Landfill Rd. / Northbound U.S. 101* | *LOS* | *Delay* [1] | *LOS* | *Delay* [1] |
| Eastbound Through | D | 20.3 | E | 37.3 |
| Westbound Through | D | 23.4 | F | 67.0 |
| Westbound Right Turn | B | 6.2 | B | 8.5 |
| *Sanitary Landfill Rd. / Southbound U.S. 101* | *LOS* | *Density* [2] | *LOS* | *Density* [2] |
| U.S. 101 Merge from median acceleration lane | F | 41 | B | 19 |

*Notes:* 1. Delay is the average vehicle delay at an intersection measured in seconds.
2. Density is measured in passenger cars per mile per lane.
*Source:* Dowling Associates 1997

The crossing of the northbound lanes was analyzed as a traditional stop-sign controlled intersection, and the entry into the southbound lanes was analyzed as a freeway merge. A summary of this analysis is shown in Table 4.7-10.

During the A.M. peak hour, vehicles exiting Sanitary Landfill Road and merging onto southbound U.S. 101 encounter heavy traffic, resulting in LOS F operating conditions. During the noon peak hour, vehicles exiting Sanitary Landfill Road encounter high delays and LOS F conditions due to the lack of gaps in northbound U.S. 101 traffic.

*Truck Traffic.* Truck volumes are taken from Caltran's *Average Annual Daily Truck Traffic on the California State Highway System – 1995.* Caltrans estimates that on U.S. 101 between SR 37 and South Petaluma Blvd., trucks averaged between 5.3 and 6.0 percent of all vehicles (depending on

location). Of these trucks, the approximate breakdown by number of axles is: 38 percent 2-axle; 16 percent 3-axle; 5 percent 4-axle; and 41 percent 5-axle.

*Safety.* The STOP sign-controlled intersection of U.S. 101 and the Sanitary Landfill Road presents a safety concern because of the high speed of traffic involved and the high percentage of trucks turning into or out of this intersection. Over a 3.5-year period, a total of 20 accidents were recorded at this location; these accidents resulted in three fatalities and 20 injuries. A calculation of the accident rate per million vehicles approaching the intersection confirms that the accident rate is not unduly high in comparison to statewide averages (COE and Port of Oakland 1994). However, the number of fatalities and injuries suggest that at-grade crossings and high speeds do pose a safety concern.

Although the number of accidents is large enough to justify consideration of traffic signals, the warrants for traffic signals are not currently satisfied. It is likely that placement of an isolated signal at a location like this could *increase* the number of accidents: rear-end type accidents generally increase, and broadside accidents typically decrease when a signal is installed.

*Rail.* The Redwood Landfill site is directly adjacent to the tracks of a railroad owned by the Northwest Pacific Railroad Authority. This is a single track line, with passing tracks (sidings) provided at strategic points. A rail/roadway at-grade crossing is located on Sanitary Landfill Road. Train speeds are restricted to 25 mph in this area (SPTC 1986). Track gradients are nearly level, with the maximum grade of 1 percent occurring just north of Novato, and horizontal curves are relatively gentle.

Only a few trains per week are served on this line, due to the lack of demand. There is no fixed schedule for freight trains; they are instead scheduled on an "as needed" basis. The line mainly carries finished lumber and other wood products from Mendocino and Humboldt counties to the Bay Area and points south and east. Regularly scheduled passenger train service on this portion of the railroad was last operated in 1962. While there has been discussion of operating commuter train service on the portion of the line paralleling U.S. 101, such service is unlikely to occur before the year 2003.

The potential for accidents is low because of the low volume of traffic on Sanitary Landfill Road and the relatively slow speed (25 mph) to which trains are restricted in this vicinity. In addition, observations indicate that many train movements are made late in the evening or in the early morning, when traffic volumes are lowest.

VASCO ROAD LANDFILL

The Vasco Road Landfill is located in Alameda County north and east of Livermore. The discussion below addresses the highway connections from the Port of Oakland to the landfill.

*Regional Highways.* The same regional highways serve Vasco Road as those that serve the Altamont Landfill. Please refer to the Altamont Landfill section for the discussion of regional highway facilities.

*Local Roadways.* Vasco Road carries all traffic to and from the Vasco Road Landfill. Vasco Road has been recently widened to four lanes from I-580 to just south of the Vasco Road Landfill. North of the four-lane section, Vasco Road has two lanes, and serves the City of Brentwood and eastern

Contra Costa County. The existing I-580/Vasco Road interchange is a three-quadrant partial cloverleaf connected with collector-distributor roads.

**Table 4.7-11. Existing Traffic Operations for Vasco Road**

| *Location* | *A.M. Peak Hour* | | *P.M. Peak Hour* | |
|---|---|---|---|---|
| *Vasco Road Interchange* | *LOS* | *Density* [1] | *LOS* | *Density* [1] |
| I-580 Eastbound Diverge | C | 25 | F | 43 |
| I-580 Westbound Merge | B | 20 | B | 18 |
| *I-580 Ramps* | *LOS* | *V/C* [2] | *LOS* | *V/C* [2] |
| Eastbound Off Ramp After Freeway Diverge | F | 1.21 | F | 1.07 |
| Eastbound to Northbound Loop Ramp | D [3] | 0.19 | D | 0.78 |
| Southbound to Westbound Ramp | C | 0.70 | B [3] | 0.24 |
| Westbound On Ramp Prior to Freeway Merge | F | 1.08 | F | 1.03 |
| *Vasco Road Weaving Section* | *LOS* | *Speed* [4] | *LOS* | *Speed* [4] |
| Northbound Weaving Vehicles | E | 32 | F | 24 |
| Northbound Non-Weaving Vehicles | D | 37 | F | 27 |
| *Intersection* | *LOS* | *Delay* [5] | *LOS* | *Delay* [5] |
| Vasco Road/ Northfront Road | C | 15.7 | E | 48.7 |

*Notes:* 1. Density is measured in passenger cars per mile per lane.
2. V/C = Volume/Capacity measured in number of vehicles.
3. Level of service is limited by the restricted ramp design speed.
4. Speed is measured in miles per hour.
5. Delay is the average vehicle delay at an intersection measured in seconds.

*Source:* Dowling Associates 1997

*Existing Traffic Conditions.* The existing traffic operating conditions for all of the I-580 freeway segments east of I-238 are shown in Table 4.7-7 under the Altamont Landfill section. I-580 is congested along much of its length in the westbound direction during the A.M. peak hour, and in the eastbound direction during the P.M. peak hour.

Traffic operating conditions for the interchange and roadways leading to the Vasco Road Landfill are shown in Table 4.7-11.

The foregoing analysis was performed using the procedures described in the Highway Capacity Manual (TRB 1994). A weaving section exists on Northbound Vasco Road at the 580 interchange. In analyzing that weaving section, the procedures for the weaving analysis were modified to account for the fact that the weaving section analyzed is on Vasco Road, and the Highway Capacity Manual (HCM) procedures apply to freeway speeds. The maximum posted speed on Vasco Road in the weaving section is 45 mph. The adjusted LOS criteria for Vasco Road are shown in Appendix S.

During the morning peak hour, a traffic bottleneck occurs eastbound on the I-580 exit to Vasco Road just after the exit. This bottleneck creates queues that sometimes extend onto the freeway. In the westbound direction, the Vasco Road on-ramp operates at capacity.

During the evening peak hour, bottlenecks occur at the point where eastbound traffic exits the freeway, on the ramp after the exit, and at the weaving section on northbound Vasco Road between the loop ramps. The westbound freeway on-ramp also operates at capacity during the

P.M. peak hour. In addition, the Vasco Road/Northfront Road intersection operates at LOS E (below standard) during the P.M. peak hour.

*Truck Traffic.* Truck volumes were taken from Caltrans' *Average Annual Daily Truck Traffic on the California State Highway System – 1995.* Caltrans estimates that on I-580 between I-238 in San Lorenzo and SR 84 in Livermore, trucks comprised between 7.8 and 9.4 percent of all vehicles (depending on location). Of these trucks, the approximate breakdown by number of axles is: 28 percent 2-axle; 8 percent 3-axle; 3 percent 4-axle; and 61 percent 5-axle.

## 4.8 NOISE

The region of influence (ROI) for noise impacts includes areas adjacent to the proposed dredging as well as the reuse/disposal site options. This includes the vicinities of the Inner, Middle, and Outer harbors and the routes that would be used by trucks off-hauling dredged material. Existing noise sources and noise levels, sensitive receptors in the ROIs, and the planning framework for noise are described below. Wildlife may also be sensitive to increased noise levels; potential noise impacts on wildlife are addressed under biological resources (section 5.4).

**Noise Descriptors**

Noise is defined as unwanted sound that disrupts normal activities or that diminishes the quality of the environment. It is usually caused by human activity that adds to the natural acoustic setting of a locale. Noise sources that contribute to *regional* ambient noise levels are typically transportation-related (mobile) sources, including vehicular traffic, trains, ship traffic, and aircraft overflights. In contrast, noise sources that contribute to *local* ambient noise levels are generally from point sources, including construction sites, industrial sites, or other places where heavy equipment or noise-generating machinery is used.

Sound is mechanical energy transmitted by pressure waves in a compressible medium such as air, whereas noise is unwanted sound. Sound is characterized by various parameters that describe the rate of oscillation of sound waves, the distance between successive troughs or crests, the speed of propagation, and the pressure level or energy content of a given sound. In particular, the sound pressure level has become the most common descriptor used to characterize the loudness of an ambient sound level. The unit of sound pressure ratioed to the faintest level detectable by a young person with good hearing is called a decibel. The decibel (dB) scale is used to quantify sound intensity. Because sound or noise can vary in intensity by over one million times within the range of human hearing, a logarithmic loudness scale is used to keep sound intensity numbers at a convenient and manageable level. Since the human ear is not equally sensitive to all sound frequencies within the entire spectrum, human response is factored into sound descriptions in a process called "A-weighting," written as dBA.

Environmental noise is measured in units of dBA. The dBA, or A-weighted decibel, refers to a scale of noise measurement that approximates the range of sensitivity of the human ear to sounds of different frequencies. On this scale, the normal range of human hearing extends from about 0 dBA to about 140 dBA. Typical sound levels that occur in common noise environments are listed in Table 4.8-1. A 10-dBA increase in the level of a continuous noise represents a perceived doubling of loudness; a 5-dBA increase is a readily noticeable change, while a 3-dBA increase is barely noticeable to most people.

Time variations in noise exposure are typically expressed in terms of a steady-state energy level (called Leq) which represents the acoustical energy of a given measurement. Because community receptors are more sensitive to unwanted noise intrusion during the evening and at night, state law requires that for planning purposes, an artificial dB increment be added to quiet time noise levels in a 24-hour noise descriptor called the Community Noise Equivalent Level (CNEL). CNEL adds a 5-dB penalty during the evening hours (7 P.M. to 10 P.M.) and a 10-dB penalty during the night hours (10 P.M. to 7 A.M.). Another 24-hour noise descriptor, called the day-night noise level (Ldn), is similar to CNEL. While both add a 10-dB penalty to all nighttime noise events between 10

**Table 4.8-1. Typical Sound Levels Measured in the Environment**

| *At a Given Distance from Noise Source* | *A-Weighted Sound Level in Decibels* | *Noise Environments* | *Subjective Impression* |
|---|---|---|---|
| | 140 | | |
| Civil defense siren (100') | | | |
| | 130 | | |
| Jet takeoff (200') | 120 | | Pain threshold |
| | 110 | Rock music concert | |
| Pile driver (50') | 100 | | Very loud |
| Ambulance siren (100') | | | |
| | 90 | Boiler room | |
| Freight cars (50') | | Printing press plant | |
| Pneumatic drill (50') | 80 | In kitchen with garbage disposal running | |
| | 70 | | Moderately loud |
| Vacuum cleaner (10') | 60 | Data processing center | |
| | | Department store | |
| Light traffic (100') | 50 | Private business office | |
| Large transformer (200') | | | |
| | 40 | | Quiet |
| Soft whisper (5') | 30 | Quiet bedroom | |
| | 20 | Recording studio | |
| | 10 | | Threshold of hearing |
| | 0 | | |

*Source:* U.S. Department of Housing and Urban Development 1985.

P.M. and 7 A.M., Ldn does not add the evening 5-dB penalty. In practice, Ldn and CNEL usually differ by less than 1 dBA at any given location for transportation and other semi steady-state noise sources. Another noise descriptor that is referenced in the noise ordinances of the cities of Oakland and Alameda is the maximum instantaneous noise level ($L_{max}$) measured during a given measurement period.

Human response to noise varies from individual to individual and is dependent upon the ambient environment in which the noise is perceived. The same noise that would be highly intrusive to a sleeping person or someone in a quiet park might be barely perceptible at an athletic event or in the middle of the freeway at rush hour. Therefore, planning for an acceptable noise exposure must take into account the types of activities and corresponding noise sensitivity in a specified location for each particular set of land uses. Some general guidelines are as follows: sleep disturbance may occur at less than 50 dB, interference with human speech begins at around 60 dB, and hearing damage may result from prolonged exposure to noise levels in excess of 90 dB.

### 4.8.1 Proposed Dredge Area

*Existing Noise Sources*

The primary noise sources in the ROI for proposed dredging activities include Port-related maritime uses along the shoreline of the Inner, Middle, and Outer Harbor areas, trucks on local roadways, existing military activities associated with the Oakland Army Base (Figure 4.8-1), and trains associated with railroad facilities of Union Pacific Railroad (UPRR). Railroad tracks of the Union Pacific Railroad (which also include former Southern Pacific facilities) extend through Oakland, generally following the Oakland waterfront from West Oakland on the north to East Oakland on the south. The privately-owned Alameda Beltline is located near the Alameda waterfront east of the Inner Harbor turning basin (Figure 4.8-2). This line extends between the now-closed Alameda Fleet Supply Center, through Alameda, eventually connecting with Union Pacific railroad facilities in Oakland (personal communication, Furtney 1997).

*Existing Noise Environment*

In order to characterize the current noise environment in the ROI for the proposed dredging activities, available noise data from other land use and development studies were assembled, and they are presented in Table 4.8-2. The data in this table include short- and long-term noise measurements, and the measurement locations are shown on Figure 4.8-1. These measurements indicate that noise levels in the ROI for proposed dredging activities are generally high (about 70 dBA) along the I-880 freeway, local streets that serve as truck routes, BART tracks, and UPRR railroad tracks. Local streets in the ROI, where noise levels generally exceed 70 dBA, include (but are not limited to) 3rd Street (south of Adeline Street) and 7th Street.

The closest sensitive receptors to the proposed dredging area are residences located on 3rd Street (3,200 feet northeast of the proposed Inner Harbor turning basin), and isolated residences located in the vicinity of Brush Street and Martin Luther King Jr. Way near 4th and 5th streets (2,700 feet southeast of the proposed Inner Harbor turning basin) (receptor locations 1 and 2, respectively, Figure 4.8-2). Homes located on 3rd Street and surrounding the West Oakland neighborhood are separated from Port-related uses by the I-880 freeway structure. The isolated residences in the vicinity of Brush Street and Martin Luther King Jr. Way are surrounded by commercial and industrial land uses. Therefore, the noise environment in the vicinity of these receptors is dominated by traffic noise from the I-880 freeway as well as truck traffic along local roadways.

The now-closed NAS Alameda is relatively quiet due to the lack of major noise sources, but is developed with residential uses in the vicinity of the Inner Harbor. Although currently unoccupied, residential uses include on- and off-base housing (receptor locations 3, 4, 5, and 6 in Figure 4.8-2). Off-base housing includes the North Housing located on the south side of Mosely Avenue (approximately 500 feet from the Inner Harbor shoreline) and Marina Village housing located south of Singleton Avenue (approximately 1,200 feet south of the Inner Harbor shoreline). On-base housing includes the former bachelor housing located south of West Redline Avenue, former officers homes located south and west of Main Street, with the homes along Barbers Point Road located closest (within approximately 500 feet) of the Alameda shoreline of the Inner Harbor.

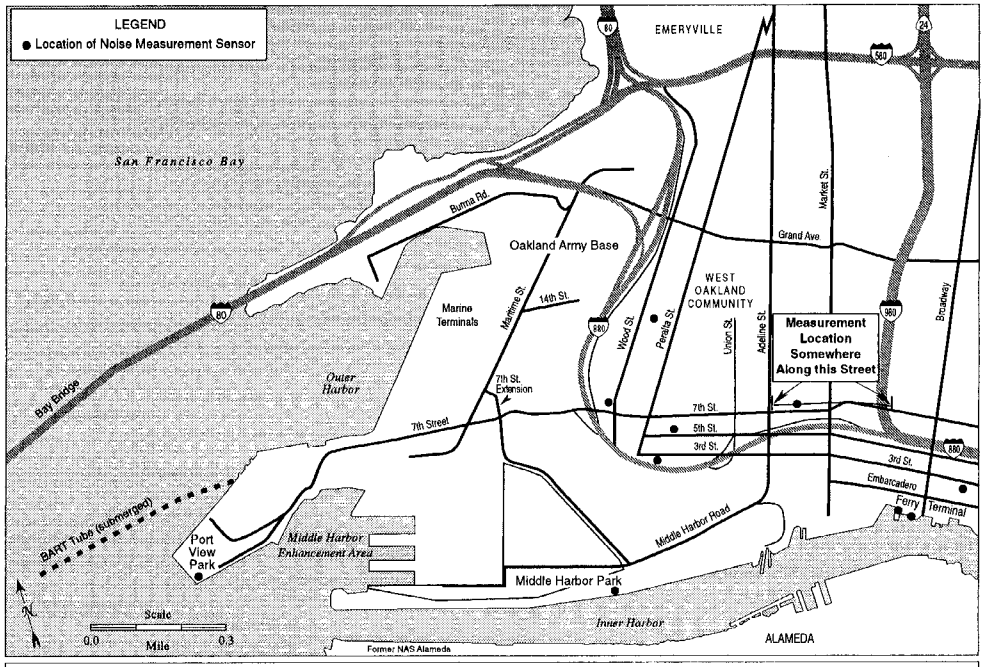



**Figure 4.8-1**

**NOISE MEASUREMENT LOCATIONS**

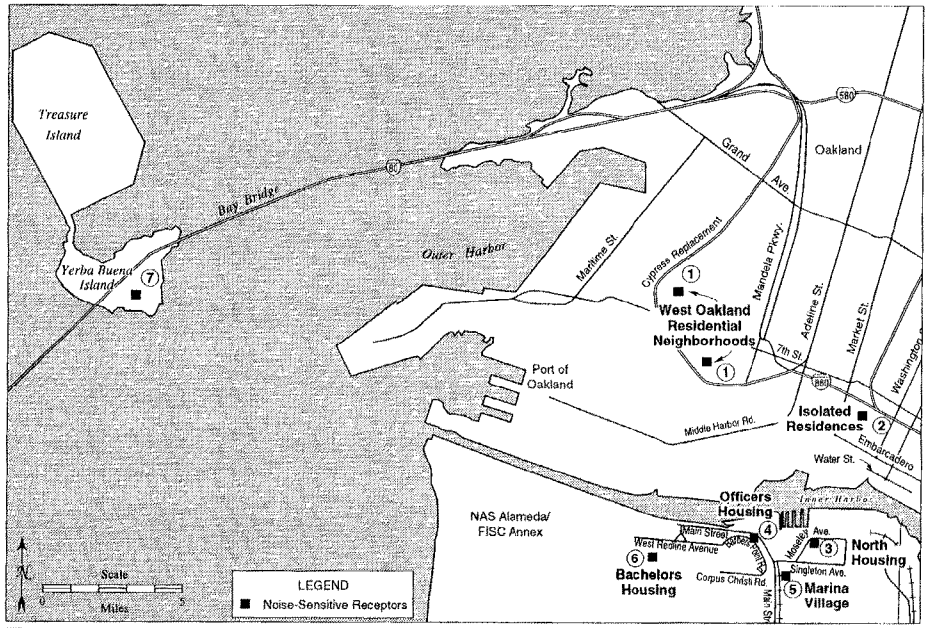



**Figure 4.8-2**

**EXISTING AND FUTURE OAKLAND AND ALAMEDA NOISE-SENSITIVE RECEPTORS**

**Table 4.8-2. Existing Noise Levels in the West Oakland Area**

| *Noise Measurement Locations* | *Leq* | *CNEL or Ldn* | *Distance to Centerline of Noise Source* |
|---|---|---|---|
| 3rd Street (at Amtrak Station) [1] | n/a | 72 dBA | n/a |
| Jack London Square (at Water & Washington streets) [1] | 66 dBA | – | n/a |
| Jack London Square (Waterfront Hotel) [1] | 55 dBA | – | n/a |
| Jack London Square (Oakland Fire Station #2) [1] | 61 dBA | – | n/a |
| 7th Street (between Jefferson & Adeline streets) [1] | 70-72 dBA | – | n/a |
| 7th Street (at 7th Street Ext.) [2] | 74 dBA | – | 40 feet |
| West Oakland streets along I-880 Cypress Corridor [3] | 61-74 dBA | – | n/a |
| Middle Harbor Park, End of Ferro Street [4] | 68 dBA[5] | 67 dBA[6] | n/a |
| Port View Park, End of 7th Street [4] | 50-62 dBA | 62 dBA | n/a |
| I-880 near 3rd and Lewis streets [4] | 52-60 dBA | 60-61 dBA | 300 feet |
| Chester Street Tot Lot, Chester Street at 3rd Street [7] | 60 dBA | – | 25 feet |
| Bertha Port Tot Lot, Goss Street at Wood Street [7] | 65 dBA | – | 25 feet |
| Willow Park Neighborhood Park, Willow Street at 14th Street [7] | 62 dBA | – | 25 feet |
| Ernie Raimondi Park, Wood Street northeast of 18th Street [7] | 63 dBA | – | 25 feet |
| DeFremery Park, 16th Street northwest of Adeline Street [7] | 55 dBA | – | 25 feet |

"–" = long-term measurements were not collected
n/a = not applicable or available

*Notes:* In general, Leq represents short-term measurements (15- or 30-minute), while CNEL or Ldn represent long-term measurements (24-hour).

1. FISCO and Port of Oakland (1997b). Measurement at Water and Washington streets includes a train horn, while a loud, passing tugboat was included in the Fire Station #2 measurement.
2. Measurements taken in 1990 and indicated noise levels along the I-880 Cypress corridor were 61 to 74 dBA (Leq). Projected levels at these locations once this freeway segment is completed and fully operational (1998) range between 66 to 78 dBA (Leq) and required noise barriers would reduce noise levels to less than 67 dBA in all areas except at the Goss/9th Street and I-580/I-880 vicinities, where projected mitigated noise levels would be 68 to 69 dBA at residential receptors.
3. Environmental Science Associates, Inc. (1992)
4. Long-term measurements collected by Geier & Geier Consulting on October 2-3, 1997 at Middle Harbor Park and Port View Park, and on September 23-25, 1997 at I-880 near 3rd and Lewis streets. There is a noise wall along this section of I-880.
5. This short-term measurement was taken on September 23, 1997, and reflects noise generated by a hydraulic dredger operating approximately 650 feet away.
6. Measurement includes noise from dredging activities with a clamshell dredger that were occurring in the Inner Harbor adjacent to Middle Harbor Park (within approximately 500 feet) and crane loading/unloading operations at the adjacent APL berths (within approximately 600 to 700 feet).
7. Measurements collected by Geier & Geier Consulting, Inc. in September 1997 and are based on short-term measurements (10 to 15 minutes) taken between 9:00 A.M. and 11:00 A.M. Passing trucks and/or buses were the primary noise sources at all parks except at DeFremery Park (where there were buses on Adeline Street). Passing BART trains were another noise source at the Chester Street and Bertha Port parks.

*Source:* Geier & Geier Consulting, Inc. 1997.

### *Noise Standards*

*City of Oakland Noise Ordinance*

The Oakland Planning Code (Section 7710) specifies standards for maximum allowable noise levels at various land uses. These standards are presented in Table 4.8-3. The first set of standards applies to long-term noise exposure for specific land uses, while the second set of standards applies to temporary exposure to short- and long-term construction noise (less than and more than 10 days, respectively). Construction noise standards apply to activities occurring during the daytime. The nighttime construction noise standard (between weekday hours of 7 P.M. and 7 A.M. or between 8 P.M. and 9 A.M. on weekends or federal holidays) shall not exceed the applicable nighttime noise level standards listed in Table 4.8-3. The standards also indicate that, in areas where the measured ambient noise level exceeds the applicable noise level standard, the ambient noise level becomes the applicable standard (i.e., in such situations, the ambient noise level sets the standard that must be maintained).

**Table 4.8-3. City Of Oakland Maximum Allowable Receiving Noise Standards**

| *Noise Level Standard for Specified Land Uses* | | | |
|---|---|---|---|
| | | MAXIMUM ALLOWABLE NOISE LEVEL STANDARD, dBA | |
| *Receiving Land Use* | *Cumulative Number of Minutes in 1-Hour Time Period* | *Daytime 7 A.M. to 10 P.M.* | *Nighttime 10 P.M. to 7 A.M.* |
| Residential, School, Child Care, Health Care Or Nursing Home, and Public Open Space | 20 (L33) | 60 | 45 |
| | 10 (L16.7) | 65 | 50 |
| | 5 (L8.3) | 70 | 55 |
| | 1 (L1.7) | 75 | 60 |
| | 0 (Lmax) | 80 | 65 |
| Commercial | 20 (L33) | 65 | 65 |
| | 10 (L16.7) | 70 | 70 |
| | 5 (L8.3) | 75 | 75 |
| | 1 (L1.7) | 80 | 80 |
| | 0 (Lmax) | 85 | 85 |
| Manufacturing, Mining, and Quarrying | 20 (L33) | 70 | 70 |
| | 10 (L16.7) | 75 | 75 |
| | 5 (L8.3) | 80 | 80 |
| | 1 (L1.7) | 85 | 85 |
| | 0 (Lmax) | 90 | 90 |
| *Noise Level Standards for Temporary Construction or Demolition Activities* | | | |
| *Operation/Receiving Land Use* | | *Daily 7 A.M. to 7 P.M.* | *Weekends 9 A.M. to 8 P.M.* |
| Short Term Operation (less than 10 days) | | | |
| Residential | | 80 | 65 |
| Commercial, Industrial | | 85 | 70 |
| Long Term Operation (more than 10 days) | | | |
| Residential | | 65 | 55 |
| Commercial, Industrial | | 70 | 60 |

*Source:* City of Oakland 1996a.

*City of Alameda Noise Ordinance*

The City of Alameda has adopted a quantitative ordinance in Section 11 of the City's Municipal Code. The noise ordinance establishes noise level standards based on the type of land use receiving the noise.

Applicable ordinance limits are presented in Table 4.8-4. These standards are to be adjusted upward to reflect higher measured ambient noise levels and downward by 5 dBA if offending noises include simple tones, speech or music, or recurring impulsive noises. Simple or pure tones are more noticeable at lower levels due to their continuous or hum component, while music and speech are intrusive at lower levels as people tend to process these types of noise differently, trying to discern it. Recurring impulsive noise, such as pile driving, can be disturbing or annoying at low levels because of its repetitive nature. With respect to construction noise, construction activities are limited to 7:00 A.M. to 7:00 P.M., Monday through Friday, and 8:00 A.M. to 5:00 P.M. on Saturdays. Maximum allowable construction noise levels are not specified in the ordinance.

**Table 4.8-4. City of Alameda Maximum Allowable Receiving Noise Standards**

| *Noise Level Standard for Specified Land Uses* | | | |
|---|---|---|---|
| | *Cumulative Number of Minutes in 1-Hour Time Period* | MAXIMUM ALLOWABLE NOISE LEVEL STANDARD, dBA | |
| *Receiving Land Use* | | *Daytime 7 A.M. to 10 P.M.* | *Nighttime 10 P.M. to 7 A.M.* |
| Residential, School, Hospital, Church, or Public Library | 30 ($L_{50}$) | 55 | 50 |
| | 15 ($L_{25}$) | 60 | 55 |
| | 5 ($L_{8.3}$) | 65 | 60 |
| | 1 ($L_{1.7}$) | 70 | 65 |
| | 0 ($L_{max}$) | 75 | 70 |
| Commercial | 30 ($L_{50}$) | 65 | 60 |
| | 15 ($L_{25}$) | 70 | 65 |
| | 5 ($L_{8.3}$) | 75 | 70 |
| | 1 ($L_{1.7}$) | 80 | 75 |
| | 0 ($L_{max}$) | 85 | 80 |

*Source*: City of Alameda 1996.

### 4.8.2 Possible Reuse/Disposal Options

***Existing Noise Environment***

The areas around the reuse/disposal site options are located in a variety of settings ranging from the urbanized Port of Oakland to grazing and agricultural lands. In the urban Port setting, noise sources include industrial uses, port activities, and traffic on local roadways. In rural areas, noise sources are limited to agricultural uses and traffic on local roadways.

Ambient noise levels at the reuse/disposal site options located in or near Port of Oakland vary by location and proximity to port-related noise sources, but are generally substantially higher than ambient noise levels in rural settings. The nearest land uses and sensitive receptors to each reuse/disposal site option are described below.

*Vision 2000 Upland*

The FISCO/Vision 2000 Upland EIS/R (U.S. Navy and Port of Oakland 1997b) indicates that limited data are available concerning noise levels in the Vision 2000 Upland area. CNEL levels on FISCO property were estimated to be above 75 dB in the mid 1980s. Noise levels may have declined somewhat since that time, due to changes in aircraft flight operations from Alameda Naval Air Station.

Existing noise levels in the Vision 2000 Upland area are indicated by noise measurements taken for Port View Park (adjacent to Vision 2000 Upland) and Middle Harbor Park (located adjacent to Vision 2000 Upland), as well as measurements collected in nearby areas to the north and east (locations indicated in Figure 4.8-1). These measurements are listed in Table 4.8-2; they indicate that noise levels in the Vision 2000 Upland area generally range between 60 and 74 dBA (Leq), depending on proximity to roadways (truck routes) and Port-related activities.

Existing noise-sensitive land uses in the vicinity include the West Oakland residential area located north and east of the new I-880 Cypress Freeway and approximately 3,000 to 4,000 feet northeast of the center of the Oakland Inner Harbor and are dominated by traffic noise from the I-880 freeway (receptor 1, Figure 4.8-2).

*New Berth 21*

The New Berth 21 site is located north of Maritime Street in the Outer Harbor area. The site is currently undeveloped and the primary sources of noise in this vicinity include the I-880 freeway and other maritime-related uses at adjacent berths. The closest sensitive receptors are residential uses located south of the I-880 freeway, approximately 4,000 feet south of the New Berth 21 site (receptor 1, Figure 4.8-2), and the noise environment is dominated by traffic noise from I-880 and traffic on local roads. Vacant housing associated with the Oakland Army Base is located approximately 2,000 feet south of this site, across Maritime Street.

*Middle Harbor Enhancement Area*

The description above for the Vision 2000 Upland applies to this site as well.

*NAS Alameda*

Existing land uses in areas adjacent to or near the NAS Alameda include the ferry terminal, parking, vacant warehouses at the Naval Supply Center Annex, vacant base housing, vacant recreational facilities (e.g., gymnasium, etc.), and runways associated with the former Navy use. Since base facilities are currently vacant, the primary sources of noise along the waterfront portion of the NAS Alameda are currently maritime activities along the Inner Harbor.

*SF-DODS*

SF-DODS is located in the ocean 49 nautical miles from the coast and 50 nautical miles from Golden Gate Bridge. The existing noise environment is dominated by natural sources (such as wind) and passing ships. The site is located a considerable distance from any noise-sensitive receptors (COE and Contra Costa County 1997).

*Hamilton Wetlands Restoration*

The primary existing noise sources in the vicinity of the Hamilton site are traffic along U.S. Highway 101, construction activities throughout the Hamilton Army Airfield for housing, community centers, roads, and contaminant remediation for base closure. Other local roads, including Main Gate Road, Nave Road, and Bel Marin Keys Road, contribute lesser noise levels.

Existing noise-sensitive land uses in the Hamilton vicinity include Department of Defense housing located south of Main Gate Road, Lanham housing located north of Main Gate Road, the Hamilton Meadow Home Park schools east of Nave Road just south of Main Gate Road, and the Los Robles Mobile Home Park located southeast of the intersection of Nave Road and Bel Marin Keys Road. Future land uses include the New Hamilton Partnership housing, to begin construction in 1998, located south of the airfield behind a recently-constructed, 15-foot-tall flood control levee.

*Montezuma Wetlands Restoration*

The most prevalent sounds at the Montezuma Wetlands site are birds and wind. The primary noise source is distant air traffic associated with Travis Air Force Base. The noise sensitive land uses in the area are residences along Collinsville Road adjacent to the Sacramento River (Collinsville Resort). A Department of Water Resources day-use area is also located along Montezuma Slough at the end of Fire Truck Road. Short-term noise measurements taken for the proposed Montezuma Wetlands Project (COE and Solano County 1994) indicate that the average noise level ($L_{eq}$) near the residential areas ranged from 41 to 44 dBA during the daytime. The background noise level (the noise level exceeded 90 percent of the time) ranged from 36 to 38 dBA. Noise levels generated by aircraft did not exceed 48 dBA. The Jerico dredging operation was the major source of noise in the immediate area, but noise from this activity was not audible at either location at which noise measurements were taken (COE and Contra Costa County 1997).

*Various Landfills*

Existing noise sources in the vicinity of Redwood Landfill include traffic on U.S. Highway 101, frontage and access road traffic, aircraft flyovers from Gnoss Field located within a mile south of the landfill, and on-site activities at the landfill. Traffic noise from U.S. Highway 101, located approximately 3,000 feet west of the landfill, is the predominant source of noise. No sensitive receptors are located in the immediate vicinity of this landfill. The two other landfills that could be used under this disposal option are the Altamont Landfill and Vasco Road Landfill, both located in Alameda County. These landfills are located in the hills north of Livermore, approximately 1.5 to 2 miles north of the I-580 freeway. Traffic noise from I-580 is the primary source of noise in this area, although the landfills are isolated from the freeway by intervening hills. No sensitive receptors are located in the immediate vicinity of these landfills. Residential uses are located along Vasco Road, which serves as the access road to the Vasco Landfill. Greenville Road, Altamont Pass Road, and Northfront Road provide access to Altamont Landfill. No sensitive receptors are located along these roads.

## 4.9 HUMAN HEALTH AND RISK

As described in Chapter 3 of this EIS/R/FS, the sediment or soil in some dredging locations contains chemical contaminants that can cause adverse impacts on human health. Such impacts can occur if a person (a "receptor") comes into contact with contaminated dredged materials. The means by which a receptor may be exposed to a contaminant is referred to as an "exposure pathway". Thus, the first steps in assessment of human health risk are identification of potential receptors and exposure pathways. Surrounding land uses, which could indicate the presence of potential receptors, are described in section 4.12. Meteorological conditions, which could affect dispersal of contaminants during dredging and disposal operations, are described in section 4.1.

Receptors that could come into contact with contaminated dredged materials include:

- The dredge crew;
- The off-loading crew;
- Workers at the rehandling facility who are drying and/or stabilizing dredged materials;
- Construction workers using dredged materials to raise grades during upland construction;
- Nearby workers;
- Truck drivers transporting dredged materials; and
- Passers-by at the scene of an accidental spill from a truck carrying dredged materials.

Nearby workers include other construction workers (those who are not working directly with dredged materials) and terminal workers (if dredged material handling operations occur in the vicinity of the nearby APL terminal or on the new Berth 55-58). No residential areas are located close to the proposed dredging, handling, or reuse/disposal locations.

Exposure pathways by which receptors could be exposed to dredged materials include:

- Direct dermal contact with dredged materials;
- Incidental ingestion of dredged materials (usually due to improper hygiene, when workers fail to wash their hands before eating, drinking, or smoking); or
- Inhalation of airborne dust released from dried dredged materials.

As long as contaminated sediment or soil remains in place (in the Bay or on the ground), receptors cannot come into contact with contaminants. Under existing conditions, the only potential for contact with contaminants is through maintenance dredging activities. Human health risks associated with maintenance dredging are addressed in other documents, including the Human Health Risk Assessment (HHRA) for the Berth 10 Rehandling Facility (*Calculation of Risk-Based Storage Durations for Dredged Sediment Piles at Berth 10 of the Bridge Terminal*, Environmental Toxicology International, October 1994) and the designation documentation for SF-DODS. Thus, this EIS/R/FS does not further describe human health baseline conditions for this project.

## 4.10 HAZARDOUS MATERIALS AND CONTAMINATED WASTES

This section addresses hazardous materials and the two types of contaminated dredged material (wetland non-cover and fill) defined in Chapter 3. The other two categories of dredged material (suitable for unconfined ocean disposal and wetland cover), which contain only very low levels of contaminants and are not of concern for this discussion, are addressed in sections 4.3 and 5.3.

### 4.10.1 Hazardous Materials

Hazardous materials are defined as "materials that may pose an unreasonable risk to health, safety, and property when transported in commerce" (49 CFR 171.8). Hazardous materials are listed in Appendix A of 49 CFR Part 172.101. Hazardous materials include hazardous wastes as defined by the federal Resource Conservation and Recovery Act (RCRA), the federal Hazardous and Solid Waste Amendments (HSWA) of 1984, and the state Hazardous Waste Control Health and Safety Law (Chapter 6.5 of the California Code of Regulations [CCR] Title 22). In addition to the various tracking, labeling, and placarding requirements applicable to hazardous materials under 49 CFR Part 173 *et seq.*, transport of hazardous materials on water is governed by 46 CFR Part 146 *et seq.* (Dangerous Cargo). The Port Tariff (Port of Oakland 1996) includes further requirements applicable to shippers of hazardous materials using Port facilities.

The presence of hazardous materials, if any, in the Port is due to normal operations. As part of the regular shipping operations conducted at the Port, cargo containing hazardous materials may be shipped into and out of the Port. Various vessels calling at the Port may also use or generate small quantities of hazardous materials as part of their routine operations (e.g., on-board maintenance). The Port can only require that shippers follow applicable laws and regulations in shipping their cargo; it does not control the types and quantities of hazardous materials brought into the Port.

Hazardous wastes, although included in the definition of hazardous materials, are also regulated under RCRA, HSWA, and 22 CCR Chapter 6.5. The statutory definition of hazardous wastes are those wastes classified as ignitable, corrosive, reactive, or toxic. A material can be classified as a hazardous waste only after it is generated, i.e., after it has been designated as a waste by its owner. Any materials that meet the statutory definition of hazardous wastes are taken off Port property for treatment or disposal, as appropriate.

***Proposed Dredge Area***

The presence of hazardous materials in the proposed dredge area is limited to vessels in transit. No fixed locations containing hazardous materials are known within the proposed dredge area.

***Possible Reuse/Disposal Options***

The following reuse/disposal locations are not known to contain hazardous materials: New Berth 21, Middle Harbor Enhancement Area, former NAS Alameda, SF-DODS, Hamilton Wetlands Restoration, and Montezuma Wetlands Restoration. Small quantities of hazardous materials may be present at the Vision 2000 Upland site as part of ongoing operations.

### 4.10.2 Contaminated Sediment

As used in this section, "contaminated sediment" refers to sediment that exceeds the chemical criteria for wetland non-cover material (Wolfenden and Carlin 1992). Contaminated sediment can generally be used for construction fill without treatment or special precautions, provided that it does not contain elevated levels of soluble compounds and does not pose a potential risk to human health (see sections 4.9 and 5.9 for a discussion of human health concerns potentially posed by contaminated sediments). This material, which requires special precautions to be taken if it is to be disposed of in the aquatic environment, is preferentially reused or disposed of at an upland location. Contaminated sediment may require treatment prior to reuse as construction fill, due to elevated levels of soluble compounds.

*Proposed Dredge Area*

The channel footprint for the 50-foot project is similar to the previous 42-foot project except for a small part of the channel banks along the Inner Harbor, Outer Harbor passage, and Inner Harbor turning basin. The difference in the channel footprint between the 42-foot project and the 50-foot project is the areas that would be widened (not just deepened) as shown in Figure 2.1-1. Since the majority of the project site has been periodically dredged, most recently in 1997, as part of the 42-foot project, most of the remaining dredged material has background or low levels of contamination. The small portion of the project area that would expand dredging into new channel, berth, and turning basin areas (that were not affected by the 42-foot project) has been tested, and pockets of construction fill have been detected (see Chapter 3).

Definitive information on the sources of contaminated waste in channel sediments is not available. A number of industrial land uses in the vicinity, however, are known to have historically contributed to the existing contamination.

The UPRR Mole (a breakwater with a rail-track extension) was constructed sometime prior to 1910 using an unknown source of fill. For an extensive period, the Inner Harbor turning basin area was used as a shipyard. Since the early 1900s, numerous types of industrial and related activities could have contaminated the sediments adjacent to the UPRR Mole and the Inner Harbor turning basin. These include ship building and repair, a lumber yard, creosoting, paint production, tanneries, pesticide storage, foundries, light and power production facilities, coal storage and distillation, petroleum refineries, oil distribution plants, rail repair and cleaning, and naval aviation operations. Sewage and storm water outfalls discharging untreated wastes were also located along the channels.

*Possible Reuse/Disposal Options*

Construction fill may be reused or disposed of at the New Berth 21, the Vision 2000 Upland area, and Various Landfills. Former NAS Alameda will only accept wetland cover, or better quality material. Provided that construction fill does not contain elevated levels of soluble compounds, no further treatment is required prior to reuse/disposal. If elevated levels of leachable compounds are present, then limited treatment may be required prior to reuse or disposal.

If hazardous wastes are detected in dredged materials, they must be treated or disposed of at an approved location outside the Port. All the reuse/disposal options except for the Various Landfills are prohibited by federal and state regulations from accepting hazardous waste for disposal. Another possibility is that hazardous waste could be transported to off-site treatment

facilities (see section 2.2.4); a variety of these facilities are available in the Bay Area. Facilities within the Bay Area are capable of accepting non-hazardous solid waste (i.e., Class III landfills), and special wastes that do not meet the statutory definition of hazardous wastes but that may pose a threat to human health or the environment if not adequately confined (i.e., Class II facilities). An alternative to local Class II landfills is the non-RCRA landfill operated by East Carbon Development Corporation in Utah. In the unlikely event that statutory hazardous waste is identified in the project area, it will have to be disposed of at a RCRA (Class I) landfill, either within California or out of state.

## 4.11 PUBLIC SERVICES

This section describes public services, utilities, and related infrastructure that could be affected by project dredging activities. The focus is on the potential for damage to these types of facilities, the need to possibly relocate or otherwise protect the facilities, and the potential for disruption in these services/utilities during dredging or disposal operations. The analysis does not address the project's effect on supply and demand for these public services, since these would not be substantively affected by the proposed project.

The region of influence (ROI) is the footprint of the proposed channel deepening area within the Inner, Middle, and Outer harbors (Figure 4.11-1) to a depth of 52 feet (dredging to 50 feet MLLW plus 2 feet of overdepth). The ROI also includes each reuse/disposal site.

A number of agencies, municipalities, and businesses, including the Port of Oakland, Pacific Gas & Electric (PG&E), U.S. Navy Department of Public Works (Navy), Bay Area Rapid Transit District (BART), East Bay Municipal Utilities District (EBMUD), City and County of San Francisco, and the City of Alameda were contacted to provide information and location maps of utilities that may be impacted by the project. All reported submerged utilities in and near the ROI were located on maps. Additional information on the depth of utilities was acquired only for the four utilities that are within the footprint of the dredge area; these are described below and are shown on Figure 4.11-1.

### 4.11.1 Proposed Dredge Area

*Abandoned Navy Power Cable*

The U.S. Navy Public Works Department reported that an abandoned power cable which formerly served Treasure Island enters the Bay at Berth 26 (personal communication, D. Pollistrini 1997). The northern segment of the power cable is plotted on the San Francisco-Oakland Bay Bridge (SFOBB) Utility Plan for Design Study (Port of Oakland 1997g). It runs in a north-south alignment from the westerly tip of the Bay Bridge toll plaza peninsula through the Oakland Outer Harbor to the Oakland Naval Supply Center toward Berth 26 (see Figure 4.11-1, Utility 1). The southern part of the cable at Berth 26 is not shown on the SFOBB design map, but it is identified on a map of the Transbay Container Terminal (Port of Oakland 1997h). The depth of the abandoned cable, and whether the cable still exists is not known.

*BART Transbay Tube and Anode System*

The BART Transbay Tube and Anode System enters the Bay in an east-west alignment at the Outer Harbor entrance channel (see Figure 4.11-1, Utility 2).

The BART tube runs beneath the Outer Harbor Channel at Berth 34. According to plans provided by BART, the tube is protected by a 5-foot-thick stone blanket (San Francisco Bay Area Rapid Transit 1997b,c). At station 45, beneath the northwestern margin of the channel, the top of the stone blanket is 51.5 feet MLLW (or 55 feet below mean sea level [msl]). At station 47, beneath the southeast margin of the channel, the top of the stone blanket is 53.5 feet below msl or 50 feet MLLW (personal communication, D. Duey 1997). The top of the BART tube is located at 56.5 feet

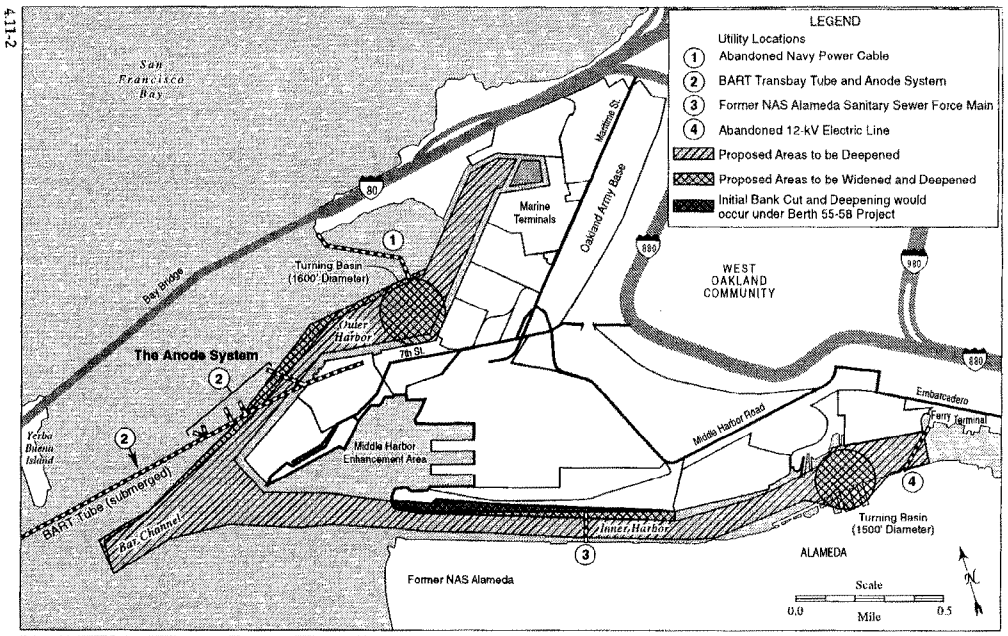



**Figure 4.11-1**

**UTILITY LOCATIONS WITHIN THE PROPOSED DREDGE AREA**

MLLW and 55 feet MLLW for stations 45 and 47, respectively (San Francisco Bay Area Rapid Transit 1997b,c).

The BART cathodic protection system consists of a series of cables connecting the BART tube with anode platforms that are driven deeply into the Bay floor sediments. In the channel area, the cables are buried within a trench approximately 5 feet below grade (personal communication, R. Andrews 1997). The anode platforms are placed outside of, but near, the margin of the channel (see Figure 4.11-1; Port of Oakland 1997l). BART is currently replacing some of the anode array as part of its general maintenance program (personal communication, P. Todd 1997).

*Sanitary Sewer Force Main*

A 16-inch sanitary sewer force main was identified on the Port of Oakland Map of the Inner Harbor at Alameda Air Station (Port of Oakland 1997i). This line served NAS Alameda and crossed the Inner Harbor near the eastern end of the Oakland Naval Supply Center at the southern end of 9th street (see Figure 4.11-1, Utility 3). The 16-inch line was relocated and enlarged to 20 inches during the construction of the 42-foot project. The new line is approximately 50 feet east of the old line at a depth of approximately 57 feet (personal communication, R. Andrews 1997).

*Abandoned 12-kV Electric Line*

An abandoned 12-kV PG&E electric line is identified at the foot of Clay Street in Oakland (Port of Oakland 1997j). The alignment is approximately northeast-southwest at the eastern project limit (see Figure 4.11-1, Utility 4). The map which identifies the line does not indicate the depth. PG&E did not indicate this line as one of their existing power lines within or near the 50-foot project (personal communications, R. Chew and T. Robinson 1997).

### 4.11.2 Possible Reuse/Disposal Options

*Vision 2000 Upland Area*

The Fleet Industrial Supply Center of Oakland (FISCO) is the primary property occupying the Vision 2000 site. It is essentially flat and is developed with a variety of industrial, transportation, and maritime uses. The Center is still operating in a limited capacity, and is expected to be closed by the Navy for reuse by the Port of Oakland. Utilities and public services that service FISCO include electrical systems, steam distribution systems, potable water and fire protection systems, wastewater collection and treatment systems, stormwater and sewer systems, telephone and telecommunication systems, and cable television systems.

*New Berth 21*

No underwater or underground utilities are present at the New Berth 21 site.

*Middle Harbor Enhancement Area*

No underwater or underground utilities are present at the Middle Harbor Enhancement Area site.

*NAS Alameda*

The NAS Alameda site consists of undeveloped area and runways. Utilities at the project site are restricted to an electrical system supporting runway lighting. Catch basins, manholes and outfalls that are part of Alameda's stormwater system are present at the site. The stormwater system is described and analyzed in sections 4.2 and 5.2.

*SF-DODS*

No underwater utilities are present at the SF-DODS Site.

***Hamilton Wetlands Restoration***

*Wastewater*

The Hamilton site is adjacent to, but not within, the Novato Sanitary District. Three components of the Novato Sanitation District (NSD) wastewater treatment system are located on the Hamilton site. A 54-inch force main runs in an easement along the northern property line of Hamilton between the site and Bel Marin Keys to the northwest and the Antennae Field to the northeast. This force main feeds into a dechlorination plant located at the northeastern corner of the Hamilton site. Finally, NSD operates a shallow water discharge pipe that extends 900 feet into San Pablo Bay. Average discharges vary from a low of 4.5 to 4.8 million gallons per day (mgd) during dry weather conditions (with a permitted capacity of 6.55 mgd) to a high well in excess of dry weather flows in the winter during wet weather peak flows. The NPDES permit does not allow any discharge to San Pablo Bay during June through August, and generally NSD does not discharge for a total of five months each calendar year (personal communication, T. Selfridge 1997).

The Novato Sanitary District's (NSD) dechlorination station is located on State property northeast of the site. The station treats all effluent from the NSD's Novato and Ignacio treatment plants prior to discharge in San Pablo Bay. The NSD requires access across the site for maintenance purposes. The NSD has been granted an easement for the station, but access across the airfield is not under easement.

*Power Supply*

The site is within PG&E's service district. PG&E has historically provided electricity service to the perimeter of the base, at which time it was distributed through the site by the military. Power is supplied through a 60-kilovolt (kV) transmission line from PG&E's Ignacio substation and the Army's substation on Escolta Drive (EIP 1986 and personal communication, Bahn).

***Montezuma Wetlands Restoration***

*Power Supply*

The Montezuma Wetlands Project is located within the PG&E service area. The project area is served by two PG&E substations, the Peabody substation in Vacaville and the Cordelia Substation in Cordelia. The area is served by 12-kilovolt (kV) over-head transmission lines. A transmission line runs east of the Project site, the entire length of Collinsville Road and terminates near the Sacramento River.

In the northern section of the Project site a transmission line runs from Collinsville Road along Dinkelspiel Road and ends near an existing pumping station and small boat launch ramp on the eastern edge of Montezuma Slough. In the southern portion of the Project site, similar transmission lines run from Collinsville Road to the Jerico Towing Company. The transmission line then continues along the perimeter of the Sacramento River and Montezuma Slough approximately 200 to 700 feet away from the water's edge and terminates at the DWR Day Use Area. Transmission lines also run east from the DWR Day Use along Fire Truck Road for approximately 900 feet.

*Water Supply*

There is no municipal water line serving the area for potable water. Water is provided by five on-site wells for cattle.

*Wastewater*

Individual septic tanks treat the wastewater currently generated in the Montezuma project area. There is no municipal sewer service available.

***Various Landfills***

The rehandling facility that would be used in connection with the landfills would be located at one or more locations within the Vision 2000 Upland area. Please refer to the discussion of utilities at that site, above. There would be no effect on utilities at the landfills, which are existing, permitted facilities.

## 4.12 LAND USE

This analysis addresses existing land and water uses, including recreational uses such as boating and fishing. Use of the harbor waters vessels by commercial vessels, including ferries, is addressed in under "Vessel Transportation" in sections 4.7 and 5.7.

### 4.12.1 Regional Setting

The project lies in the San Francisco Bay region. San Francisco Bay is a natural bay that encompasses 548 square miles of inland waterways on the northern California coast. The Bay Area comprises a nine-county area in northern California that includes Alameda, Contra Costa, Solano, Napa, Sonoma, Marin, San Francisco, San Mateo, and Santa Clara (see Figure 4.12-1). The Bay Area is one of the major shipping and port centers on the west coast. The primary commercial shipping centers in the Bay Area are the ports of Oakland, Richmond, and San Francisco.

### 4.12.2 Proposed Dredge Area

The dredge area is within the Port of Oakland. Existing and proposed land and water uses both within and adjacent to the Port are described below. Additional information regarding the uses proposed as part of the Vision 2000 program is included in section 1.6, Related Projects. Land uses described below are shown in Figure 4.12-2.

*Marine Facilities*

The Port of Oakland occupies 19 miles of waterfront, with more than 680 acres of marine terminal facilities and active support areas. The Port's nine container terminals and two break-bulk terminals are located along the waters of the Inner and Outer harbors. The Oakland waterfront is served by the mainline tracks of two railroads, the Union Pacific and the Southern Pacific. Both maintain intermodal container transfer facilities adjacent to the marine terminals.

*Recreational and Commercial Areas*

A number of commercial and recreational uses are located along the Inner Harbor between the Howard Terminal and Ninth Avenue Terminal. One of the area's primary attractions is Jack London Square, a 12-block area that has developed from a maritime/industrial area into a commercial/office and recreation/entertainment center. The Square consists of a mix of land uses, including retail stores, restaurants, offices, a television studio, a train station, marinas, hotels, and cinemas. The Franklin Roosevelt Pier is at the west end of Jack London Square, and the Oakland-Alameda Ferry operates from the foot of this pier. President Roosevelt's official yacht, the USS Potomac, is now moored next to the pier and is open to the public. Outdoor recreational uses in this area include kayaking, pleasure boating, rafting, and fishing. Jack London Village is east of Jack London Square. It is a retail shopping area that includes restaurants and retail outlets.

Several parks are located in the Port area. Middle Harbor Park is located between the American President Lines Terminal and the Union Pacific Intermodal Yard. Port View Park is located along the Middle Harbor near the 7th Street Marine Container Terminal. Estuary Park is located along the Inner Channel, southeast of Jack London Square. It includes a public boat launching ramp and

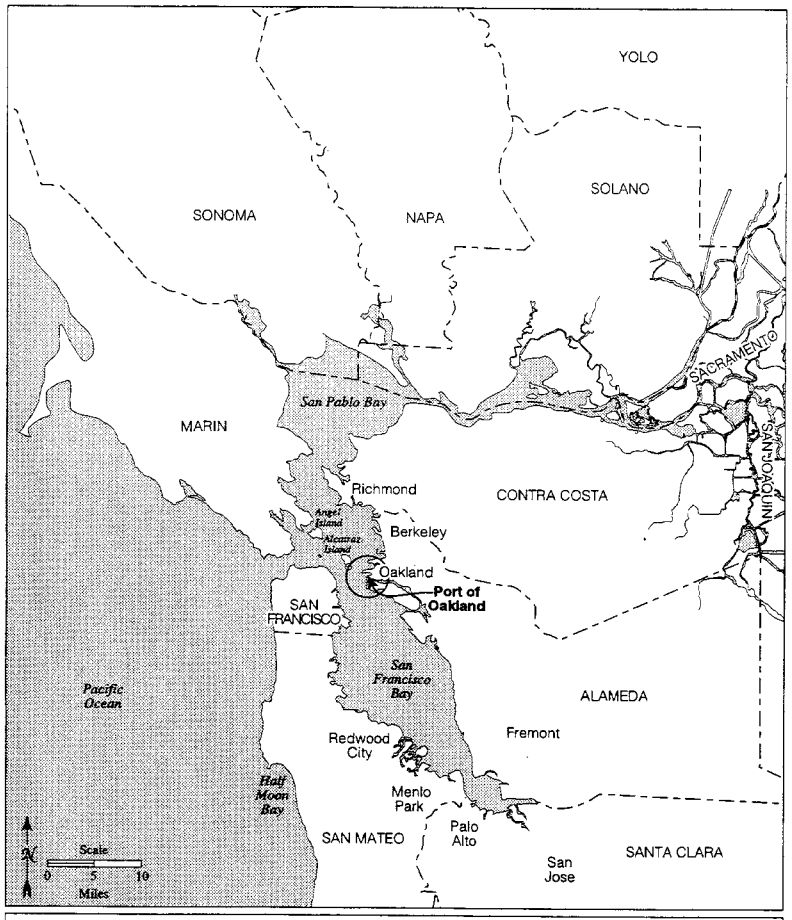



**Figure 4.12-1**

**REGIONAL SETTING**

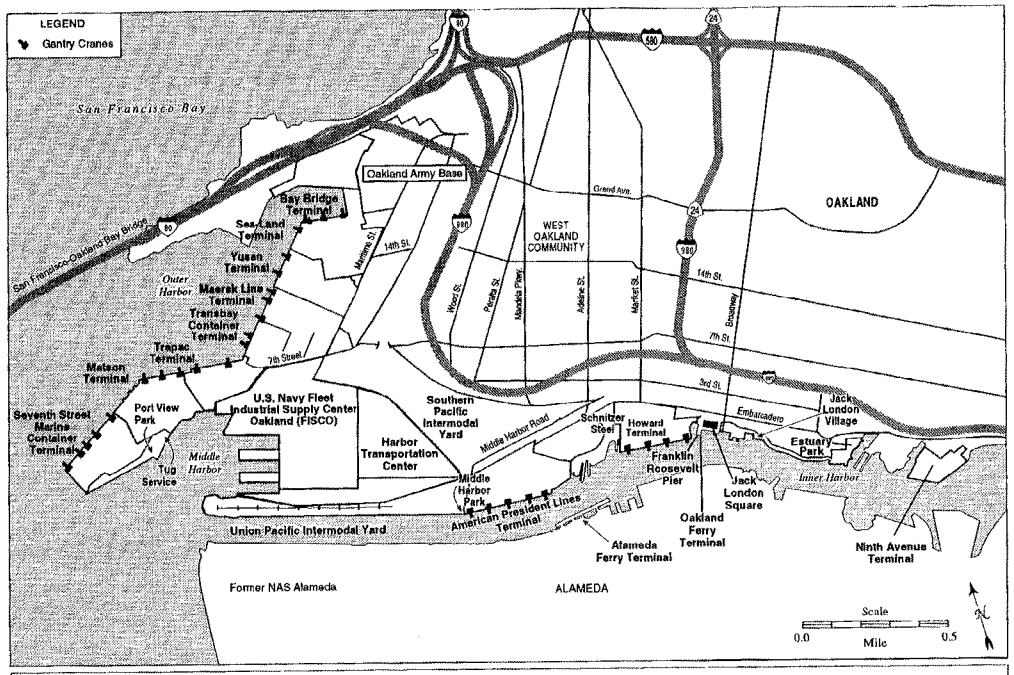



**Figure 4.12-2**

**OVERVIEW OF LAND USES IN THE PROJECT AREA**

public fishing area. Channel Park lies on the north side of the Embarcadero opposite Estuary Park. Middle Harbor, Port View, and Estuary parks are owned by the Port of Oakland. Estuary Park land is leased to the City of Oakland, which operates and maintains that park. The City of Oakland also owns and operates Channel Park.

The East Bay Regional Park District has requested approximately 15 acres of land to the south of the Bay Bridge on the Oakland Army Base as a public benefit conveyance for an "East Bay Gateway Park" through the base reuse process. Caltrans has proposed to add another 15 acres (approximately) of land within the state right-of-way to this park as part of replacing the east span of the Bay Bridge, and has been collaborating with the District to develop the park concept.

*Oakland Army Base*

The Oakland Army Base adjoins the Outer Harbor. The Base Realignment and Closure (BRAC) Commission included the 422-acre Oakland Army Base on the 1995 Base Closure List. According to base closure regulations, all military operations must cease by July 13, 2001. Any decision allowing Port use of Army property would require separate Army approval.

The Oakland Army Base is the headquarters for the Military Traffic Management Command Western Area (MTMCWA). MTMCWA's mission is to provide military ocean marine terminals, to transport defense-related cargo, to maintain berths for Military Sealift Command, and to monitor worldwide personal property movement of household goods.

The Port leases 63 acres of the Oakland Army Base that, in turn, it has subleased for operation of the Bay Bridge Terminal. The existing Berth 21 is under the Port of Oakland's jurisdiction. Land used for Berths 8 and 9 is part of the Oakland Army Base. The port leases this land area from the Army. A portion of the proposed Berth 21 fill area is also within the boundaries of the Oakland Army Base, and the other portion is under the jurisdiction of the Port. Land uses in the area are characterized by paved, developed areas for cargo-related operations and parking. Maritime uses include ship berthing, cargo loading and unloading, and laydown/staging space. Three ship berths are located in this area, along with one break-bulk facility.

Proposed land uses in the vicinity of the Berth 21 fill area are similar to current uses (refer to section 1.6 for further discussion of proposed land uses).

*FISCO*

The western portion of the FISCO site includes warehouses, office buildings, former military housing, berths and wharf areas, paved surfaces, and loading docks. The eastern portion of the site includes a mixture of open layout storage areas for miscellaneous metals and large bulk materials, as well as general transportation support activities, such as warehousing, container depot activities, loading, and container freight stations. A railroad classification yard was formerly located in the eastern portion of the site; the rail tracks were used primarily for moving heavy bulk materials and steel plates from one area of FISCO to another. The Port has removed portions of the railyard and is using the remaining ballast area for truck and container storage. The site also includes the Port's Harbor Transportation Center, which provides space for warehousing, container depot activities, loading, and container freight stations. Section 1.6 describes future uses of the FISCO property.

*City of Oakland*

West Oakland, a community within the city of Oakland, is separated from the Port by the Southern Pacific West Oakland Yard and the relocated Cypress Freeway. The land use pattern in this neighborhood includes a mix of uses, including residential, governmental, commercial, and industrial, all in close proximity to each other. The nearest nonmilitary housing is located northeast of 7th Street and east of Pine Street within the West Oakland neighborhood. Single-family residences are located among a mix of uses, including churches, schools, office space, and industrial/commercial structures and support facilities.

Major streets that access the Port include Middle Harbor Road, Maritime Street, and 7th Street. Interstate highways 80, 580, 980, and 880 are located north and east of the Port. The new I-880 Cypress Freeway project is located on the northeast side of the Southern Pacific West Oakland Railyard.

*City of Alameda*

Approximately 2 miles of shoreline along the south side of the Inner Harbor channel are under the jurisdiction of the City of Alameda. Land uses in this area are characterized by various vacant facilities, including aircraft hangars, aircraft and ship maintenance facilities, open space, housing, an administrative and community support campus, and aircraft runways that were part of the former NAS Alameda. Some base housing is still occupied, and some recreational facilities are in place and planned for expansion during 1998. Other structures are being leased for reuse. Both North Housing and Marina Village housing are being transitioned from occupancy by the U.S. Navy to occupancy by the U.S. Coast Guard. (Additional information regarding existing and planned land uses at NAS Alameda and the Fleet Industrial Supply Center (FISC) and Annex is provided in section 4.12.3.)

The Alameda Ferry Terminal lies across the channel from the Schnitzer Steel facility. Occasional fishing has been observed in the area immediately west of the ferry terminal. Alameda Gateway is located at the north end of Main Street. The City of Alameda owns about half of this 35-acre site of the former Todd Shipyard, which is leased to John Beery; the remaining portion is owned by Mr. Beery. The Alameda Gateway/Beery site is designated as a business-industrial area by the City of Alameda General Plan. The General Plan provides:

> A 1987 Development Agreement between the City and the lessor and owner of the [Alameda Gateway] site extends to 2034, and notes that uncertainties about a turning basin proposed by the U.S. Army Corps of Engineers at the urging of the Port of Oakland make planned development zoning impractical. Current tenants have short-term leases, and are marine-related or other types of businesses needing warehouse or office space. The developer projects an addition of 263,000 square feet of business park-warehouse space and a total of 800 jobs at buildout.

The City of Alameda General Plan also supports maintaining the bulk cargo seaport capacity at Alameda Gateway consistent with the Seaport Plan. However, upon the City of Alameda's request, the Seaport Plan has been amended and no longer designates Alameda Gateway for port priority use. Therefore, the Seaport Plan no longer calls for maintaining existing and potential bulk cargo seaport capacity at Alameda Gateway.

This area also includes Bay Ship & Yacht, a ship repair facility that provides services to tugs, barges, and fishing vessels homeported in the Bay Area. Pier space is available at this site. Mariner Square lies across the channel from Jack London Square and consists of a mix of water-related uses and residential and office space.

### 4.12.3 Possible Reuse/Disposal Options

*Vision 2000 Upland*

This is the site of existing piers associated with FISCO, located along the eastern side of the Middle Harbor. The proposed rehandling facility would be located here, as well.

*New Berth 21*

This site is located in the Outer Harbor submerged area bordered by Berths 8, 9, 10, 20, and 21 (see Figure 2.2-5). The site, which is currently navigable water used for maritime transportation, is surrounded by upland industrial and maritime uses and the Oakland Army Base. The submerged area in the Outer Harbor is owned by the Port of Oakland and the U.S. Army.

*Middle Harbor Enhancement Area*

The Middle Harbor Enhancement Area (MHEA) is currently navigable water and used for military maritime transportation; it is surrounded by upland industrial and maritime uses. The MHEA is located within the City of Oakland and is within the Port's planning jurisdiction.

*Former NAS Alameda*

The former NAS Alameda occupies the western third of the island of Alameda, across the Oakland Inner Harbor from the Port of Oakland. The installation contains an airfield; seaport; seaplane lagoon; aircraft and ship maintenance facilities; housing; and industrial, retail, warehouse, recreational, and special-purpose facilities. The FISC Alameda Facility and FISC Alameda Annex located adjacent to NAS Alameda comprise 176 acres of warehouses, open space storage, and administrative buildings. The FISC Annex will close in September 1998; the other two facilities have been closed.

A reuse plan was adopted by the Alameda Reuse and Redevelopment Authority (ARRA 1996). It is currently undergoing environmental review, and thus is subject to revision. Four subareas with specific land use designations have been proposed for the area that borders the Inner Harbor. The northwestern tip of the installation is designated as "Northwest Territories" and is proposed for mixed use development. A portion of the northern edge of the existing airfield is designated for development as an international commerce and trade zone, including light industrial/research and development and warehouse uses. This area may include a site for the Alameda Science & Technology Center. The remainder of the Northwest Territories would be devoted to recreation and open space uses. Recreational uses would include the Bay Trail and shoreline park and the Point Alameda Regional park at the far northwestern end of the island. The "Civic Core" borders "Northwest Territories" on the east; it, too, is designated for mixed uses, with an emphasis on providing public serving and civic uses. The "Main Street Neighborhoods" area is further east and borders the site of the proposed turning basin on the south; it is planned for residential and related uses. The easternmost subarea, the "North Waterfront," also adjoins the east side of the proposed turning basin. The northern portion of the area, which is adjacent to the waterfront, is planned as a mixed use neighborhood with an office park/research and development and housing

emphasis. Shoreline activity may include water-oriented commercial uses such as retail development, restaurants, and other supporting uses, including an Oakland-Alameda water taxi/ferry service. Housing uses would be encouraged. Existing pier space may be leased for larger vessels and recreational uses.

*San Francisco Deep Ocean Disposal Site (SF-DODS)*

This existing disposal site is located in the waters of the United States approximately 50 nautical miles west of the Golden Gate Bridge. Extremely limited commercial and recreational fishing occurs in the vicinity of SF-DODS.

*Hamilton Wetlands Restoration*

Hamilton restoration site is located on the western shore of San Pablo Bay in the City of Novato in Marin County, approximately 25 miles north of San Francisco. The area is generally characterized by moderately dense pockets of urban development surrounded by large tracts of open space, including areas with wetlands, floodplains, and steep terrain. Portions of the former air base, including the airfield and antenna field, were once marshland and are now separated from the Bay by a series of low levees. Although much of the base has been developed or urbanized, grassland, oak woodland, and wetland habitats occur on the base. U.S. Highway 101 runs north-south along the western edge of the former base. The site is now primarily concrete (from the airfield runway) and degraded grassland.

The airfield parcel includes a runway, aprons, taxiways, an aircraft dispersal area, an airplane hangar, and other miscellaneous support structures. The runway, which was formerly 8,000 feet long, has been shortened to 6,000 feet to create a wetland mitigation site. A JP-4 pipeline formerly used to supply the active petroleum, oil, and lubricant (POL) facility with fuel from ships in San Pablo Bay transects the airfield and extends approximately 18,000 feet into the Bay. The airfield is surrounded by a system of low levees on the north, east, and south sides.

The only current activity at the airfield is remediation work related to the presence of hazardous materials. Most of the buildings on the airfield parcel are no longer occupied or used, with the exception of three pump stations (at Buildings 35, 39, and 41). These stormwater pump stations are located on the eastern side of the airfield parcel. These buildings are not occupied, but they are still operating.

The decommissioned antenna field contains remnants related to its former use which are scattered throughout the site, with the most prominent ones clustered near the center. The remnants in the central area include: an array of seven approximately 50-foot poles topped by antennae; an approximately 50-foot by 100-foot concrete operations building (Building 30) with an adjacent above ground storage tank; an approximately 20-foot by 20-foot concrete generator building (Building 31) on piles with three adjacent transformers, three oil-filled switch gears, and a nearby approximately 4-foot by 8-foot storage tank foundation (with no tank); and an approximately 60-foot-square paved parking area. All of these features are located at the north end of the paved central access road which originates near the south boundary of the site.

The southeast corner of the antennae field is occupied by the former Air Force rifle range. The major remnants in this area are: a target pit, consisting of an approximately 125-foot-long concrete trench with numerous moveable wooden target supports, backed by an earthen berm, and a subsurface bunker; a heavily vandalized office building on the north side of the paved firing range

access road; an ammunition storage building in good condition on the south side of the access road; an above ground storage tank; two large concrete foundations; a power line; two wood observation towers; several small sheds; and a derelict boat. A 7-foot by 7-foot concrete burn pit is located directly north of the target pit. A pile of approximately 10 bullet-ridden circa 1950's automobile hulks is located on the inboard slope of bayfront levee north of the rifle range.

A portion of the former Air Force firing range is presently used by the Marin County Sheriff's Department under a short-term lease from the State Lands Commission. The facilities which appear to be in active use include: an approximately 95-foot by 140-foot paved target range with 15 painted lanes and target mounts; a paved loop access road; an approximately 14-foot by 30-foot storage shed; and a warning flagpole.

The proposed site is bordered by a variety of land uses. The Bel Marin Keys Unit 5, which lies to the northwest, is currently cultivated with hay but is being considered for a large mixed unit development or for a potential restoration project. The Ignacio Reservoir adjoins the narrow neck of the site on the northeast. The Army/GSA Sale Parcel on the west was formerly the administrative center of the base. The approved New Hamilton Partners 1994 Master Plan for this parcel includes a mix of residential, commercial, and retail uses, along with a number of parks and recreational facilities. A small portion of Department of Defense housing is located near the southern portion of the site. Current plans call for this area to be vacated in 1997, although other agencies have requested use of the housing. The State Lands Commission (SLC) owns the shoreline property along San Pablo Bay east and northeast of the airfield, and the Novato Sanitary District dechlorination plant is also located on land owned by the SLC immediately north of the airfield.

Other surrounding land uses include the Los Robles Mobile Home Park on the northwest, San Pablo Bay to the east, and Pacheco Hill to the south, which separates the site from 1,500 acres of undeveloped land now used for grazing and hay production. St. Vincent's Boys School, planned for mixed-use development, occupies a portion of this property. The remainder of the former air base to the southwest is the subject of a proposal for a 402-acre mixed use development.

The Hamilton Army Airbase, which includes the airfield, has been the in base closure process since 1974. Approximately 20 acres of the airfield are considered "contaminated" with relatively low levels of petroleum hydrocarbons, volatile and semi-volatile organic compounds, herbicides and metals. The U.S Army is implementing a remediation program under BRAC of 1988 to restore the airfield to a condition protective of human health and the environment, and is coordinating its remediation technical studies with the State's efforts to restore a valuable wetlands ecosystem. The State Lands property is a formerly used defense site (FUDS) and is being merged with the remediation efforts at the Hamilton airfield. The Army intends to have the site remediated and available for reuse by January 2000.

*Recreation and Public Access*

Between the potential dredge material offloading facility and the site, San Pablo Bay progressively shallows from the -16-foot contour to intertidal mudflats and marsh outboard of the eastern Hamilton levee. This shallow portion of San Pablo Bay has no commercial vessel traffic, though the Petaluma River navigation channel is located to the east of the -16-foot contour. Though no information could be obtained on the extent of recreational boat traffic in the western portion of San Pablo Bay, some recreational activity does occur and a handful of duck blinds remain. Nearby recreational boat access points include a boat launch ramp at Black Point approximately 4 miles to

the north, the Port Sonoma Marina approximately 4 miles to the north, Novato Creek approximately 3 miles to the north, Las Gallinas Creek approximately 3 miles to the south, and a boat launch ramp at China Camp State Park approximately 4 miles to the south.

*Montezuma Wetlands Restoration*

The Montezuma Wetlands site is located in the unincorporated area of Solano County. The entire Montezuma Wetlands site (2,394 acres) includes approximately 1,822 acres of land used for cattle and sheep grazing. About 360 acres at the northern end of the site are leased to a private hunting club and used for hunting ducks and pheasant. A small area at the southeast end of the site adjacent to the McDougal Cut is leased to Jerico Towing Company, which brings oyster shells and sand to the site. This material is processed and sold for construction purposes. The California Department of Water Resources (DWR) has a day use area for fishing, boating, and picnicking on the site at the Montezuma Slough, accessible via Fire Truck Road. A Sacramento Northern railroad right-of-way and tracks extend through the middle of the site from north to south (COE and Solano County 1994).

Adjacent land uses include sheep and cattle grazing in the Montezuma hills east and north of the site. Several residences are clustered on the eastern edge of the site along the northern portion of Collinsville Road; another eight to ten residences are located farther south at the intersection of Collinsville Road and Fire Truck Road. Two small settlements also border the site: the Town of Collinsville is at the southeast corner of the site at the southern end of Collinsville Road, and Birds Landing is located adjacent to the northeast corner of the site. Suisun Marsh lies west of the site, where hunting is a major recreational activity (COE and Solano County 1994).

Recreational uses on and near the Montezuma Wetlands site include the following:

- Birds Landing Hunting Preserve and Sporting Clays, a 1,017-acre site located between Montezuma Slough and Collinsville Road, used by approximately 10,000 to 15,000 people annually for the seasonal hunting of pheasant and partridge and the year-round shooting of sporting clays;
- The DWR Day Use Area, located along the Montezuma Slough at the end of Fire Truck Road within the boundary of the MW site, used by approximately 600 to 700 people each year;
- Collinsville Marina, located on the Sacramento River east of the town of Collinsville; and
- General recreation and public access areas along the Sacramento River and Montezuma Slough, used infrequently due to the relatively sparse population in the area.

*Various Landfills*

The Altamont Landfill and Resource and Recovery Facility is a Class II and Class III facility in northern Alameda County and as such is permitted to receive typical non-hazardous residential and commercial waste. The landfill imports material, including dredged material, for use as cell liner, daily cover and cell cover. The landfill consists of approximately 1,530 acres, of which 225 acres are fully permitted and currently in operation. With the exception of a small portion of the site reserved for possible composting operating, most of the remaining property is planned for landfill operations. As of January 1997, the estimated remaining capacity of Fill Area 1 was established at approximately 6,268,000 cubic yards (personal communication, D. Edminister 1997).

Redwood Landfill is a Class III sanitary landfill that has been owned and operated privately since 1958 on a 600-acre site in unincorporated northeastern Marin County. It has a remaining capacity of 14.1 mcy (personal communication, M. Frost 1997).

Vasco Road Sanitary Landfill is a Class III facility in northern Alameda County, northeast of the City of Livermore, and just slightly west of the Altamont Landfill. The remaining capacity of the landfill as of January 1997 was estimated at about 16,487,000 cy (personal communication, D. Edminster 1997).

## 4.13 VISUAL RESOURCES

Visual resources consist of the natural and manmade features that give a particular environment its aesthetic qualities. These features may be natural appearing or modified by human activities. Together, they form the overall impression of an area, referred to as its *landscape character*. Landforms, water surfaces, vegetation, and manmade features are treated as characteristic of an area if they are inherent to the formation, structure, and function of the landscape. Landscape character is evaluated to assess whether a proposed project would appear compatible with the existing setting or would contrast noticeably with the setting and appear out of place.

Visual resources also have a social setting; which includes public values, goals, awareness, and concern regarding visual quality. Social setting is addressed as *visual sensitivity*, or the relative degree of public interest in visual resources and concern over adverse changes in the quality of that resource. Visual sensitivity is key in assessing how important an effect on the visual resource would be and whether it represents a significant impact. Recreational and residential uses are generally considered to have high visual sensitivity, as are views from scenic routes or corridors.

### 4.13.1 Proposed Dredge Area

*Overview*

The areas to be dredged are located within and immediately outside of Oakland Harbor, on the east shore of San Francisco Bay. The harbor lies at the edge of the Oakland Estuary, and the surrounding topography is essentially flat. The project area is predominantly characterized by maritime, industrial, and urban uses associated with the Port of Oakland, whose terminals surround the dredge areas; the city of Oakland, which borders the Port on the north and east; and the city of Alameda and the former NAS Alameda, which border the Port on the south (see Figure 2.1-1).

Nearby freeways, built at grade and in elevated configurations, carry large volumes of traffic through the region. They include 1-80 and the Bay Bridge, I-580, I-980, I-880, and Highway 24. None of these is designated as a scenic route or highway. A proposal for the Bay Trail along the waterfront in this area is being developed by the East Bay Regional Park District in association with other agencies, including Caltrans, the Port of Oakland, and San Francisco Bay Conservation and Development Commission (BCDC). The precise route of the entire trail is not known at this time. The East Bay Regional Park District has requested approximately 15 acres of land to the south of the Bay Bridge on the Oakland Army Base as a public benefit conveyance for an "East Bay Gateway Park" through the base reuse process. Caltrans has proposed to add another 15 acres (approximately) of land within the state right-of-way to this park as part of the east span replacement of the east span of the Bay Bridge, and has been collaborating with the District to develop the park concept.

*Port of Oakland*

The waters of Oakland Harbor are divided into three main areas: the Outer Harbor, Middle Harbor, and Inner Harbor, each of which is described below. The land uses that contribute to the visual character of these areas are shown in Figure 4.12-2. Figure 4.13-1 provides an overview of the key viewpoints within Oakland Harbor from which the photographs in figures 4.13-2A through 4.13-2D were taken.

*Outer Harbor*

Eight major terminals are located along the Outer Harbor directly opposite the Bay Bridge. The large mechanized cranes associated with the terminals, as well as the succession of very large ocean-going cargo vessels that dock at these terminals, give the area a distinct industrial-waterfront character. Large container storage areas and numerous warehouses are associated with the terminals. Floodlighting on high-mast structures is needed to permit loading on a 24-hour basis and is visible at night throughout the immediate Bay Area.

The Oakland Army Base is also located in the Outer Harbor area, surrounding several of the terminals on the north and east. The base occupies a 422-acre site that contains a mixture of industrial/warehouse buildings and some military housing. Views from public roads are mainly of utilitarian structures and storage space, although some landscaping and individual buildings of more distinct architectural character can be observed. The base is scheduled for closure as an active military facility in July 2001. The Oakland Base Realignment Authority (OBRA) is currently completing a reuse plan that will identify and analyze short- and long-term reuses. The Port of Oakland is also completing a reuse plan for the base. Whether these two planning efforts will result in the same or similar reuse recommendations is uncertain. The preferred plan is scheduled for adoption by OBRA in early 1998.

A park is proposed at the eastern anchorage of the Bay Bridge, in an area known as the "Spit," as part of the Caltrans improvements in this area. Until this park is constructed, however, no public access is available in this area.

*Middle Harbor*

Wharves within the U.S. Navy Fleet Industrial Supply Center Oakland (FISCO) define the eastern edge of the Middle Harbor, where they form a semi-enclosed bay almost 0.5 mile wide. The piers and docksides are dominated by vessels, cranes, and maritime administration buildings. Port View Park is located along the western side of the Middle Harbor. The facilities at this park are used primarily by local residents for fishing and recreation, and it is considered a sensitive public viewpoint. Views from the park include the FISCO, the UP mole, and dramatic views of the Bay Bridge and San Francisco skyline. Other views include the mouth of the Inner Harbor, the west end of NAS Alameda, and the Bay. A tug service facility adjoins the park.

*Inner Harbor*

The area that abuts the Inner Harbor also has a generally industrial waterfront character, with container terminals and storage areas, rail tracks, industrial buildings, a scrap yard, floodlighting in some areas, and visually prominent dockside gantry cranes. Middle Harbor Park occupies about 250 feet of shoreline between the Union Pacific Intermodal Yard and American President Lines Terminal. The 1-acre park contains a small pier and is landscaped with grass and trees, in contrast with the surrounding industrial uses. The park is not heavily used.

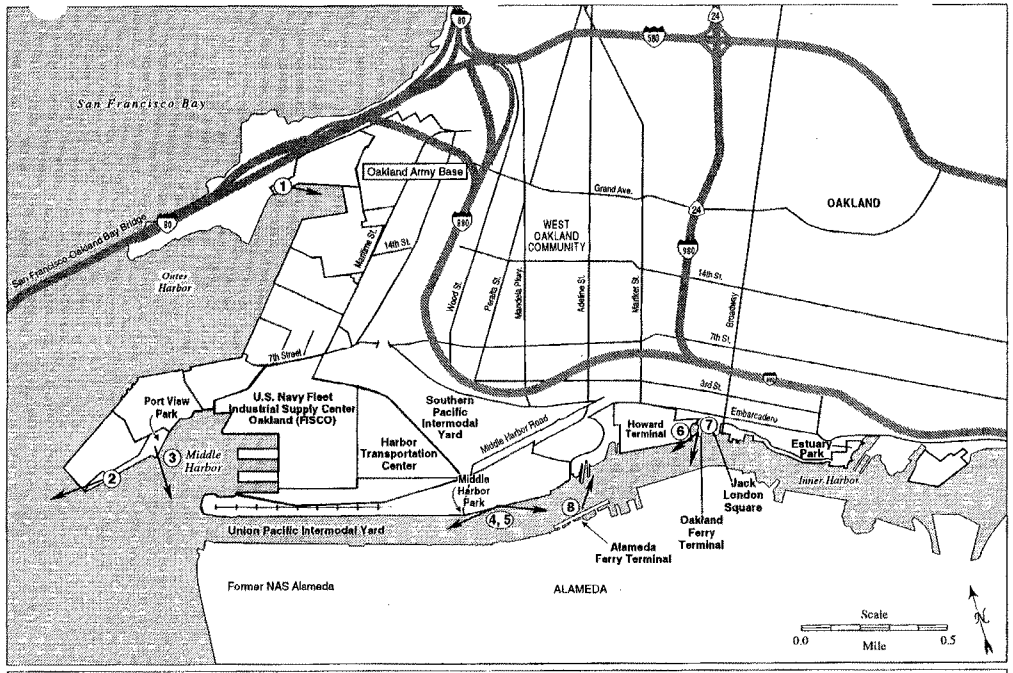
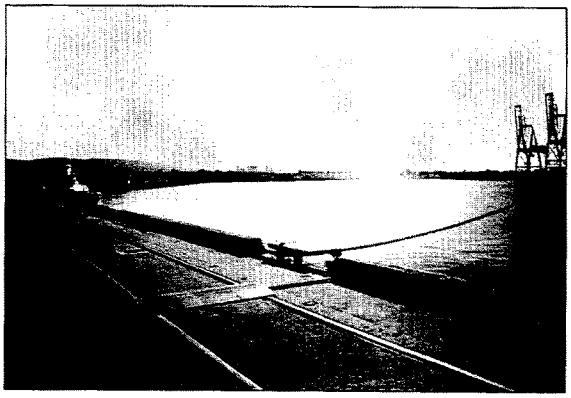
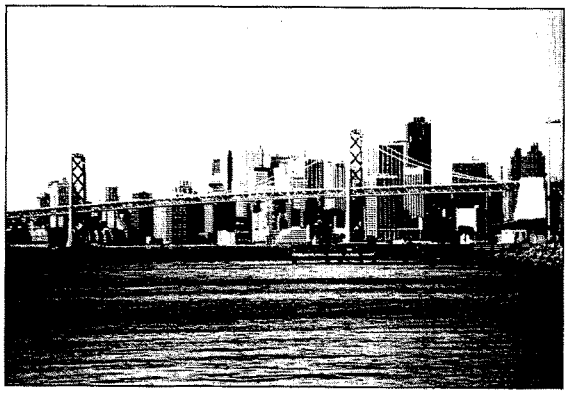



Figure 4.13-1

VIEWPOINTS WITHIN THE PROJECT AREA - LOCATION OF PHOTOGRAPHS



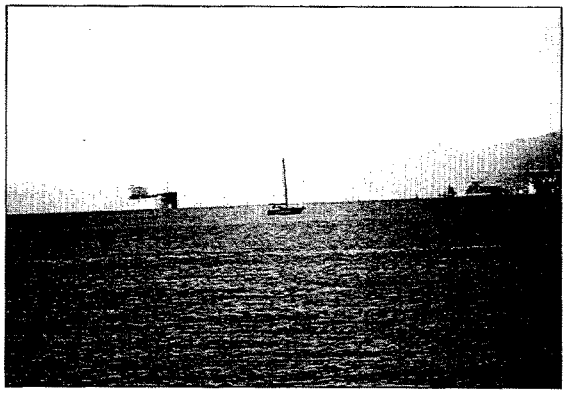
1. View Looking East from Vicinity of Berth 8 toward Berth 21 Fill Area



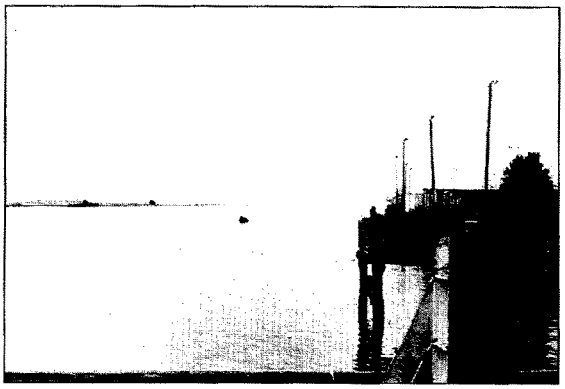
2. View Looking West Toward San Francisco from Port View Park

**Figure 4.13-2A**

**VIEWPOINTS WITHIN THE PROJECT AREA**



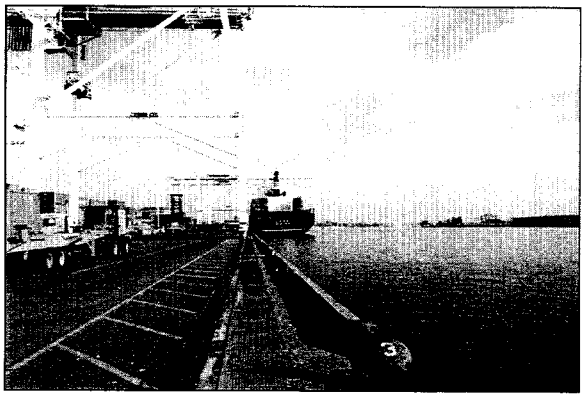
3. View Toward Bay from Port View Park



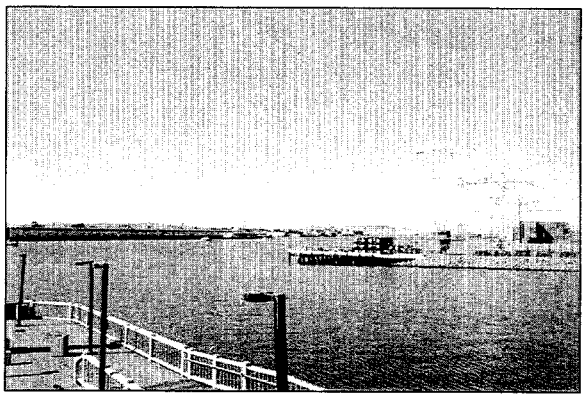
4. View West from APL Terminal Toward Middle Harbor Park and Outer Harbor

**Figure 4.13-2B**

**VIEWPOINTS WITHIN THE PROJECT AREA**



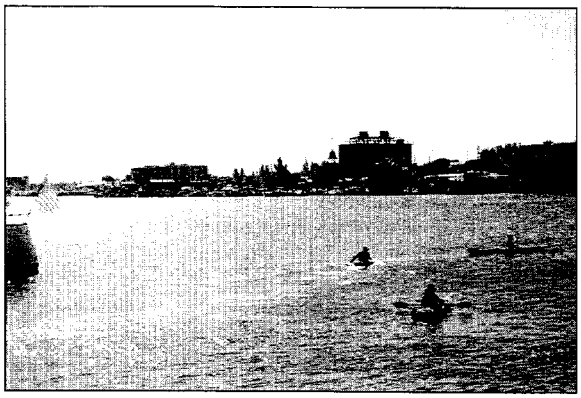
5. View Looking East from APL Terminal Toward Inner Harbor Area



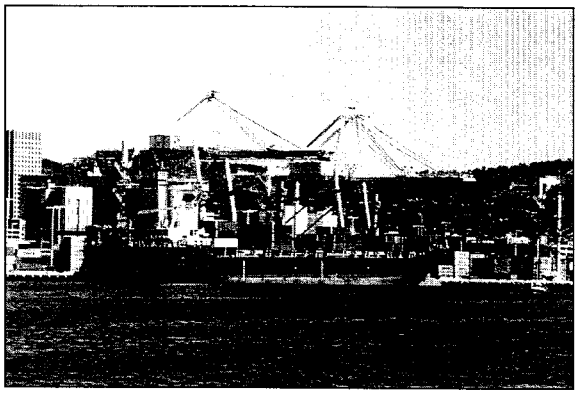
6. View Looking West from Oakland Ferry Terminal Area Toward Howard Terminal

**Figure 4.13-2C**

**VIEWPOINTS WITHIN THE PROJECT AREA**



7. View Looking South from Jack London Square Toward Inner Harbor Area and Alameda Shoreline



8. View Looking North from Alameda Ferry Terminal Area Toward Inner Harbor and Howard Terminal

**Figure 4.13-2D**

**VIEWPOINTS WITHIN THE PROJECT AREA**

Other non-industrial uses lie between the Howard Terminal and Ninth Avenue Terminal. These include the Oakland Ferry Terminal, Franklin Roosevelt Pier, Jack London Square, Jack London Village, Alice Street Minipark, and Estuary Park. Occasional fishing has been observed at the Franklin Roosevelt Pier, which is immediately west of the ferry terminal.

Jack London Square is a specialized commercial development featuring restaurants, entertainment, specialty shops, boat sales, and a marina. Most of the development at the Square has a waterfront/marina theme or character. As a tourist destination, the Square receives extensive public use. Boardwalks along the shore, waterfront restaurants, and a hotel provide opportunities for panoramic views of the Inner Harbor and the opposite shore. From upper-story levels, the area provides views down the channel toward the FISCO site and Outer Harbor terminals. Ground level views are blocked or dominated by the Howard and American President Lines terminals.

Jack London Square lies to the east of Jack London Village. This area includes restaurants, boutiques, specialty shops, and views of the Oakland Estuary.

The south side of the Inner Harbor is bordered by the former NAS Alameda and the city of Alameda. The former NAS Alameda landscape is characterized by various vacant facilities, including aircraft hangars, housing, and aircraft runways. An administrative and community support campus is near the central portion of the station.

The Alameda Gateway adjoins the Inner Harbor on the south and is located between the FISC Annex and Main Street. The site is partially owned by John Beery and partially by the City of Alameda, which leases property to Mr. Beery for industrial and warehouse purposes. The Alameda Ferry Terminal is in this area.

Several yacht clubs and marinas are located in the city of Alameda near the southern end of the Inner Harbor.

### 4.13.2 Possible Reuse/Disposal Options

*Vision 2000 Upland*

This site is in the Middle Harbor, which is described above.

*New Berth 21*

The site is currently navigable water used for maritime transportation in the Outer Harbor. It is surrounded by upland industrial and maritime uses and the Oakland Army Base.

*Middle Harbor Enhancement Area*

The Middle Harbor Enhancement Area (MHEA) is located in the Middle Harbor, which is described above. The site is currently navigable water and used for maritime transportation.

*Former NAS Alameda*

The characteristics of this site are described under the Port of Oakland, Inner Harbor, above.

*San Francisco Deep Ocean Disposal Site (SF-DODS)*

This is an open water site located on the continental rise approximately 50 nautical miles west of the Golden Gate Bridge.

*Hamilton Wetlands Restoration*

The Hamilton site is bordered to the south by approximately 1,500 acres of undeveloped land used mostly for grazing and hay production. Other surrounding visual elements include Department of Defense Housing, Hospital Hill, Airport Hangars, Reservoir Hill, and Ammo Hill. Most of these surrounding land uses have the general characteristics of a military base.

In addition, the Los Robles Mobile Home Park abuts the base's northwest property line. The Bel Marin Keys site, which is currently cultivated with oat hay and has scattered eucalyptus groves, is located to the north of the project site.

The site itself is flat and at or below sea level. Large portions are covered by grasses and low-growing vegetation. The airfield is paved, surrounded by grassland.

Pacheco Hill forms a physical and visual barrier between the Hamilton site and the Bay plain located south of the property.

Presently, few persons have views of the site. However, the number of viewers could increase in the future with the proposed development on the remainder of the Hamilton base. Future land uses to the south of the airfield include the New Hamilton Partnership housing, to begin construction in 1998.

*Montezuma Wetlands*

This site is bounded by the rolling Montezuma Hills on the east, the waters of the Sacramento River to the south, the low dikes of Montezuma Slough and Suisun Marsh views to the west, and the hills to the north. The most striking quality of the site is its homogeneity. The 2,394-acre site has very little relief or change in elevation. The site slopes gradually from its inland boundaries (Collinsville and Birds Landing Roads) to the low dikes at Montezuma Slough and the Bay. The change is so gradual so as not to be evident to the viewer. The site also has little variety in texture or color. In the summer and dry seasons, the ground in the uplands is golden brown; occasional patches of green seasonal marsh dot the landscape. In winter, the ground is primarily green with brown patches. Because of homogeneity in elevation and in texture and color, vertical elements provide a strong contrast. The few trees, fence lines, railroad trestles, and utility poles stand out prominently in this flat landscape.

*Various Landfills*

The Various Landfills disposal option includes the Altamont, Redwood, and Vasco landfills. Because they are all existing landfills, they all have low visual sensitivity.

# 5.0 ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

This chapter describes the environmental impacts associated with the proposed dredging and use of the eight reuse/disposal options considered in detail for the dredged material. Mitigation measures are presented for the significant impacts. The discussion is organized by resource area.

Two of the possible reuse/disposal options – the Hamilton Wetlands Restoration site and the Montezuma Wetlands Restoration site – would involve wetland restoration using dredged material. Both the Hamilton and Montezuma sites are the subject of separate wetland restoration proposals independent of the 50-foot project (see section 2.2.4). Since these two sites could receive dredged material from sources other than Oakland Harbor (i.e., they would be multi-user sites), it is only the impacts of *transporting* Oakland sediment to these sites that would be attributable to the proposed project. The other impacts associated with the proposed wetland restoration efforts at these sites (e.g., offloading, sediment placement) are not factored into the comparison of impacts with the other reuse/disposal sites presented in other sections of this document (e.g., Chapter 8, Table S-2, the Mitigation Monitoring and Reporting Plan in Appendix R).

## 5.1 AIR QUALITY

The following sections discuss air quality impacts that would occur from the proposed project and the significance of those impacts. Feasible mitigation measures that would reduce impacts are also identified. Since the mitigation measures would apply to equipment used for both dredging and reuse/disposal operations (and would not be specific to any one disposal option), the mitigation measures are discussed in one section (section 5.1.4), following the impacts of dredging (section 5.1.2), and the impacts of reuse/disposal (section 5.1.3).

Construction activities associated with channel deepening and infrastructure modifications would occur for a period of approximately 4 years. The main source of construction-related emissions during this period would be combustion products from project dredging and reuse/disposal equipment (primarily diesel-powered cutterhead and clamshell dredges, tugboats that assist the dredges and transport the dredged material barges, survey boats, and tender boats). Activities at reuse/disposal sites would also involve use of earth-moving equipment, such as bulldozers, loaders, rollers, backhoes, and end-dump trucks.

The main source of long-term operations-related emissions would be fuel combustion from the increased number of container vessels, trucks, and trains allowed by the project. Also, some increased maintenance dredging emissions would be associated with the deepened and widened dredge areas.

Information on dredging and reuse/disposal emission sources was obtained from Port of Oakland staff (personal communications, G. Joseph and G. Staba, 1997 and 1998) and from recent environmental documentation of related activities, including (1) *Oakland Harbor SEIR/S* (COE and Port of Oakland 1994); (2) *Richmond Harbor SEIS/EIR* (COE and Port of Richmond 1996); and (3) *San Francisco Bay to Stockton Phase III (John F. Baldwin) Navigation Channel Project Draft EIR/E* (COE and Contra Costa County 1997). Emission inventories were estimated for all project-related activities (as described in Chapter 2) based on reasonable worst-case assumptions. For example, it was assumed that even though in some cases dredging would continue 24 hours a day, all equipment would operate a maximum of 22.5 hours per day, due to necessary maintenance and unscheduled downtime. Emission factors used to calculate emissions were obtained from *Compilation of Air Pollution Emission Factors, AP-42, Vols. I and II* (EPA 1993b and 1995), the *CEQA*

*Air Quality Handbook* (SCAQMD 1993), the EMFAC7G mobile source emission factor program (ARB 1997b), *Inventory of Air Pollutant Emissions from Marine Vessels* and revisions (Booz-Allen & Hamilton 1991, 1992, 1993), and special studies on vessel emissions conducted for the ARB (1984). Detailed emission and equipment usage data associated with each project activity are contained in Appendix I.1.

### 5.1.1 Impact Significance Criteria

Criteria to determine the significance of air quality impacts are based on federal, state, and local air pollution standards and regulations. Impacts are considered to be significant if project emissions:

- Increase ambient pollutant levels from below to above the National Ambient Air Quality Standards (NAAQS) or California Ambient Air Quality Standards (CAAQS);
- Substantially contribute to an existing or projected air quality standard violation;
- Are inconsistent with emission growth factors contained in any of the following plans (inconsistent projects include those exceeding the land use and population forecasts that were used to generate emission forecasts in these plans):

  a) The 1994 Clean Air Plan (CAP),

  b) The 1993 Ozone Maintenance Plan, or

  c) The 1994 Carbon Monoxide Maintenance Plan; or
- Exceed the following thresholds that the Bay Area Air Quality Management District (BAAQMD) defines as significant under CEQA for project operation activities: total emissions greater than 80 pounds per day or 15 tons per year of reactive organic gases (ROG), oxides of nitrogen ($NO_x$), particulate matter less than 10 microns in diameter ($PM_{10}$), or $PM_{10}$ precursors, such as sulfur oxides ($SO_x$) (BAAQMD 1996).

The BAAQMD has not identified thresholds of significance for emissions from construction activities. Construction-related emissions are generally short-term in duration, but may still cause adverse air quality impacts. $PM_{10}$ is the pollutant of greatest concern with respect to construction activities. Construction equipment emits CO and ozone precursors, however, these emissions are included in the emission inventory that is the basis for regional air quality plans. These pollutants are therefore not expected to impede attainment or maintenance of the ozone and CO standards in the Bay Area (BAAQMD 1996).

The BAAQMD has identified a set of feasible $PM_{10}$ control measures for construction activities. These control measures are listed below. If all control measures indicated below (as appropriate, depending on the size of the project area) will be implemented, then air pollutant emissions from construction activities would be considered a less than significant impact. If all of the appropriate measures indicated below will not be implemented, then construction impacts would be considered to be significant (unless the lead agency provides a detailed explanation as to why a specific measure is unnecessary or not feasible).

***Basic Control Measures***

The following controls should be implemented at all construction sites during dry conditions.

- Water all active construction areas at least twice daily.
- Cover all trucks hauling soil, sand, and other loose material *or* require all trucks to maintain at least 2 feet of freeboard (freeboard is the space between the top of the load and the top edge of the truck bed).
- Pave, apply water three times daily, or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas, and staging areas at construction sites.
- Sweep daily (with water sweepers) all paved access roads, parking areas, and staging areas at construction sites.
- Sweep streets daily (with water sweepers) if visible soil material is carried onto adjacent public streets.

*Enhanced Control Measures*

The following measures should be implemented at construction sites that are larger than 4 acres.

- All "Basic" control measures listed above.
- Hydroseed or apply (non-toxic) soil stabilizers to inactive construction areas (previously graded areas inactive for 10 days or more).
- Enclose, cover, water twice daily or apply (non-toxic) soil binders to exposed stockpiles (dirt, sand, etc.).
- Limit traffic speeds on unpaved roads to 15 mph.
- Install sandbags or other erosion control measures to prevent silt runoff to public roadways.
- Replant vegetation in disturbed areas as quickly as possible.

*Optional Control Measures*

The following control measures are strongly encouraged at construction sites that cover a large area that are located near sensitive receptors, or which for any other reason may warrant additional emission reductions.

- Install wheel washers for all exiting trucks, or wash off the tires or tracks of all trucks and equipment leaving the site.
- Install wind breaks, or plant trees/vegetative wind breaks at windward side(s) of construction areas.
- Suspend excavation and grading activity when winds (instantaneous gusts) exceed 25 mph.
- Limit the area subject to excavation, grading and other construction activity at any one time.

### 5.1.2 Proposed Dredging

For air quality, the impacts from dredging the Oakland Bar Channel and Approach, the Outer Harbor Channel, the Inner Harbor Channel, the berths, and the turning basins are not considered separate from the impacts associated with transport/reuse/disposal of the dredged material. Air quality throughout the entire SFBAAB would be affected by the concurrent dredging and transport/reuse/disposal emissions, and construction phase impacts are thus based on the cumulative emissions from both activities.

Project emissions for all potential dredging and transport/reuse/disposal activities would be spread over a large portion of the Bay Area during dredge operations and during transport between the dredging sites and the reuse/disposal sites. Since project construction emission sources would be mobile, and because background concentrations in the project area are well below standards (see section 4.1), pollutant concentration impacts would not be large enough in a localized area to cause or contribute to any exceedance of an ambient air quality standard.

The total amount of emissions from dredging and transport/reuse/disposal activities would vary depending upon the particular reuse/disposal option chosen. These variations would occur despite the fact that the same amount of material would be dredged and, in most cases, the same types of dredging equipment would be used for each option. Clamshell and/or hydraulic cutterhead dredges, work tugs, barges (scows), tending boats, and survey boats would be used for the dredging operations, and a maximum of 14.5 mcy of material would be dredged and reused or disposed of at a combination of the potential reuse/disposal sites. However, depending on the locations of the selected sites, the number of pieces of equipment used, and the dredging schedule, the dredging rate would be adjusted to optimize productivity based on the time required for barges to transport material and return to the dredging site.

### 5.1.3 Possible Reuse/Disposal Options

The possible reuse/disposal sites, as fully described in section 2.2.4, include (1) the Vision 2000 Upland Area, (2) the New Berth 21 area, (3) the MHEA, (4) the former NAS Alameda, (5) SF-DODS, (6) the Hamilton Wetlands Restoration area, (7) the Montezuma Wetlands Restoration area, and (8) Various Landfills (Altamont, Redwood, or Vasco). Since it is not known which combination of these sites will be selected and what amounts of dredged material will be reused/disposed at each site, the analysis in this section focuses on the maximum amount of material that could be reused or disposed at each site.

***Vision 2000 Upland Area***

Under this disposal option, a maximum of 2,600,000 cy of material would be dredged from the Inner Harbor (IH) and IH turning basin with a clamshell dredge, transported to the Vision 2000 Upland Area in 5,000 cy scows, and unloaded with a clamshell dredge. Approximately 30,000 cy of the material is expected to be debris which would have to be separated at the Vision 2000 Upland Area and front-end loaded onto 20-cy end-dump trucks for haul and ultimate disposal at the Vasco landfill. Another 2,470,000 cy would be spread at the Vision 2000 Upland site using a bulldozer. The remaining 100,000 cy would be transported to the Vision 2000 Upland Area rehandling facility. The 100,000 cy would be processed by the rehandling facility and transported to the Altamont, Redwood, or Vasco Road landfill. Up to 20,000 cy of this amount could be transported by rail to a Class I landfill located in Utah. However, for the air quality analysis, it is assumed that all 100,000 cy is transported by truck to the Altamont, Redwood, or Vasco Road Landfill since the emissions generated within the Bay Area Air Basin by the approximately 2,000

truck trips required to haul the 20,000 cy would exceed the emissions generated by the approximately 10 train trips required to haul the same amount.

Emissions associated with construction of the rehandling facility and transport of the 100,000 cy of rehandled material to one of the landfills are addressed in a subsequent section. Only the emissions associated with the dredging and initial transport of the 2,600,000 cy, and reuse of 2,500,000 cy of material at Vision 2000 Upland Area are considered here, as summarized in Table 5.1-1. Detailed calculations of emissions for each piece of equipment associated with these dredging, transport, and reuse source categories shown in Table 5.1-1 are provided in Appendix I.1. Since all of the emissions are from temporary construction activities, as opposed to long-term operational activities, the emissions are considered to cause an adverse, but not significant, impact under the BAAQMD CEQA Guidelines, which have been adopted as the significance criteria for construction emissions for this EIS/R. However, all appropriate $PM_{10}$ control measures identified in section 5.1.1 must be implemented at the reuse site.

**Table 5.1-1. Emissions for Dredging, Transport, and Reuse of Material at Vision 2000 Upland Area**

| | DAILY EMISSIONS[a] (LBS/DAY) | | | | |
|---|---|---|---|---|---|
| *Activity* | *ROG* | *CO* | *NOx* | *SO2* | *PM10* |
| Dredge/Transport IH (2,600,000 cy) | 53 | 258 | 872 | 58 | 26 |
| Reuse (2,500,000 cy)[b] | 47 | 333 | 741 | 70 | 35 |
| Maximum Daily Emissions | 100 | 591 | 1,613 | 128 | 61 |
| Mitigated Maximum Daily | 65 | 359 | 617 | 18 | 46 |
| | TOTAL EMISSIONS[c] (TONS) | | | | |
| *Activity* | *ROG* | *CO* | *NOx* | *SO2* | *PM10* |
| Dredge/Transport IH (2,600,000 cy) | 17 | 84 | 283 | 19 | 8 |
| Reuse (2,500,000 cy) [b] | 4 | 44 | 87 | 6 | 2 |
| Total Emissions | 21 | 128 | 371 | 25 | 10 |
| Mitigated Total | 11 | 52 | 70 | 2 | 6 |

*Notes:* a. Refer to Appendix I.1, Tables I-1 and I-24, for detailed equipment calculations. Emissions rounded to three or fewer significant digits.
b. Emissions from 100,000 cy of material processed by rehandling facility are presented in Table 5.1-8.
c. Refer to Appendix I.1, Tables I-1 and I-44, for detailed equipment calculations. Emissions rounded to three or fewer significant digits.

*New Berth 21*

Under this reuse/disposal option, a maximum of 2,500,000 cy of material would be dredged from the Outer Harbor (OH) and OH turning basin and transported to the New Berth 21 area. Approximately 1,335,000 cy of material would be dredged using a hydraulic cutterhead dredge, which would deposit the dredged material by pipeline directly into the New Berth 21 area. The remaining 1,165,000 cy of material would be dredged by a clamshell dredge, loaded into 5,000 cy scows, transported by tug to the New Berth 21 area, and unloaded by another clamshell dredge. The material would be spread at the site using bulldozers and loaders.

Emissions associated with the dredging, transport, and reuse of material at this site are summarized in Table 5.1-2. Detailed calculations of emissions are provided in Appendix I.1. Emissions from these temporary construction activities are considered to cause an adverse, but not significant, impact under the BAAQMD CEQA Guidelines, which have been adopted as the significance criteria for construction emissions for this EIS/R. However, all appropriate $PM_{10}$ control measures identified in section 5.1.1 must be implemented at the reuse site.

**Table 5.1-2. Emissions for Dredging, Transport, and Reuse of Material at New Berth 21**

| | Daily Emissions[a] (lbs/day) | | | | |
|---|---|---|---|---|---|
| *Activity* | *ROG* | *CO* | *$NO_x$* | *$SO_2$* | *$PM_{10}$* |
| Dredge/Transport OH (1,165,000 cy) | 67 | 272 | 1,010 | 68 | 37 |
| Reuse (1,165,000 cy) | 10 | 102 | 255 | 17 | 5 |
| Dredge/Reuse OH (1,335,000 cy) | 49 | 340 | 1,190 | 78 | 21 |
| Maximum Daily Emissions | 126 | 715 | 2,460 | 163 | 62 |
| Mitigated Maximum Daily | 60 | 186 | 370 | 8 | 30 |
| | Total Emissions[b] (tons) | | | | |
| *Activity* | *ROG* | *CO* | *$NO_x$* | *$SO_2$* | *$PM_{10}$* |
| Dredge/Transport OH (1,165,000 cy) | 7.8 | 32 | 118 | 7.9 | 4.3 |
| Reuse (1,165,000 cy) | 1.0 | 12 | 29 | 1.9 | 0.5 |
| Dredge/Reuse OH (1,335,000 cy) | 1.1 | 7 | 26 | 1.7 | 0.5 |
| Total Emissions | 9.9 | 51 | 172 | 11.4 | 5.2 |
| Mitigated Total | 5.4 | 17 | 37 | 0.8 | 3.5 |

*Notes:* a. Refer to Appendix I.1, Tables I-4, I-7, I-27, and I-30, for detailed equipment calculations. Emissions rounded to three or fewer significant digits.
b. Refer to Appendix I.1, Tables I-4, I-7, I-47, and I-50, for detailed equipment calculations. Emissions rounded to three or fewer significant digits.

*Middle Harbor Enhancement Area*

Under this reuse/disposal option, a maximum of 7,000,000 cy of material would be dredged and placed in the MHEA. Approximately 4,556,000 cy of material would be dredged from the IH and 1,861,000 cy from the OH using hydraulic cutterhead dredges, which would deposit the dredged material by pipeline directly into the MHEA. The remaining 583,000 cy of material would be dredged by clamshell dredge from the OH berths, loaded into 5,000 cy scows, transported by tug to the MHEA, and unloaded by clamshell dredges. The material would be spread at the site by selective placement at time of delivery using bottom dump scows or pipe placement.

Emissions associated with the dredging, transport, and reuse of material at this site are summarized in Table 5.1-3. Detailed calculations of emissions are provided in Appendix I.1.

Emissions from these temporary construction activities are considered to cause an adverse but not significant impact under the BAAQMD CEQA Guidelines, which have been adopted as the significance criteria for construction emissions for this EIS/R. However, all appropriate $PM_{10}$ control measures identified in section 5.1.1 must be implemented at the reuse site.

*Former NAS Alameda*

Under this reuse/disposal option, a maximum of 750,000 cy of material would be dredged from the IH using hydraulic cutterhead dredges, which would deposit the dredged material by pipeline directly to the site. The material would be stockpiled at the site using bulldozers.

Emissions associated with the dredging, transport, and reuse of 750,000 cy of material at the NAS Alameda site are summarized in Table 5.1-4. Detailed calculations of emissions for each piece of equipment associated with these dredging, transport, and reuse source categories shown in Table 5.1-4 are provided in Appendix I.1. Since all of the emissions are from temporary construction activities, as opposed to long-term operational activities, they are considered to cause an adverse, but not significant, impact under the BAAQMD CEQA Guidelines, which have been adopted as the significance criteria for construction emissions for this EIS/R. However, all appropriate $PM_{10}$ control measures identified in section 5.1.1 must be implemented at the reuse site.

**Table 5.1-3. Emissions for Dredging, Transport, and Reuse of Material at the MHEA**

| | DAILY EMISSIONS[a] (LBS/DAY) | | | | |
|---|---|---|---|---|---|
| *Activity* | *ROG* | *CO* | *NOx* | *SO2* | *PM10* |
| Dredge/Transport IH (4,556,000 cy) | 42 | 258 | 895 | 59 | 18 |
| Dredge/Transport OH (1,861,000 cy) | 49 | 340 | 1,190 | 78 | 21 |
| Dredge/Transport OH Berths (583,000 cy) | 68 | 282 | 1,010 | 68 | 37 |
| Reuse | 6 | 22 | 46 | 5 | 4 |
| Maximum Daily Emissions | 164 | 901 | 3,140 | 210 | 79 |
| Mitigated Maximum Daily | 79 | 224 | 473 | 11 | 38 |
| | TOTAL EMISSIONS[b] (TONS) | | | | |
| *Activity* | *ROG* | *CO* | *NOx* | *SO2* | *PM10* |
| Dredge/Transport IH (4,556,000 cy) | 3.0 | 18.8 | 65.3 | 4.3 | 1.3 |
| Dredge/Transport OH (1,861,000 cy) | 1.5 | 10.2 | 35.8 | 2.4 | 0.6 |
| Dredge/Transport OH Berths (583,000 cy) | 4.0 | 16.5 | 59.1 | 4.0 | 2.2 |
| Reuse | 0.0 | 0.1 | 0.2 | 0.0 | 0.0 |
| Total Emissions | 8.5 | 45.6 | 160.0 | 10.6 | 4.1 |
| Mitigated Total | 4.2 | 11.4 | 25.2 | 0.5 | 2.0 |

*Notes:* a. Refer to Appendix I.1, Tables I-3, I-6, I-11, I-26, I-29, and I-34, for detailed equipment calculations. Emissions rounded to three or fewer significant digits.
b. Refer to Appendix I.1, Tables I-1, I-6, I-11, I-46, I-49, and I-54, for detailed equipment calculations. Emissions rounded to three or fewer significant digits.

**Table 5.1-4. Emissions for Dredging and Reuse of Material at the NAS Alameda**

| | DAILY EMISSIONS[a] (LBS/DAY) | | | | |
|---|---|---|---|---|---|
| *Activity* | *ROG* | *CO* | *NOx* | *SO2* | *PM10* |
| Dredge/Transport IH (750,000 cy) | 42 | 258 | 895 | 59 | 18 |
| Reuse | 3 | 11 | 23 | 3 | 2 |
| Maximum Daily Emissions | 44 | 269 | 918 | 61 | 20 |
| Mitigated Maximum Daily | 19 | 58 | 94 | 2 | 7 |
| | TOTAL EMISSIONS[b] (TONS) | | | | |
| *Activity* | *ROG* | *CO* | *NOx* | *SO2* | *PM10* |
| Dredge/Transport IH (750,000 cy) | 0.5 | 3.1 | 10.7 | 0.7 | 0.2 |
| Reuse | 0.0 | 0.1 | 0.1 | 0.0 | 0.0 |
| Total Emissions | 0.5 | 3.2 | 10.9 | 0.7 | 0.2 |
| Mitigated Total | 0.2 | 0.6 | 1.0 | 0.0 | 0.1 |

*Notes:* a. Refer to Appendix I.1, Tables I-2 and I-25, for detailed equipment calculations. Emissions rounded to three or fewer significant digits.
b. Refer to Appendix I.1, Tables I-2 and I-45, for detailed equipment calculations. Emissions rounded to three or fewer significant digits.

*SF-DODS*

Under this reuse/disposal option, a maximum of 6,900,000 cy of material would be removed from the IH and OH using two clamshell dredges, loaded onto 5,000 cy scows, and transported to the deep ocean disposal site. Dredged material would be disposed at the site by bottom dumping from the scows.

Emissions associated with the dredging and transport of material to this site are summarized in Table 5.1-5. Detailed calculations of emissions are provided in Appendix I.1. Emissions from these temporary construction activities would cause an adverse, but not significant, air quality impact under the BAAQMD CEQA Guidelines, which have been adopted as the significance criteria for construction emissions for this EIS/R. No $PM_{10}$ control measures would be required for disposal at this site since no activity would occur on land.

**Table 5.1-5. Emissions for Dredging and Transport of Material to SF-DODS**

| | DAILY EMISSIONS[a] (LBS/DAY) | | | | |
|---|---|---|---|---|---|
| *Activity* | *ROG* | *CO* | *NOx* | *SO2* | *PM10* |
| Dredge/Transport IH and OH (6,900,000 cy) | 245 | 735 | 3,120 | 213 | 161 |
| Maximum Daily Emissions | 245 | 735 | 3,120 | 213 | 161 |
| Mitigated Maximum Daily | 178 | 397 | 1,560 | 32 | 141 |
| | TOTAL EMISSIONS[b] (TONS) | | | | |
| *Activity* | *ROG* | *CO* | *NOx* | *SO2* | *PM10* |
| Dredge/Transport IH and OH (6,900,000 cy) | 85 | 253 | 1,078 | 73 | 56 |
| Total Emissions | 85 | 253 | 1,078 | 73 | 56 |
| Mitigated Total | 61 | 137 | 538 | 11 | 49 |

*Notes:* a. Refer to Appendix I.1, Tables I-8 and I-31, for detailed equipment calculations. Emissions rounded to three or fewer significant digits.
b. Refer to Appendix I.1, Tables I-8 and I-51, for detailed equipment calculations. Emissions rounded to three or fewer significant digits.

***Hamilton Wetland Restoration***

Under this reuse/disposal option, a maximum of 5,200,000 cy of material would be removed from the IH and OH using two clamshell dredges, loaded onto 5,000 cy scows, and transported to the Hamilton Airfield wetlands restoration site. Emissions from unloading the material at this site are considered in the environmental documentation being prepared for the Hamilton wetlands restoration project. Therefore, no unloading emissions are considered for this project for reuse at Hamilton Airfield.

Emissions associated with the dredging and transport of material to the Hamilton Airfield site are summarized in Table 5.1-6. Detailed calculations of emissions are provided in Appendix I.1. Emissions from these temporary construction activities would cause an adverse, but not significant, air quality impact under the BAAQMD CEQA Guidelines, which have been adopted as the significance criteria for construction emissions for this EIS/R. No $PM_{10}$ control measures would be required for reuse at this site since no project-related activity would occur on land.

**Table 5.1-6. Emissions for Dredging and Transport of Material to Hamilton Airfield**

| | DAILY EMISSIONS[a] (LBS/DAY) | | | | |
|---|---|---|---|---|---|
| *Activity* | *ROG* | *CO* | *NOx* | *SO2* | *PM10* |
| Dredge/Transport IH and OH (5,200,000 cy) | 191 | 648 | 2,620 | 177 | 122 |
| Maximum Daily Emissions | 191 | 648 | 2,620 | 177 | 122 |
| Mitigated Maximum Daily | 132 | 311 | 1,130 | 23 | 101 |
| | TOTAL EMISSIONS[b] (TONS) | | | | |
| *Activity* | *ROG* | *CO* | *NOx* | *SO2* | *PM10* |
| Dredge/Transport IH and OH (5,200,000 cy) | 50 | 168 | 681 | 46 | 32 |
| Total Emissions | 50 | 168 | 681 | 46 | 32 |
| Mitigated Total | 34 | 81 | 294 | 6 | 26 |

*Notes:* a. Refer to Appendix I.1, Tables I-9 and I-32, for detailed equipment calculations. Emissions rounded to three or fewer significant digits.
b. Refer to Appendix I.1, Tables I-9 and I-52, for detailed equipment calculations. Emissions rounded to three or fewer significant digits.

*Montezuma Wetlands Restoration*

Under this reuse/disposal option, a maximum of 5,200,000 cy of material would be removed from the IH and OH using two clamshell dredges, loaded onto 5,000 cy scows, and transported to the Montezuma Wetlands restoration site. Emissions from unloading the material at this site are considered in the environmental documentation prepared for the Montezuma wetlands restoration project. Therefore, no unloading emissions are considered for this project for reuse at Montezuma Wetlands.

Emissions associated with the dredging and transport of material to the Montezuma Wetlands site are summarized in Table 5.1-7. Detailed calculations of emissions are provided in Appendix I.1. Emissions from these temporary construction activities would cause an adverse, but not significant, air quality impact under the BAAQMD CEQA Guidelines, which have been adopted as the significance criteria for construction emissions for this EIS/R. No PM10 control measures would be required for reuse at this site since no project-related activity would occur on land.

**Table 5.1-7. Emissions for Dredging and Transport of Material to Montezuma Wetlands**

| | DAILY EMISSIONS[a] (LBS/DAY) | | | | |
|---|---|---|---|---|---|
| *Activity* | *ROG* | *CO* | *NOx* | *SO2* | *PM10* |
| Dredge/Transport IH and OH (5,200,000 cy) | 245 | 735 | 3,120 | 213 | 161 |
| Maximum Daily Emissions | 245 | 735 | 3,120 | 213 | 161 |
| Mitigated Maximum Daily | 178 | 397 | 1,560 | 32 | 141 |
| | TOTAL EMISSIONS[b] (TONS) | | | | |
| *Activity* | *ROG* | *CO* | *NOx* | *SO2* | *PM10* |
| Dredge/Transport IH and OH (5,200,000 cy) | 64 | 191 | 812 | 55 | 42 |
| Total Emissions | 64 | 191 | 812 | 55 | 42 |
| Mitigated Total | 46 | 103 | 687 | 8 | 37 |

*Notes:* a. Refer to Appendix I.1, Tables I-10 and I-33, for detailed equipment calculations. Emissions rounded to three or fewer significant digits.
b. Refer to Appendix I.1, Tables I-10 and I-53, for detailed equipment calculations. Emissions rounded to three or fewer significant digits.

*Various Landfills*

Up to 100,000 cy of contaminated dredged material could be disposed at one of three potential landfill sites: Altamont Landfill, Redwood Landfill, or Vasco Road Landfill. The material would first be processed at a rehandling facility which would be located at the Vision 2000 Upland Area. The dredge material would be dried at the rehandling facility and then loaded onto 10- to 12-cy end-dump trucks for transport to the selected landfill.

Up to 20,000 cy of the 100,000 cy could be transported by rail to a Class I landfill located in Utah. However, for the air quality analysis, it is assumed that all 100,000 cy is transported by truck to the Altamont, Redwood, or Vasco Road Landfill since the emissions generated within the Bay Area Air Basin by the approximately 2,000 truck trips required to haul the 20,000 cy would exceed the emissions generated by the approximately 10 train trips required to haul the same amount.

The emissions associated with handling and loading the material at the rehandling facility, combined with the emissions from transport to the landfill, are shown in Table 5.1-8. Since the distance from the rehandling facility location to each of the three potential landfills is roughly the same (approximately 35 miles), the total emissions are assumed to be the same regardless of the landfill selected. (Emissions within the Bay Area Air Basin from rail haul of 20,000 cy of material to Utah would be less than 20 percent of the total emissions associated with truck haul of 100,000 cy, as shown in Table 5.1-8.)

Emissions from transport of the dredged material from the dredge site to the Vision 2000 Upland Area rehandling facility are not included in Table 5.1-8. These emissions have already been accounted for as part of the emissions associated with the Vision 2000 Upland Area (see Table 5.1-1 above). Detailed calculations of the emissions contained in Table 5.1-8 are provided for each type of equipment in Appendix I.1. Emissions from this temporary construction reuse/disposal activity would cause an adverse, but not significant, air quality impact under the BAAQMD CEQA Guidelines, which have been adopted as the significance criteria for construction emissions for this EIS/R. However, all appropriate $PM_{10}$ control measures identified in section 5.1.1 must be implemented at the rehandling facility and landfill site.

**Table 5.1-8. Emissions from Handling and Transport to Landfill of Contaminated Dredge Material**

| | MAXIMUM DAILY EMISSIONS[a] (LBS/DAY) | | | | |
|---|---|---|---|---|---|
| *Activity* | *ROG* | *CO* | *$NO_x$* | *$SO_2$* | *$PM_{10}$* |
| Handle and Transport Dredge Material to Landfill (100,000 cy) | 17 | 99 | 95 | 7.1 | 7.3 |
| Mitigated Maximum Daily | 15 | 99 | 81 | 1.8 | 7.3 |
| | TOTAL EMISSIONS[b] (TONS) | | | | |
| *Activity* | *ROG* | *CO* | *$NO_x$* | *$SO_2$* | *$PM_{10}$* |
| Handle and Transport Dredge Material to Landfill (100,000 cy) | 2.9 | 17 | 16 | 1.2 | 1.2 |
| Mitigated Total | 2.5 | 17 | 14 | 0.3 | 1.2 |

*Notes:* a. Refer to Appendix I.1, Tables I-16 and I-39, for detailed equipment calculations. Emissions are rounded to three or fewer significant digits.
b. Refer to Appendix I.1, Tables I-16 and I-59, for detailed equipment calculations. Emissions are rounded to three or fewer significant digits.

*Mitigation Measures*

The impact due to short-term emissions from dredging and reuse/disposal construction activities would not be considered significant under the BAAQMD CEQA Guidelines, which have been adopted as the significance criteria for construction emissions for this EIS/R. Nonetheless, since dredging and reuse/disposal activity emissions would be substantial and would cause an adverse air quality impact, mitigation measures were evaluated to reduce project emissions. The most feasible measures to reduce project emissions would be to (1) replace diesel-powered dredges with electric powered dredges, (2) retard injection timing of older diesel-powered equipment and engines which do not have mechanical injection for $NO_x$ control, and (3) use reformulated diesel fuel to reduce ROG and $SO_2$ emissions. The Corps will commit to implementing these measures by establishing binding agreements with construction phase contractors before the start of construction. The BAAQMD-prescribed $PM_{10}$ control measures detailed in section 5.1.1 shall also be implemented.

Use of electric-powered dredges would essentially eliminate all emissions from this source in the areas of project activity. Some emissions would still occur at the facilities generating the power required to operate the dredges. However, facilities contributing power to the grid in the Bay area are either permitted, well-controlled sources and/or hydro-power facilities which produce minimal emissions. Retarding injection timing by 2 degrees from the manufacturers suggested setting would reduce $NO_x$ emissions by about 15 percent from diesel-powered equipment. Although retarding injection timing by more than 2 degrees would further reduce $NO_x$ emissions, it was not considered due to fuel economy penalties. Use of reformulated fuel would reduce ROG and $SO_2$ emissions by 15 and 75 percent, respectively, from diesel-powered equipment (Southwest Research Institute 1991). No other mitigation measures were deemed feasible.

Another potential mitigation measure, phasing of dredging activities, would spread project emissions over a longer period and decrease daily emissions. However, this measure was deemed infeasible due to project completion goals and scheduling conflicts for limited dredge equipment. Dredging and reuse/disposal emissions would be temporary, intermittent, and would cease upon completion of project activities. Daily and total project emissions remaining after application of electric dredges, injection timing retard and use of reformulated fuel are shown in tables 5.1-1 through 5.1-8.

### 5.1.4 Other Project Construction Activities

Other project construction activities (besides dredging and reuse/disposal) that would occur during the 4 year construction period include the following:

1. Modify BART anode structures and cable
2. Lower or relocate submarine utilities in project area
3. Demolish Navy wharf/warehouse(s) at IH turning basin
4. Install sheetpile on Alameda side of the proposed IH turning basin
5. Construct rehandling facility at Vision 2000 Upland Area
6. Construct main dike at MHEA
7. Stabilize existing berths prior to deepening

### *Project Impacts*

Emissions associated with the "other construction activities" that would occur during the dredging/reuse/disposal period are provided in Table 5.1-9. Detailed calculations of the equipment emissions for each of these activities are provided in Appendix I.1. The emissions from these temporary construction activities are considered to cause an adverse, but not significant, impact under the BAAQMD CEQA Guidelines, which have been adopted as the significance criteria for construction emissions for this EIS/R. However, all appropriate $PM_{10}$ control measures, as identified in section 5.1.1, must be implemented.

**Table 5.1-9. Emissions from Other Construction Activities**

| | Maximum Daily Emissions[a] (lbs/day) | | | | |
|---|---|---|---|---|---|
| *Activity* | *ROG* | *CO* | *NOx* | *SO2* | *PM10* |
| 1. Modify BART Anode Structures and Cables | 18 | 47 | 166 | 12 | 13 |
| 2. Lower/Relocate Submarine Utilities | 54 | 158 | 414 | 35 | 30 |
| 3. Demolish Navy Wharf/Warehouse | 15 | 99 | 131 | 13 | 9 |
| 4. Install 300 Feet of Sheetpile at Beery | 4 | 27 | 28 | 2 | 2 |
| 5. Construct Rehandling Facility | 3 | 17 | 18 | 2 | 2 |
| 6. Construct Main Dike at MHEA | 241 | 573 | 2,650 | 183 | 165 |
| 7. Stabilize IH Existing Berths | 4 | 21 | 32 | 3 | 2 |
| | Total Emissions[b] (tons) | | | | |
| *Activity* | *ROG* | *CO* | *NOx* | *SO2* | *PM10* |
| 1. Modify BART Anode Structures and Cables | 0.02 | 0.05 | 0.17 | 0.01 | 0.01 |
| 2. Lower/Relocate Submarine Utilities | 0.27 | 0.78 | 2.04 | 0.17 | 0.15 |
| 3. Demolish Navy Wharf/Warehouse | 0.43 | 2.96 | 3.92 | 0.38 | 0.26 |
| 4. Install 300 Feet of Sheetpile at Beery | 0.05 | 0.40 | 0.42 | 0.04 | 0.03 |
| 5. Construct Rehandling Facility | 0.26 | 0.03 | 0.13 | 0.01 | 0.01 |
| 6. Construct Main Dike at MHEA | 2.85 | 5.84 | 28.00 | 1.94 | 1.96 |
| 7. Stabilize IH Existing Berths | 0.05 | 0.31 | 0.48 | 0.04 | 0.04 |
| TOTAL | 3.90 | 10.40 | 35.20 | 2.60 | 2.50 |
| TOTAL (Mitigated) | 3.20 | 9.20 | 26.10 | 0.60 | 2.30 |

*Notes:* a. Refer to Appendix I.1, Tables I-12 through I-20 and Tables I-35 through I-43, for detailed equipment calculations. Emissions rounded to three or fewer significant digits.
b. Refer to Appendix I.1, Tables I-12 through I-20 and Tables I-55 through I-63, for detailed equipment calculations. Emissions rounded to three or fewer significant digits.

### *Mitigation Measures*

The combined total of "other construction activity" emissions with dredging and reuse/disposal activity emissions would be substantial. Therefore, the same mitigation measures described above for reducing emissions from dredging and reuse/disposal activities were considered for these other construction activities, i.e., (1) use of electric-powered dredges, (2) retard injection timing of older diesel-powered equipment for $NO_x$ control, and (3) use reformulated diesel fuel to reduce ROG and $SO_2$ emissions. Use of electric-powered dredges would eliminate all project-related emissions from these sources. Retarding injection timing by 2 degrees would reduce $NO_x$ emissions by about 15 percent from diesel-powered equipment. Use of reformulated fuel would reduce ROG and $SO_2$ emissions from diesel-powered equipment by 15 and 75 percent, respectively (Southwest Research Institute 1991). No other mitigation measures were deemed feasible. Total emissions remaining after application of these mitigation measures are shown in Table 5.1-9.

### 5.1.5 Project Operations

Dredging the IH and OH to a new depth of 50 feet would allow larger container vessels to enter the Port. It is expected that both the number and size of container vessels calling at the Port will

increase over time. With this increase will come a corresponding increase in the number of containers (cargo) and number of trucks, trains, terminal equipment, and new employees to handle the new containers. Therefore, the operational emission sources considered in this section as being related to the dredging project include: vessels, tugs, trucks, trains, terminal equipment, and employee vehicles. The emissions from these sources would cause operational impacts, as opposed to the construction impacts generated by the dredging/transport/reuse/disposal activities.

No emission increases are considered for vessel types other than container ships. Currently, 97 to 98 percent of all vessel calls at the Port of Oakland are container ships (personal communication, G. Joseph 1997). The relatively small number of vessels other than container ships that call at the Port of Oakland is not expected to increase as a result of the dredging project.

*Vessel Emissions*

Container vessel calls at the Port are expected to increase from the 1996 baseline of 1,630 visits to 1,737 visits in 2003, and 1,930 visits in 2010 as a result of dredging, other proposed Port development, and regional economic growth (personal communication, G. Joseph 1997). New emissions would be generated by this increased vessel traffic in the form of combustion emissions emitted during vessel cruise, maneuvering, and hoteling modes. The maximum daily and total emissions associated with the vessels are provided in Table 5.1-10. Also included in the vessel emission numbers are emissions from the tugs that would assist the vessels during maneuvering and berthing operations. Detailed calculations of emissions broken down into vessel size categories by operating mode are contained in Appendix I.1.

*Truck Emissions*

Truck trips required to handle the increase in container cargo due to the deepened channels at the Port have been projected in the Transportation analysis (see section 5.7). The truck trips required to haul containers to the Port of Oakland intermodal rail terminal and the truck trips required for local deliveries are projected to increase from a 1996 baseline of 995 rail haul trips and 7,777 local delivery trips to 1,067 rail trips and 8,338 local trips in 2003. In 2010, these numbers would increase to 1,144 rail trips and 8,939 local trips. The maximum daily and total emissions associated with these trucks are provided in Table 5.1-10. Despite the fact that the number of truck trips increases in both 2003 and 2010, emissions of ROG, $NO_x$, and $PM_{10}$ from this source would actually be less than 1996 baseline emissions. The reason for this decrease is that the emission factors for these pollutants drop significantly for later-year vehicles. The improved emission control systems on later model year trucks will more than compensate for the increase in trips and mileage traveled. Detailed calculations of truck emissions for each of the years 1996, 2003, and 2010 are contained in Appendix I.1.

*Train Emissions*

Train trips required to handle the project-related container cargo increase have been projected in the Transportation analysis (see section 5.7). The train trips are projected to increase from an average of 2.9 per day in 1996, to 6.5 per day in 2003, and 10.0 per day in 2010. The maximum daily and total emissions associated with these train trips are provided in Table 5.1-10. Detailed calculations of train emissions for each of the years 1996, 2003, and 2010 are contained in Appendix I.1.

**Table 5.1-10. Emissions from Project-Related Operation Sources at Port of Oakland**

| | Maximum Daily Emissions[a] (lbs/day) | | | | |
|---|---|---|---|---|---|
| *Year/Emission Sources* | *ROG* | *CO* | *$NO_x$* | *$SO_2$* | *$PM_{10}$* |
| **1996 (Baseline)** | | | | | |
| Vessels | 462 | 940 | 9,450 | 6,520 | 954 |
| Trucks | 383 | 2,340 | 3,770 | 100 | 299 |
| Trains | 20 | 64 | 476 | 35 | 10 |
| Terminal Equipment | 233 | 716 | 2,650 | 69 | 144 |
| Employee Vehicles | 220 | 4,550 | 238 | 4 | 3 |
| TOTAL | 1,320 | 8,610 | 16,600 | 6,720 | 1,410 |
| **2003** | | | | | |
| Vessels | 572 | 1,200 | 12,200 | 8,220 | 1,200 |
| Trucks | 265 | 2,400 | 2,850 | 94 | 116 |
| Trains | 46 | 142 | 1,070 | 77 | 22 |
| Terminal Equipment | 278 | 857 | 3,170 | 83 | 172 |
| Employee Vehicles | 147 | 3,140 | 163 | 5 | 4 |
| TOTAL | 1,310 | 7,740 | 19,400 | 8,480 | 1,520 |
| **Increase Over Baseline** | (10) | (870) | 2,800 | 1,760 | 110 |
| **2010** | | | | | |
| Vessels | 687 | 1,470 | 15,000 | 9,990 | 1,470 |
| Trucks | 284 | 2,570 | 3,050 | 101 | 124 |
| Trains | 71 | 219 | 1,640 | 119 | 34 |
| Terminal Equipment | 327 | 1,010 | 3,730 | 97 | 203 |
| Employee Vehicles | 82 | 2,000 | 125 | 6 | 4 |
| TOTAL | 1,450 | 7,260 | 23,500 | 10,300 | 1,830 |
| **Increase Over Baseline** | 133 | (1,350) | 6,930 | 3,590 | 420 |
| | Total Emissions[b] (tons) | | | | |
| *Year/Emission Sources* | *ROG* | *CO* | *$NO_x$* | *$SO_2$* | *$PM_{10}$* |
| **1996 Baseline** | | | | | |
| Vessels | 60 | 122 | 1,230 | 847 | 124 |
| Trucks | 50 | 304 | 490 | 13 | 39 |
| Trains | 3 | 8 | 62 | 5 | 1 |
| Terminal Equipment | 30 | 93 | 345 | 9 | 19 |
| Employee Vehicles | 29 | 592 | 31 | 1 | 0 |
| TOTAL | 171 | 1,120 | 2,160 | 874 | 183 |
| **2003** | | | | | |
| Vessels | 74 | 156 | 1,580 | 1,070 | 157 |
| Trucks | 34 | 311 | 370 | 12 | 15 |
| Trains | 6 | 19 | 139 | 10 | 3 |
| Terminal Equipment | 36 | 111 | 412 | 11 | 22 |
| Employee Vehicles | 19 | 409 | 21 | 1 | 1 |
| TOTAL | 170 | 1,010 | 2,530 | 1,100 | 197 |
| **Increase Over Baseline** | (1) | (114) | 371 | 228 | 14 |
| **2010** | | | | | |
| Vessels | 89 | 191 | 1,950 | 1,300 | 191 |
| Trucks | 37 | 334 | 397 | 13 | 16 |
| Trains | 9 | 29 | 213 | 15 | 5 |
| Terminal Equipment | 43 | 131 | 485 | 13 | 26 |
| Employee Vehicles | 11 | 260 | 16 | 1 | 1 |
| TOTAL | 189 | 944 | 3,060 | 1,340 | 238 |
| **Increase Over Baseline** | 17 | (176) | 901 | 467 | 55 |

*Notes:* a. Refer to Appendix I.1, Tables I-67 through I-69 and I-72 through I-80, for detailed calculations. Emissions rounded to three or fewer significant digits.

b. Refer to Appendix I.1, Tables I-67 through I-69, I-72 through I-77, and Tables I-83 through I-85, for detailed calculations. Emissions rounded to three or fewer significant digits.

*Terminal Equipment Emissions*

Emission estimates have been made for the increased activity of terminal equipment required to handle the containers that will flow through the Port as a direct result of the deepening project. These estimates of maximum daily and total emissions are provided in Table 5.1-10, and include emissions for terminal sources such as transtainers, side-loaders, and hostlers. (Transtainers and side-loaders are types of fork lifts used to stack and load containers in the terminal area and at the ICTF. Hostlers are diesel-powered transport vehicles used to move containers within the terminal area.) Emissions from the loading/unloading cranes have not been considered since these equipment are electric-powered and do not generate on-site emissions. Detailed calculations of the terminal equipment emissions are contained in Appendix I.1.

*Employee Vehicle Emissions*

Estimates of increased employee commute trips associated with the project-related container cargo increase have been projected in the Transportation analysis (see section 5.7). It should be noted that the increase in employee commute trips is not attributable to Port employees, but rather to employees of other businesses associated with container cargo operations. Employee trips are projected to increase from 4,787 per day in 1996, to 5,813 per day in 2003, and 6,853 per day in 2010. The maximum daily and total emissions associated with these employee trips are provided in Table 5.1-10. Despite the increase in employee commute trips in 2003 and 2010, emissions of ROG, CO, and $NO_x$ will decrease to below the 1996 baseline emissions level. The reason for this decrease is due to a significant drop in the emission factors for these pollutants for later model year vehicles. The improved emission control systems on later model year automobiles and pickup trucks would more than compensate for the increase in the number of commute trips. Detailed calculations of the employee vehicle emissions are contained in Appendix I.1.

*Impacts (All Operation Sources)*

The emission increases shown in Table 5.1-10 indicate that in 2003 the BAAQMD significance thresholds of 80 pounds per day and 15 tons per year would be exceeded for $NO_x$ and $SO_2$ (as $SO_x$). In 2010 these thresholds would be exceeded for ROG, $NO_x$, $SO_x$, and $PM_{10}$. These exceedances are considered to cause a significant air quality impact.

*Mitigation Measures*

A wide variety of mitigation measures from sources such as U.S. EPA, ARB, COE, BAAQMD, South Coast AQMD, Port of Oakland, Port of Los Angeles, and private organizations including the CAL-START and the Gas Research Institute were examined to determine those measures that could potentially be used to reduce emissions from the 50-foot project operation sources. Each measure was evaluated as to its potential feasibility and improvement expected and rated high, medium, or low according to the following criteria:

- *Feasibility of Implementing the Measure*

  High – Presents few barriers to implementation (easily implementable given existing administrative structures; low to moderate cost given improvement expected; existing technology available for emissions control purposes; fits well into existing industry operations).

Medium — Presents reasonable procedural steps toward implementation (existing administrative structure that could be efficiently modified to implement measure; moderate cost given improvement expected; existing technology easily adaptable for emissions control purposes; measure would fit into established industry operations).

Low — Presents numerous barriers to implementation (difficult to implement given existing administrative structures, or would require new administrative structure to be established; high cost given improvement expected; would require extensive technological developments; measure is outside existing industry changes to implement).

- *Improvement Expected*

  High (> 25 tons emission reduction).

  Medium (1-25 tons emission reduction).

  Low (< 1 ton emission reduction).

Mitigation measures that would have medium to high levels of feasibility and medium to high levels of expected improvement were initially selected for further consideration as enforceable actions that would be committed to by one or both project lead agencies, i.e., the Corps as federal lead agency and the Port of Oakland as state lead agency. However, a number of these mitigation measures had to be rejected because the measure would require actions which are outside of the authority of the Corps or Port of Oakland to implement, or because the cost for improvement expected was too high. The measures considered viable for this project are indicated by project operation emissions source type in Table 5.1-11.

As shown in Table 5.1-11, one or more of the measures would be applied to reduce emissions from each of the operations source types as follows:

| *Source Type* | *Applicable Mitigation Measure* |
|---|---|
| Vessels | 1 |
| Trucks | 1, 2, 3, 4, 5, 6 |
| Trains | 1 |
| Terminal equipment | 1, 2, 3 |
| Employee vehicles | 6 |
| General Port operations | 7, 8 |
| All source types | 9 |

The Port will commit to the implementation of the measures listed in Table 5.1-11 in order to offset and/or reduce pollutant emissions from the new project-related vessel, truck, train, terminal equipment, and employee vehicle sources.

The Port further proposes to embark upon a long-term air quality program as a result of the proposed Vision 2000 program. The program will serve as a clearinghouse for air quality impacts resulting from the Vision 2000 Program and related maritime activities and to study and propose implementation of feasible mitigation measures. These could include mitigation measures that may be beyond the authority of the Port, but could be implemented by cooperative action between the Port of Oakland and other agencies, such as the City of Oakland.

**Table 5.1-11. Mitigation Measures Selected to Reduce Emissions from Oakland Harbor 50-Foot Project Operation Sources**
(page 1 of 2)

| *Mitigation Measure Description* | *Source Type(s)* | *Pollutants Removed* [1] | *Improvement Expected* [2] | *Implementing Authority* |
|---|---|---|---|---|
| 1. Optimize Port operations. Design new and retrofitted wharf, terminal, and intermodal facilities to minimize vehicle idling and vehicle miles traveled within the Port area. | Vessels, trucks, trains, terminal equipment | ROG, CO, NOx, SOx, PM | Medium | Port of Oakland |
| 2. Encourage Port tenants to retrofit and operate low- or zero-emissions off-road light and medium duty vehicles. | Trucks and terminal equipment | ROG, CO, NOx, SOx, PM | Medium | Port tenants and others |
| 3. Support regional programs to retrofit and operate low- or zero-emissions on-road light and medium duty vehicles. | Trucks and terminal equipment | ROG, CO, NOx, SOx, PM | Low to Medium | Port of Oakland; Port tenants; truck owners/operators; others |
| 4. Support regional programs to install oxidative catalysts, particulate traps, turbo chargers, and engine intercoolers on heavy duty diesel trucks servicing Port tenants' vessels. | Heavy-duty trucks | ROG, NOx, PM | High | Port of Oakland and others |
| 5. Participate in development of a regional program to assist truck operators to purchase new, reduced emission heavy-duty vehicles to replace older vehicles used at the Port. | Heavy-duty trucks | NOx | High | Port of Oakland and others |
| 6. Participate in development of a program to retrofit vehicle fleets used in the Port area (e.g., vans and taxis). | Trucks, automobiles | ROG, CO, NOx | Medium | Port of Oakland, fleet owners/ operators; and others |

**Table 5.1-11. Mitigation Measures Selected to Reduce Emissions from Oakland Harbor 50-Foot Project Operation Sources**
(page 2 of 2)

| *Mitigation Measure Description* | *Source Type(s)* | *Pollutants Removed*[1] | *Improvement Expected*[2] | *Implementing Authority* |
|---|---|---|---|---|
| 7. Inventory unpaved roads and parking lots in the maritime area of the Port and consider paving. | General operations | PM | Low to Medium | Port of Oakland |
| 8. Implement street sweeping and cleaning at regular intervals in Port area and West Oakland area. | General operations | PM | Low to Medium | Port of Oakland |

*Notes:* 1. ROG = reactive organic gases
CO = carbon monoxide
NOx = oxides of nitrogen
SOx = oxides of sulfur
PM = particulate matter
2. Improvement Expected = Low (< 1 ton), Medium ( 1-25 tons), and High (> 25 tons).

One of the most important functions of the long-term air quality program is to provide a forum for air quality stakeholders to meet, discuss, develop, and support implementation of appropriate and feasible measures that can ameliorate and mitigate adverse air quality impacts. While air quality concerns are regional in nature, and therefore the purview of the BAAQMD, a particular focus of the long-term air quality program will be the West Oakland community, the neighborhood that has been most affected by Port of Oakland maritime activities. (See also the discussion in section 9.2.1: Cumulative Air Quality Mitigation Measures.)

It is very difficult to quantify the amount of emission reduction that will be realized by the application of the mitigation measures contained in Table 5.1-11. However, it is clear that the reductions would not be sufficient to reduce the $NO_x$, $SO_x$, and $PM_{10}$ emission levels to below the BAAQMD significance thresholds of 80 pounds per day and 15 tons per year. Therefore, despite the application of mitigation measures the impact of emissions from operational phase sources would remain significant.

## 5.2 SURFACE WATER RESOURCES

This section discusses the impacts of the project on surface water resources. Groundwater resources are addressed in section 5.3.

### 5.2.1 Impact Significance Criteria

Surface water impacts would be considered significant if project activities resulted in any of the following conditions:

- Exceedance of the state water quality standards or objectives (e.g., SF-RWQCB Basin Plan Objectives) and state maximum contaminant levels [MCL], where applicable, based on specific site conditions;
- Exceedance of the federal marine water quality standards, where applicable;
- Increased flooding that could cause impacts on the integrity of the site design or surrounding areas; or
- Increased risk due to spillage or exceedances of water quality standards in the sensitive Middle Harbor Enhancement Area.

In addition to the above criteria, dredged material disposed in the ocean would have to be done in accordance with the testing requirements of the federal Marine Protection, Research, and Sanctuaries Act (MPRSA), and the disposal of material at in-Bay sites would have to be consistent with the federal Clean Water Act (CWA). These requirements are considered protective of water quality. These requirements could include the tests for water column limiting permissible concentration (LPC) and compliance with water quality criteria established in the SF-RWQCB Basin Plan (refer to section 3.1 and Appendix O).

Material deemed suitable for unconfined aquatic disposal (SUAD), according to the testing requirements of the MPRSA and CWA, would be disposed at SF-DODS and unconfined in-Bay sites. Disposal of SUAD material at these sites is considered to have no significant water quality impacts according to this criterion. In addition, disposal of Old Bay Mud and Merritt Sand material at SF-DODS has been shown to meet the Tier 1 exclusion criteria in the Green Book (refer to Chapter 3).

At the New Berth 21 site and MHEA, a small quantity of wetland non-cover material deemed not suitable for unconfined aquatic disposal (NUAD) according to the testing requirements of the CWA would be disposed in an unconfined aquatic site prior to being capped with wetland cover material. For these reuse/disposal options, LPC compliance and solubility tests are appropriate water quality significance criterion. The LPC standard is designed to provide adequate protection of water quality (Chapter 3). Additional material that is SUAD wetland non-cover material would also be placed at New Berth 21 and MHEA and capped with wetland cover material.

### 5.2.2 Proposed Dredging

Dredging Oakland Harbor would have essentially the same impacts on surface water resources under either dredging option B or F. Dredging options B and F are similar with the exception that

Option B would widen the Outer Harbor channel an additional 250 feet from the existing 750-foot channel width (refer to Table 2.1-1).

Dredging operations would occur in compliance with all permitting requirements. Dredging of softer muds will be done in a way to minimize sediment loss during the dredge cycle (refer to section 2.1.2). Removal would continue to project depth, -50 feet MLLW, plus allowable overdepth. While using the cutterhead dredge, undercutting would be avoided because sediment above the area being undercut could slump in on the cutterhead, increasing turbidity.

For SUAD material, barges would not be filled beyond their capacity and would remain over the project site to allow for the overflow of water. For NUAD material, overflow water from the barges during dredging or transport to reuse/disposal sites would not be permitted.

Within the wings of the Inner Harbor turning basin shown in Figure 3.2-3, the softer NUAD muds would be removed. If required by the SF-RWQCB, additional material would be dredged to ensure the removal of softer material not suitable for aquatic disposal in an area that might be subject to scour in the event of ship movement. During dredging of specific contaminated areas of the Inner Harbor turning basin, booms would be placed around the dredging area to contain oil or floating material that might be released from sediments. All of the material shall be treated as not suitable for unconfined aquatic disposal and would be moved to an upland site. Up to 20,000 cy could be disposed at a Class I landfill.

***Project Impacts***

*Hydrodynamics*

Waters in Oakland Inner and Outer Harbor areas experience relatively rapid exchange with Central Bay tidal cycles. Current velocities average between 25-50 cm/sec in the Inner Harbor and average 3.5-4.5 cm/sec in the Middle Harbor (Hartman 1997b). In the Inner Harbor, sediments resuspended by dredging activities would move east and west with the tidal cycles. The Outer Harbor benefits from increased exposure to the west and prevailing Central Bay hydrodynamic conditions. Resuspended sediments in the Outer Harbor area may be circulated in a counterclockwise eddy located south of the Seventh Street Terminal but, eventually, they would be flushed into the South and Central bays. Adjacent pier structures would, to some degree, trap suspended sediments and limit the amount of sediment in circulation (Hartman 1997b).

The removal of sediment from these channels would leave depressions that would not change the local hydrodynamics substantially. Currents associated with tidal cycles would not change either. Waters moving through the channels would deposit the suspended sediment load into the depressions; however, current velocities would not change markedly. Impacts to channel hydrodynamics would not be significant during or after dredging.

*Water Quality*

Water quality variables in Oakland Harbor that could be affected by dredging operations are the same as those described for the reuse/disposal sites: salinity, temperature, pH, nutrients, dissolved oxygen, total suspended solids (TSS), and concentrations of metals and organics. Potential impacts on these parameters can be evaluated by reviewing field measurements collected during several water quality monitoring studies at dredge sites.

SALINITY, TEMPERATURE, AND pH

The Corps studied the effect hydraulic cutterhead and clamshell dredges had on the water column (COE 1976, Appendix C). The Corps study revealed that dredging operations did not typically cause significant fluctuations in salinity, temperature, or pH over the short or long term. Slight fluctuations were detected only 25 percent of the time while the dredges were monitored. During one event, a fluctuation of 0.5 units in pH was observed when potentially acidic materials were released from the dredge. This occurrence was considered aberrant, and background levels were regained within minutes (COE 1976, Appendix C). Surface water quality objectives for these parameters (SF-RWQCB 1995a) are expected to be satisfied based on this San Francisco Bay study.

NUTRIENTS

Nutrient enrichment caused by potentially elevated concentrations of phosphorus, nitrogen, and silica in the dredged material could increase water turbidity by enhancing primary production. In a literature review, it was reported that elevated quantities of phosphate, ammonia (as nitrogen), and silica have been measured within 180 m of a working dredge, exceeding background levels by two to nine times. However, when compared with ambient levels as a whole, the dredging operations would cause increased concentrations of nutrients by a maximum of 2 percent for ammonia, 1 percent for phosphate, and 0.5 percent for silica. Impacts would occur only in the near-field environment and they would be transient, with nutrients flushed to the open Bay. Nutrient releases would be insignificant due to rapid dilution and tidal exchange. Significant impacts would not be expected.

DISSOLVED OXYGEN

Dissolved oxygen concentrations may decline in the vicinity of dredging operations with the suspension of sediments with little available oxygen in the oxygen-rich water column creating a high oxygen demand. During the Corps study (COE 1976, Appendix C), dissolved oxygen concentrations declined in only four of the 12 measurements. Depressions in dissolved oxygen were greatest in the lower 2 m of the water column. The greatest fluctuation in dissolved oxygen (3.5 parts per million) occurred at a near-bottom sampling location within 50 m of the dredge. Concentrations declined from 9.0 ppm to 5.5 ppm, which meets the minimum dissolved oxygen requirement of 5.0 mg/L set by the SF-RWQCB (1995a). In all cases, background levels of dissolved oxygen were regained within 10 minutes of the sampling event.

Dissolved oxygen concentrations during the dredging of Oakland Harbor sediments would decline for a very short period. Another study of the Oakland Harbor showed dissolved oxygen levels ranging from 5.70-6.67 mg/L (Hartman 1997b). Dissolved oxygen concentrations in the immediate vicinity of the dredging operations may become depressed below the minimum SF-RWQCB requirement for a short period (less than 10 minutes). However, due to the localized short duration of the effect, impacts on dissolved oxygen in the water column would not be significant.

TOTAL SUSPENDED SOLIDS

Concentrations of TSS vary with the material being dredged and the type of dredge employed. Elevated suspended solids reduce light transmittance, and increase oxygen demand, which results in reduced dissolved oxygen levels, increased nutrients levels and increased levels of chemicals associated with the suspended sediments. Clamshell bucket dredging invariably creates the highest suspended sediment plumes. A plume is associated with the disruption of the bottom on

impact and the retrieval of the bucket through the water column. Gordon (1973) estimated material losses during clamshell dredging to be about 2.5 percent (COE 1976, Appendix C). MEC, a consultant to the Port of Oakland, recently completed an investigation into the turbidity plume associated with clamshell dredging activities for the 42-foot project (MEC 1997). The turbidity plume created by the proposed project is expected to be similar to the plume evaluated by MEC.

In the MEC investigation, the visual turbidity plume dissipated quickly, within 100-250 meters of the dredge. Turbidity measured by light transmissivity data decreased from the dredge down current to a distance up to 600 meters. Most of the turbidity plume was concentrated in the bottom 7 meters, with transmissivity of less than 5 percent after 100-250 meters down current. Light transmissivity on the water column immediately adjacent to the dredging operations decreased from approximately 40 percent transmissivity to 35 percent transmissivity. Surface waters with 35-40 percent transmissivity (background levels) occurred throughout the study area in the upper 7 meters of water, both up current and down current of the dredge. The MEC study suggested that some of the turbidity may have been from other sources in addition to dredging, including the movement of the dredge barge, currents, and counter currents during an ebbing tide.

During the channel deepening project in San Francisco Bay described by the Corps (COE 1976, Appendix C), suspended sediments concentrations in the water column 50 m downstream from the clamshell dredge were generally less than 200 mg/L and averaged 30 to 90 mg/L. Background levels outside the plume averaged 40 mg/L. Suspended sediments concentrations decreased with increasing distance from the dredging operation. The near-bottom sediment plume extended downstream approximately 450 m.

The amount of sediments suspended by hydraulic cutterhead dredge are less compared to the clamshell dredge; however, not all sediments being suspended by the cutterhead will be drawn into the suction tube. In comparison to the clamshell dredge, the percentage of suspended material is very small. Pipelines that extend from the seafloor to the barges during cutterhead dredging all but eliminate mid-water and surface plumes (Appendix O). Suspended materials are restricted to the immediate vicinity of the cutter itself.

EVS, a consultant to the Port of Oakland, performed computer modeling of the water quality impacts for open clamshell dredging and hydraulic cutterhead dredging using the DREDGE model (Appendix O). Predicted TSS concentrations for a large open clamshell dredge would not exceed a threshold value of 1500 mg/L at distances of 8 meters from the dredge site. For the cutterhead dredge, the farthest distance at which a TSS threshold of 1,500 mg/L would be exceeded is 32 meters, occurring only at the bottom of the channel. TSS measurements 5 meters above the sediments and at the water surface would not exceed 1500 mg/L (Appendix O).

Additional sediment loading can occur when barges containing sediment suitable for unconfined, open-water disposal are allowed to overflow to obtain the most economical load or due to inadvertent spillage.

Suspended solids impacts on the water column may occur at the dredging site; however, they would be localized and transient. The levels are not expected to increase above 1,500 mg/L beyond the immediate vicinity of dredging activities. Based on a literature review of TSS effects to aquatic organisms, a biological threshold value of 1500 mg/L was determined (Appendix O). This TSS threshold value was based on a study of juvenile chinook salmon which showed gill damage after exposure to 1547 mg/L of TSS for 96 hours. This study had the lowest adverse effect

concentration for fish or invertebrate species or life stages in Oakland Harbor (Appendix O). Other studies cited in O'Connor (1991) demonstrate that direct biological effects of suspended sediment are caused by extremely high concentrations (greater than 3,400 mg/L) that extend for long periods. TSS levels are anticipated to exceed 1,500 mg/L in the localized area of the dredging operations for short durations. The short duration and localized effect of the elevated TSS levels that would occur near the bottom 7 meters of the channel would have short-term but insignificant impacts. Significant long-term impacts due to elevated suspended sediment concentrations are not expected.

METALS AND OTHER CONTAMINANTS

The proposed dredge sediments in Oakland Harbor include a wide range of metals and contaminants concentrations (refer to Chapter 3 and Appendix H). A significant portion of this sediment is SUAD, particularly the deeper Old Bay Mud (OBM) and Merritt Sands (MS). Some sediments have been determined to be not suitable for unconfined aquatic disposal (NUAD), requiring careful removal and placement at appropriate sites including Vision 2000 Upland Fill, New Berth 21, or to a Class I, II, or III landfill. Any NUAD sediment removed during this project would be placed in barges to a level that would not cause overflow or spillage during dredging or in transit to the reuse/disposal site. This measure would restrict the potential resuspension of dredged material that would most likely contain elevated (beyond background) levels of metals and/or organics.

Chemical reactions between the suspended sediments and the water column, that have the potential to release metals to the environment, are possible during the dredging operation. These reactions are highly dependent on the redox potential of the seawater, pH and, to a certain degree, salinity. Oxidation of organic material during dredging or disposal could release metals, but field monitoring data rarely demonstrate significant contamination. This is because the metals adsorb to other available particulates. The oxidation reaction rapidly binds the metals, and the small amount of metals that are released are highly diluted by the surrounding water (Chapter 3; Appendix H). All of these factors would be present at the dredge site and are incorporated into models that estimate the potential for contaminant release (Appendix O).

The majority of heavy metals, nutrients, petroleum, and chlorinated hydrocarbons are typically associated with the fine-grained and organic components of the sediment (Chapter 3; Appendix H). The available data suggest that biologically significant releases of these constituents during dredging has not been routinely observed (EVS 1997b). Most metals and organic compounds are not available in a soluble form because they are complexed with iron, manganese, organic matter, and clay particles (Windom 1972; cited in LaSalle 1984). Water quality monitoring data collected during dredging of a metals-enriched site at the Kings Bay, Georgia Naval Base demonstrated elevated metals concentrations were present in the water column, but that metals contamination was not a long-term problem (Alvarez, Lehman & Associates 1985). Laboratory studies describing the behavior of metals and chlorinated hydrocarbons revealed that 70 percent of the copper released by disturbances of bottom sediments was adsorbed onto clay and organic particles, effectively removing it from the water column. In the same way, 97 percent of the mercury and 50 percent of the mercuric nitrate/mercury chloride were adsorbed onto fine-grained and organic components of the sediments (Stern and Stickle 1978). Chlorinated hydrocarbons were noted to be strongly bound to the solid phase but, with increasing suspended solids concentrations, greater soluble forms of hydrocarbons were detected. It was also noted that the co-occurrence of both oil and grease and chlorinated hydrocarbons may enhance bioavailability (Lee et al. 1975).

Field measurements of direct metals releases to the water column have been made in the immediate vicinity during past dredging operations. Three examples are relevant to this project because the dredging sites are metals-enriched. The three dredging projects occurred in San Francisco Bay (Wakeman 1977); Black Rock Harbor, Connecticut; and the Duwamish River, Washington (Havis 1988). The projects reported by Havis (1988) were performed using a clamshell bucket. Direct measurements were summarized in LaSalle (1984) and are presented in Table 5.2-1.

Metals concentrations from the three studies shown do not exceed Basin Plan water quality objectives (with the exception of copper in heavily contaminated Black Rock Harbor). Measurements were compared to screening criteria intended to adequately protect water quality (and hence aquatic organisms) immediately following release of the effluent/dredged material. Because the suspended sediment load is relatively small (i.e., 500 mg/L or less) in the vicinity of the dredging operation, and dilution at most dredging sites occurs quickly, substantial releases of contaminants are not expected (LaSalle 1984).

EVS also performed modeling of the metals and organic compound impacts from dredging using the Corps DREDGE model (Appendix O). The model was run for the cutterhead dredge and the

**Table 5.2-1. Comparison of Historical Contaminants Release Data during Dredging Basin Plan Water Quality Objectives (all values in mg/L)**

| | Basin Plan Water Quality Objectives | | Example Dredging Project | | |
|---|---|---|---|---|---|
| *Metal* | *1-hr Average* | *Instantaneous Maximum* | *San Francisco Bay* | *Black Rock Harbor* | *Duwamish Waterway* |
| Arsenic | 69 | - | - | 10 | - |
| Cadmium | 43 | - | - | 1 | - |
| Chromium | 1,100 | - | 30 surface/ 50 bottom | 1 | - |
| Copper | 2.9* | - | - | 10 | 2 |
| Lead | 140 | - | 10 | 3 | 7 |
| Mercury | 2.1 | - | - | 0.01 | - |
| Nickel | - | 140 | 10 surface/ 80 bottom | 10 | - |
| Selenium | - | - | - | - | - |
| Silver | - | 2.3 | - | - | - |
| Zinc | - | 170 | 160 | 30 | 20 |

*Notes:* - = Not Available
* Copper toxicity depends on complexing capacity. Bay background varies from 1 to 4 µg/L.
*Source:* LaSalle 1984.

open clamshell dredge. For the cutterhead dredge and either a 36-inch or 18-inch pipe, the dissolved metals concentrations (cadmium, copper, nickel, lead, and zinc) were not predicted to exceed USEPA marine acute water quality criteria or lowest observed effects levels (LOEL), or proposed water quality criteria (*Federal Register* 62(150): August 5, 1997). No exeedances of acute water quality standards for the organic compounds were predicted for the cutterhead dredge with an 18-inch pipe. For a 36-inch pipe, organic constituents are not expected to exceed marine acute water quality criteria except for the PAHs, fluoranthene and phenanthrene. The elevated fluoranthene and phenanthrene concentrations were predicted based on YBM from the Inner Harbor turning basin wings, a worst case scenario. Particulate fluoranthene concentrations were

predicted to exceed a LOEL of 40 mg/L a maximum distance of 10 m downcurrent from the dredge. Particulate phenanthrene concentrations were predicted to exceed the marine acute water quality criteria of 7.7 mg/L a maximum distance of 20 m downcurrent from the dredge. The rate of removal for a 36-inch pipe is four times greater than the rate for an 18-inch pipe. The 36-inch pipe would generate proportionally more resuspension of sediment.

For the clamshell dredge, dissolved metals concentrations (cadmium, copper, nickel, lead and zinc) and particulate organic chemicals concentrations were not predicted to exceed applicable water quality standards.

In conclusion, water quality impacts at the dredge site for the water quality parameters described above would have short-term localized impacts. Long-term significant impacts are not expected.

*Mitigation Measures*

To mitigate the organic compounds (fluorathene and phenanthrene) that exceed marine acute water quality criteria, a dredge pipe of 18 inches in diameter or an open clamshell dredge shall be used to dredge the YBM in the Inner Harbor turning basin wings.

### 5.2.3 Possible Reuse/Disposal Options

***Vision 2000 Upland Area***

*Project Impacts*

This section includes a discussion of sediment placement activities at the Vision 2000 Upland Area, followed by a discussion of the proposed rehandling facility, which could also be located at this site.

SEDIMENT PLACEMENT ACTIVITIES

The region of influence for the sediment placement activities would be the site itself, the Fleet Industrial Supply Center Oakland (FISCO), and the Union Pacific Railroad property.

A long-term significant impact is possible from stormwater runoff at the site. If graded improperly, the placement of fill in the Vision 2000 Upland Area may direct uncontrolled stormwater into the sensitive Middle Harbor Enhancement Area (MHEA) during heavy rains. Erosion of the fill slope by stormwater runoff may introduce silt into the sensitive MHEA area as well.

No impacts are expected from displaced water from the Vision 2000 Upland Area during infilling. Construction of the Vision 2000 Upland Area would begin with the construction of a containment dike (see section 2.2.4). Water remaining within the diked-off area would be released (decanted) into the Bay as the area is infilled. Potential releases of particulates in the discharged water, as well as constituents bound to those particles, would be monitored in accordance with SF-RWQCB permitting requirements. The decant water would be tested and subsequently treated or diluted to meet water quality objectives, or taken to a liquid recycler if the objectives could not be met.

REHANDLING FACILITY

The region of influence for the rehandling facility is the footprint of the facility at the Vision 2000 Upland Area.

A short-term potentially significant impact is associated with the operation of the rehandling facility. Water contained in the facility may contain dissolved chemical constituents that have leached from the dredged material. The contaminants may exceed water quality standards if discharged directly into the Bay. The rehandling facility, located on top of the Vision 2000 Upland Area (and the other potential locations noted in the project description), would be designed to control water that is placed in the cells or that falls into the rehandling facility as rainfall. Discharge of water from the facility would be done under permit by the SF-RWQCB. The containment dikes that form the dewatering cell would prevent the uncontrolled discharge of water that is placed in the cell or that falls into the cell as rain. Water would be tested and treated, if required, to meet RWQCB discharge requirements, then discharged to the Inner Harbor. Alternatively, water from the facility would be collected and allowed to evaporate, with no discharge to the Bay. This would be a short-term, significant impact that would be mitigable to a level of insignificance.

*Mitigation Measures*

SEDIMENT PLACEMENT ACTIVITIES

Because the Vision 2000 Upland Area comprises more that 5 acres, the Port of Oakland shall be required to file a Notice of Intent (NOI) stating that the Port (or its contractor) intends to comply with the state of California General Construction Permit for stormwater. As part of the requirements of this permit, the Port shall file a Stormwater Pollution Prevention Plan (SWPPP) that identifies Best Management Practices (BMPs) to be implemented to control stormwater runoff, and a Stormwater Management Plan, which includes wet and dry weather observations and the collection of stormwater samples from discharge locations to ensure that the BMPs are working. Once filling is complete, the Port shall file a Notice of Completion (NOC) and the operations would become part of the Port's Group Monitoring Plan (GMP) for stormwater. Once occupied, the new tenant(s) at the Berth 55-58 and JIT sites would then be responsible for filing an NOI and complying with requirements identified in the Port's GMP. Wet and dry weather sampling and the collection of stormwater samples shall continue annually as described in the GMP. If the observation and/or test results indicate that the BMPs are not fulfilling the conditions of the permit, then additional engineering controls would be required by the SF-RWQCB to mitigate the problem.

Prior to filling, the Port shall reconstruct the stormwater system in the area of the impacted outfalls to allow the system to operate properly and remain in compliance with the general permit. The stormwater drains shall be re-directed out of the Middle Harbor to minimize the potential for impacts to the sensitive MHEA. Reconstruction of the system would reduce the impact to a level of insignificance.

REHANDLING FACILITY

No mitigation measures associated with the rehandling facility would be necessary to protect surface water resources.

*New Berth 21*

A dike would be constructed along the entire outer boundary of the site. The dike would be constructed of rock up to -18 feet MLLW to allow barges to enter the site and to partially contain disposed sediments. After the disposed sediment has reached approximately -18 feet MLLW, the dike would be raised to the terminal grade level to enclose the area and the fill material would be pumped from a barge or placed by a clamshell dredge into the New Berth 21 area. Approximately 2.5 mcy of dredged material would be used to fill the site composed of 70,000 cy of wetland non-cover material and the remaining disposed sediment would be wetland cover material consisting primarily of sand (section 2.2.4).

*Project Impacts*

HYDRODYNAMICS

A dike that would enclose the new terminal area at the New Berth 21 site would permanently modify the hydrodynamics of this site, but the impact would not be significant.

WATER QUALITY

Potential water quality impacts could occur during construction prior to the dike enclosing the site, although they are not expected to be significant. When the dike is completed across the entire New Berth 21 site, tidal exchange would be eliminated. At that point, potential impacts to surface water quality would be from the discharge of decant water or stormwater.

Water quality variables that could be affected by disposal operations would include the following: salinity, temperature, pH, nutrients, dissolved oxygen, TSS, and concentrations of metals and organics. Impacts on these parameters can be inferred from data collected at the Inner Harbor and Middle Harbor (MEC 1997; Hartman 1997b). Information from these studies is included in the discussion below.

*Salinity, Temperature, and pH.* It was noted from the Corps study (COE 1976, Appendix C) that changes in salinity, temperature, and pH were localized and short in duration. Ambient concentrations of these parameters were regained usually within 10 minutes following the release of material. Based on studies performed at the in-Bay sites, it is anticipated that pH would vary less than 0.10 units, salinity would decrease by no more than 2 parts per thousand, and temperature would vary less than 1°F. These short-term alterations are well within the surface water quality objectives in the Basin Plan (SF-RWQCB 1995a).

*Nutrients.* Potential increases in the nutrient levels would be restricted to the discharge plume and may enhance primary production, and consequently increase turbidity levels. Turbidity levels would also be increased by the suspension of dredged material in the water column, minimizing the relative role of nutrient increases. However, turbidity would be confined to the New Berth 21 site due to the dike and construction phasing that would raise the dike height sufficiently to contain TSS levels within the confines of the site. These impacts are expected to be temporary and insignificant.

*Dissolved Oxygen.* The Corps study indicated that changes in dissolved oxygen were localized and of short duration. During the study, dissolved oxygen concentrations were observed to decline up to 6 mg/L in bottom waters within the disposal plume. Depressions in dissolved oxygen concentrations of this magnitude may violate the minimum requirements of 5 mg/L in the Basin

Plan for disposal operations performed during the summer months. If this occurs, potential short-term impacts on the water column at the New Berth 21 site are possible for disposal operations performed during the summer months. The placement of the dredged sediment would be controlled to ensure Basin Plan dissolved oxygen levels are met. Because the disposal is episodic and localized and there will be tidal exchange at the site, this impact would not be significant.

*Total Suspended Solids.* Increased TSS concentrations would unavoidably occur within the confines of the New Berth 21 during the disposal operations. The site depth is -42 feet MLLW and a submerged dike would initially be constructed to -18 feet MLLW. It is not expected that there would be any significant TSS impact outside the site from the disposal of the sediments until bottom depth is within a few feet of the dike. This assumes the dike itself would not allow sediments to pass through it. Of the total 2.5 mcy of fill material for the site, 70,000 cy will be fine grained, wetland non-cover material. The dredge material placed several feet below -18 feet MLLW would be wetland cover material consisting primarily of sand, which generates very low TSS concentration.

The behavior of dredged material during disposal and its impacts on the water column were also studied by the Corps — San Francisco District in 1974. In this Corps study, silty clays to clayey silts were discharged from twin hoppers at the Carquinez Straits disposal site and monitored for several water quality parameters, including suspended solids. Current velocities were measured in the Corps study at 1 cm/sec, which are slower than the velocities that are likely to occur at New Berth 21. In a study of the Oakland Inner Harbor, the velocity rate was recorded at 25-50 cm/sec (Hartman 1997b). TSS concentrations at the Carquinez site were in the range of grams per liter in surface waters (top 7 feet), while the concentration near the bottom exceeded 300 mg/L for short periods. Peak concentration typically dissipated within 10 minutes following the release (COE 1976, Appendix C). The elevated suspended sediment concentrations at New Berth 21 are expected to be transient with potentially a faster dispersion rate than the Carquinez site. Because the concentration of suspended dredge material would be minuscule compared to the Bay's overall sediment load, impacts to Bay waters are expected to be insignificant. The suspended sediment is expected to be confined to the New Berth 21 site due to the dike and careful placement of the dredged material, minimizing TSS impacts outside this site.

Dispersion modeling using the DIFID module of STFATE could not be performed for material proposed for disposal at the New Berth 21 but was inferred from the model of the MHEA. Similarity between the two sites include bottom depth near -40 feet MLLW. Both sites will also have wetland non-cover followed by wetland cover material used for fill. The model predicted that 40 minutes after disposal, suspended solids concentrations would be less than 1,500 mg/L. Ten minutes after disposal, suspended solids concentrations would exceed 1,500 mg/L at a maximum of 120 meters from the disposal point.

Based on the available information, long-term impacts on the water column due only to elevated TSS concentrations are not expected. Short-term significant impacts outside the New Berth 21 dike may occur, but they are mitigable. A waste water discharge permit from the SF-RWQCB would be required. It is expected to include a dilution zone and TSS monitoring to ensure compliance. Short-term impacts inside the dike are considered insignificant because the site would be fast land.

*Metals and Other Contaminants.* Approximately 2.5 mcy of dredged material would be used to fill a 27-acre area. Approximately 2,430,000 cy would be wetland cover material and 70,000 cy would be material suitable for wetland non-cover. This material has been extensively tested for metals and other contaminants. The wetland non-cover material would be placed as the first layer above

the existing muds, and this layer would be capped with the wetland cover material. The wetland non-cover layer in combination with the wetland cover layer would cap the existing contaminated sediments at this site. The existing sediment would be left undisturbed. The wetland non-cover material has been tested using the modified WET, and chemical constitutions are not soluble (refer to section 3.2.4). Under the placement conditions described in the project description, there is not expected to be significant water quality impact from this material. Water quality effects from placement of the wetland non-cover material would be further minimized because the wetland non-cover material would be capped with the wetland cover material shortly after placement.

Both wetland non-cover and wetland cover dredged material to be placed at New Berth 21 have been chemically and biologically tested (Chapter 3). Significant impacts from the release of toxic contaminants to the water column are not expected from the material. The modified WET test showed that sediment with high concentrations of metals and organics would not solubilize into the water column (refer to section 3.2.4). As discussed in 5.2.2, it is anticipated that disposal of the wetland non-cover material in an aquatic environment may have a short-term, localized effect that would not significantly impact the water column (EVS 1997b). The minor effects would be further minimized by the short duration of the disposal operation before capping it with cleaner fill. The placement of the wetland cover capping material would be controlled to ensure complete coverage over the wetland non-cover materials. Cap placement methods (i.e., slow release) to avoid resuspension of contaminated sediment, would be used. A dike -18 feet above MLLW would control dispersion of the sediments outside the New Berth 21 site.

SURFACE RUNOFF AND DRAINAGE

The region of influence for hydrology is the footprint of the New Berth 21 area, adjacent Port property, and the Oakland Army Base (OAB).

No impacts are expected from displaced water from the New Berth 21 area during infilling. Construction of the New Berth 21 fill area would begin with the construction of a containment dike (described in section 2.2.4 ). Water that may remain within the diked-off area would be released (decanted) into the Bay as the area is infilled. Potential releases of particulates in the discharged water, as well as constituents bound to those particles, would be monitored in accordance with SF-RWQCB WDRs. The decant water would be tested and subsequently treated or diluted to meet water quality objectives, or taken to a liquid recycler if the objectives could not be met.

A long-term, significant impact is expected due to the blocking of at least six stormwater outfalls when fill is placed against the existing wharf. During a heavy storm, the stormwater system would back up, causing flooding to the property. Rather than flowing into the stormwater system, runoff could flow across the property and discharge directly into the Bay. Because the stormwater system has been designed to reduce pollutants to the Bay, there is a slight chance of discharges exceeding acceptable standards. This would be a long-term, significant impact that would be mitigable to a level of insignificance.

*Mitigation Measures*

HYDRODYNAMICS

No mitigation measures are necessary.

WATER QUALITY

Mitigation measures to reduce the short-term impact from TSS shall be incorporated into the project. They would include:

- Wetland non-cover material shall be carefully placed behind a submerged dike at New Berth 21 to minimize TSS levels. Several methods can be used including slow opening of the bottom dump barge; placement of a thin layer of sand on top of fine grained sediments prior to rapid bottom dumping; and use of a diffuser at the end of the sediment discharge pipe.

- The submerged dike or sill elevation shall be sufficiently above the filled bottom elevation to avoid TSS levels that exceed 1,500 mg/L on the outer side of the submerged dike or sill.

- A silt curtain shall be used if TSS levels outside the dike exceed 1,500 mg/L on a continuous basis.

SURFACE RUNOFF AND DRAINAGE

Prior to filling, the Port shall reconstruct the stormwater system in the area of the impacted outfalls to allow the system to operate properly and remain in compliance with the general permit. Reconstruction of the system would reduce the impact to a level of insignificance.

***Middle Harbor Enhancement Area***

*Project Impacts*

HYDRODYNAMICS

Waters from the Middle Harbor currently experience relatively rapid exchange with Central Bay tidal cycles. To assist in the design of the MHEA, a hydrodynamic model was run to predict the hydrodynamics of the site after construction (Hartman 1997c). Under the proposed design for the MHEA, a dike would be constructed across most of the mouth of the MHEA that opens to the Inner Harbor. There would be an opening in the dike to allow adequate tidal flow to the Inner Harbor after completion of the construction.

Across the opening there would be a submerged sill with a deep hole (to -20 feet MLLW) behind it. The deep hole would slow current velocities and limit the wave energy entering the habitat area thereby minimizing erosion and resuspension of the sediments in the habitat area and back into the 50-foot navigational channel. The mouth width and sill depth would be designed to create velocities of approximately 35 cm/sec at maximum tidal exchange (Hartman 1997c). During construction a submerged berm would be placed to separate an inner Main Basin and an Outer Basin. These basins will modify the hydrodynamics only during the MHEA construction and will be homogenized into one habitat area in the final phases of the project. The final phases of the site construction will slope the bottom and create tidal channels, which will create a variety of habitat types and a state of equilibrium (Hartman 1997d). The final hydrodynamic design goals will be to configure the MHEA to control deposition of sediments into the habitat, minimize the resuspension of sediments, prevent erosion of the sediments, and control sedimentation into the navigational channel.

WATER QUALITY

Water quality variables that could be affected by disposal operations would be similar to New Berth 21 and include the following: salinity, temperature, pH, nutrients, dissolved oxygen, TSS, and concentrations of metals and other contaminants.

*Salinity, Temperature, and pH.* Impacts to salinity, temperature, and pH would be similar to those at New Berth 21. These short-term alterations would be well within the surface water quality objectives in the Basin Plan (SF-RWQCB 1995a) and, therefore, there is no significant impact.

*Nutrients.* Potential increases in the nutrient levels would be restricted to the discharge plume and the impacts would be similar to those at New Berth 21. The effects would be confined to the MHEA due to the dike, configuration of the tidal opening, and a sill (submerged dike) at the tidal opening. These effects are expected to be temporary and insignificant.

*Dissolved Oxygen.* Impacts to dissolved oxygen would be similar to those at New Berth 21. Depressions in dissolved oxygen concentrations may violate the minimum requirements of 5 mg/L in the Basin Plan for disposal operations performed during the summer months. Potential short-term impacts on the water column at the MHEA are therefore possible for disposal operations performed in the summer months. Material placement would be controlled to ensure Basin Plan dissolved oxygen levels are met. Because the sediment disposal will be episodic and localized and there will be tidal exchange, there would be no significant long-term impact to dissolved oxygen levels.

*Total Suspended Solids.* Increased TSS concentrations would unavoidably occur at the MHEA during the disposal operations. In one study at the Carquinez Strait (discussed above under New Berth 21), peak concentrations of TSS typically dissipated within 10 minutes when current velocities were 1 cm/sec. Middle Harbor current velocities are measured at 3.5-4.5 cm/sec, faster than the velocities at Carquinez Straits (Hartman 1997b). Suspended sediment concentrations at MHEA are expected to influence a localized plume at the point of discharge and then dissipate relatively rapidly to background levels. Disposal in the Main Basin of MHEA would be contained by a submerged berm (Appendix K). Of the total 7 mcy of fill material for the site, approximately 1.5 mcy will be finer grained wetland non-cover material and 5.5 mcy will be wetland cover material. The wetland non-cover material will be placed in a manner to minimize resuspension of the existing sediment and will only be placed within the confines of the Main Basin (refer to section 2.2.4). Wetland cover material, primarily sand, will be layered over the wetland non-cover material in the Main Basin and Outer Basin, also using methods to minimize resuspension of the sediments. The sandy wetland cover material will be between 10 and 12 feet thick above the wetland non-cover material. The sand would generate very low TSS concentrations. The elevated TSS is expected to be confined to the MHEA site due to the submerged berm, dike, and sill at the dike opening (refer to section 2.1.4).

Dispersion modeling using the DIFID module of STFATE was performed for material proposed for disposal at the MHEA. The suspended solids concentration from barge disposal predicted by the STFATE model indicates that 40 minutes after disposal, TSS would be less than 1,500 mg/L. Ten minutes after disposal, TSS levels would exceed 1,500 mg/L at a maximum distance of 120 meters from the barge.

Beneficial uses of the waters within the Middle Harbor would be adversely impacted to some degree during disposal episodes, but this would be a localized and short term only during

construction of a more biologically productive habitat. A waste water discharge permit from the SF-RWQCB will be required. It is expected to include a dilution zone and TSS monitoring to ensure compliance. Based on the available information, long-term impacts on the water column within MHEA due to elevated TSS would not be significant. Short-term significant impacts outside the MHEA dike may occur but they are mitigable.

*Metals and Other Contaminants.* Reuse of 7 mcy of material that is suitable for both wetland cover and non-cover may be placed in the 190-acre MHEA (see Chapter 3). This material has been extensively tested for metals and other contaminants (see Chapter 3 and Appendix H). This material would be layered on top of the existing contaminated Bay muds and would act as a cap for this material. The existing sediment would be left undisturbed. The wetland non-cover material would be placed first on top of the existing sediments to an approximate depth of 20 feet MLLW. A layer of wetland cover material would then be placed on top of the non-cover material at varying depths to create new habitat and islands. Capping the existing contaminated Bay sediments would have a beneficial impact at this site. In limited areas of the site, course sand from the dredged material would be placed to create beaches.

Dispersion modeling using the STFATE was performed for material proposed for disposal at MHEA. Copper was the trace element most likely to exceed criteria and, therefore, was used as the model variable. The model predicted dissolved copper concentrations based on this sediment concentration to be 0.25 mg/L. This concentration is below the proposed marine acute water quality criterion of 4.8 mg/L [*Federal Register* 62(150) August 5, 1997]. Similar predictions can be made for all other trace elements (Appendix O).

For the organic compounds, the maximum concentrations of PCBs, PAHs, DDT, and its metabolites, dieldren and heptachlor epoxide, were used in the model. The model predicted concentrations above background for each of these chemicals, but they were substantially lower than all water quality standards.

The dredged material that would be placed at the MHEA has been chemically and biologically tested (see Chapter 3). It meets the SF-RWQCB chemical criteria for wetland cover and non-cover materials (Wolfenden and Carlin 1992). Therefore, significant impacts from release of toxic contaminants to the water column would not be expected.

*Mitigation Measures*

HYDRODYNAMICS

No mitigation measures are required.

WATER QUALITY

Mitigation measures to reduce the short-term impact from TSS shall be incorporated into the project. They would include:

- Wetland non-cover material shall be carefully placed behind a submerged berm at MHEA to minimize TSS levels. Several methods can be used including slow opening of the bottom dump barge; placement of a thin layer of sand on top of fine grained sediments prior to rapid bottom dumping; and use of a diffuser at the end of the sediment discharge pipe.

- The dike, submerged berm or sill elevation shall be sufficiently above the filled bottom elevation to avoid TSS levels that exceed 1,500mg/L on the outer side of the dike, submerged berm or sill.

- A silt curtain shall be used if TSS levels outside the dike exceed 1,500 mg/L on a continuous basis.

*Former NAS Alameda*

The region of influence for the Former NAS Alameda is the footprint of the 21-acre dewatering cell and the 24-acre sediment stockpile area.

WATER QUALITY

No impacts on surface water quality in the Bay are anticipated as a result of construction or operation of the dewatering cell or stockpile area at NAS Alameda. Material that would be placed into the dewatering facility would be relatively clean construction fill material, and the facility would be operating under permit by the SF-RWQCB. There would thus be no impact on water quality from the use of this site.

SURFACE RUNOFF AND DRAINAGE

No impacts to the Bay from surface water or drainage are anticipated as a result of construction of the dewatering cell or stockpile area at NAS Alameda. The construction of the dewatering cell and the stockpile site would not require significant grading of the current ground surface. Existing manholes and catch basins in the area would be sealed to prevent the discharge of sediment into the existing stormwater system. The elimination of catch basins may promote some ponding adjacent to the dewatering cell and stockpile area during heavy rains, but the amount of water is not anticipated to be significant. The containment dikes that form the dewatering cell would prevent the uncontrolled discharge of water that is placed in the cell or that falls into the cell as rain. The containment dike would be constructed of engineered fill, and erosion would likely be minimal. A peripheral containment dike around the stockpile area would prevent eroded stockpiled material from entering the existing stormwater system. In addition, the Port may be required to conduct inspections of the site and file a self-certification that there is no uncontrolled stormwater runoff. The construction and operation of the dewatering cell and stockpile area should not affect the site's existing stormwater program.

*Mitigation Measures*

No mitigation measures are necessary.

*San Francisco Deep Ocean Disposal Site (SF-DODS)*

*Project Impacts*

Local and regional hydrodynamics will influence the dispersion and long-term fate of dredged material discharged at SF-DODS. The dispersion of sediment particles will, in turn, affect local and regional water quality conditions. The discussions concerning hydrodynamics and water quality that follow are based on disposal plume modeling performed by the EPA (1993a) and the U.S. Navy (1993b) in association with ocean site designation studies and the Corps (1993c) to determine the suitability of the Oakland Harbor 42-foot project sediments for disposal in ocean

waters. The actual effects of one dredged material disposal project on water quality conditions at the site were measured in a monitoring study sponsored by the U.S. Navy (U.S. Navy 1995h; summarized in EPA 1998a).

HYDRODYNAMICS

Disposal of dredged material at the SF-DODS would result in temporary and localized disturbance of water column stratification; currents would not be affected. No significant impacts to hydrodynamics would occur. Regarding the potential for hydrodynamics to affect disposed dredged material, near-bottom currents at the site are generally less than 1 cm/sec, although tidal currents may be significantly (up to five times) higher near topographic features such as submarine canyons. Even these higher velocities have little potential to erode material on the bottom. However, periodic turbidity flows (down-slope movement of sediments) may be more significant in eroding and transporting sediments in the vicinity of the SF-DODS (see section 5.3.3).

Dredged material disposal at SF-DODS would not have a measurable effect on the hydrodynamics in the area.

WATER QUALITY

Potential impacts on water quality given local and regional circulation patterns in the vicinity of the site are discussed in this section. Water quality parameters potentially impacted by dredged material disposal at SF-DODS include suspended solids, dissolved oxygen, nutrients, salinity, temperature, pH, and concentrations of dissolved contaminants. Alterations in ambient dissolved oxygen levels, nutrient concentrations, salinity, temperature, and pH as a result of dredged material disposal can be predicted using existing field and laboratory data, most of which were collected in association with the Dredged Material Research Program of the Corps (Burks and Engler 1978; Brannon et al. 1976; Hirsch et al. 1978; Pequegnat et al. 1978; Pequegnat 1983; Lunz et al. 1984). These data were gleaned from studies performed from dredging sites and relatively shallow disposal sites; impacts on the water column resulting from dredged material disposal in the deep ocean have not been extensively studied.

*Salinity, Temperature, and pH.* Changes in salinity, temperature, and pH of ambient waters would be restricted to the descent phase of disposal. The impacts to salinity, temperature, and pH would be similar to the impacts described for New Berth 21. Water column profiles of temperature and salinity during disposal by the Navy at the site in 1995 were very similar to historical data (U.S. Navy 1995h). Based on these data, entrainment of site waters in the disposal plume would cause minimal, localized, and short-term impacts of these parameters at the SF-DODS site.

*Nutrients.* The addition of nutrients (especially nitrogen and phosphorus) to the area during disposal operations may cause enhanced production of phytoplankton. Increased turbidity resulting from disposal, however, would reduce light transmittance and, as a result, tend to depress primary production. This net effect is expected to be small, transient, and localized within the discharge plume. No significant impacts are anticipated.

*Dissolved Oxygen.* Dissolved oxygen concentrations in the water column at SF-DODS may potentially decrease during disposal if chemical oxygen demand is increased by the presence of inorganic compounds associated with the dredged material. Although oxidation of unstable organic compounds would occur in the upper 400 m of the water column where waters are well

oxygenated, more pronounced effects may be noted in the "oxygen minimum zone" (at about 800 m) where ambient oxygen levels are less than 1.0 mg/L (EPA 1993a). The potential reduction in dissolved oxygen due to chemical oxygen demand is expected to be restricted to the location of the dredged material plume. Oxygen uptake is unlikely to alter the oxygen content of deep ocean waters encountered at SF-DODS, considering the small ratio between the disposal volume and the receiving water column (up to 3,000 m) (COE 1976, Appendix C). Therefore, reduction in dissolved oxygen concentrations in the water column would be a temporary, insignificant impact.

*Total Suspended Solids.* Another water quality parameter of concern is the concentration of suspended particulates in the water column following disposal and the resulting potential for adverse effects on biota, particularly fish. Excessive particulates in the water can clog the gills of fish and impede uptake of oxygen. The modeling of dredged material disposal at the ocean site conducted by the Corps (described below) indicated that the expected elevation of suspended particulate concentration after the 4-hour initial mixing period would be approximately 40 mg/L. Measurements of TSS made by the Navy during disposal at the site in 1993 were lower than those predicted by the Corps model, and those predicted by modeling that was part of the Navy study (U.S. Navy 1995h). For example, maximum TSS concentrations measured in water samples as close as possible to the dredged material release location and time were 24.2 mg/L and 19.9 mg/L (U.S. Navy 1995h). Dredged material plumes were tracked, using acoustic methods, primarily to the north and northeast of the release point. The plumes ceased to be detectable approximately 2 nautical miles from the release point, and TSS measured at the boundary of the SF-DODS 4 hours after release could not be distinguished from background. TSS concentrations in water samples collected from the surface to 1,000 m at an ocean reference station, and at the SF-DODS and GFNMS, ranged from 0.1 mg/L to a maximum of 1.7 mg/L. No dredged material plumes were tracked acoustically crossing the GFNMS boundary. Less dredged material (17 to 40 percent) remained in the water column, and more (60 to 83 percent) reached the bottom, than predicted in the Navy modeling study (U.S. Navy 1995h). The above field measurements indicated that the material that remained in the water column was dispersed rapidly.

For purposes of comparison, effects of suspended sediments on fishes and shellfishes summarized in a literature review performed by Lunz et al. (1984) were compared to these predicted dredged material concentrations at the SF-DODS site. Suspended solids in the studies reviewed ranged in concentration from 50 to 300,000 mg/L, with varying degrees of biological effects among different fish species. Biological effects were not noted for concentrations below 1,500 mg/L. For a species representative of SF-DODS, the herring, no significant effects on the hatching success were noted at concentrations as high as 5,000 mg/L. Based on these data, impacts on the water column caused by suspended sediment alone would likely be insignificant.

A STFATE model was used to evaluate the TSS impacts to water quality from the disposal of dredged Merritt Sand and Old Bay Mud from a barge to SF-DODS. Suspended sediment concentrations in the descending volume after 4 minutes were less than 1,500 mg/L. After 1 hour, the suspended sediment concentrations were predicted to be 501 mg/L at a distance of 901 meters from the disposal point. At 4 hours after disposal, the suspended sediments were predicted to be 145 mg/L (Appendix O).

*Metals and Other Contaminants.* The biological uptake, absorption, and desorption of chemical constituents and their dispersal would occur at the ocean site. However, because only dredged material found suitable for unconfined, open-water disposal would be deposited at SF-DODS, significant adverse impacts on site waters by contaminants are not anticipated. An extensive evaluation of the sediment data and confirmation sediment sampling was undertaken. The

sediments proposed for disposal at SF-DODS are Merritt Sand and Old Bay Mud. Merritt Sand and Old Bay Mud sediments were extensively tested as part of the 38-foot and 42-foot projects and determined to be SUAD. The limiting permissible concentration (LPC) modeled in the 38-foot and 42-foot project met federal and state water quality standards (EVS 1997c). Merritt Sand and Old Bay Mud sediment to be dredged in the 50-foot project are expected to be less contaminated than the Merritt Sand and Old Bay Mud sediment removed as part of the 42-foot project. Based on this premise, a Tier I evaluation was prepared in conformance with the Green Book (EVS 1997c). This evaluation, based on existing data, provided sufficient information to make a suitability determination. It was concluded that Merritt Sand and Old Bay Mud could be disposed at SF-DODS. Samples were also take of these sediments to confirm the suitability determination (Chapter 3).

Although impacts on the water column are expected to be insignificant, changes to the dredged material during disposal are anticipated. The dredged material would be affected by several physical, chemical, and biological processes. These factors include the following: the extent of initial mixing; the presence of organic material, clays, iron and manganese oxides, and hydroxides; salinity; Eh (redox potential or oxidizing potential of sediments); pH; biological uptake; and the reactivity of the compounds themselves (EPA 1993a). Water circulation is potentially the most important factor in determining the dispersal of contaminants associated with suspended sediments (Bryan 1984). Dissolved constituents are likely to be dispersed by bottom currents. Silt and clay particles, which often are associated with trace chemical constituents, may be dispersed by bottom currents and trapped in topographic lows (for example, in a small submarine canyon east of the site).

In summary, no significant impacts on the water column at the SF-DODS site would be expected. Depletions in oxygen and alterations to TSS, pH, temperature, salinity, and nutrients levels would be short term; ambient waters would replace those affected by the disposal plume, returning water quality parameters to background levels. Impacts associated with the release of contaminants from the dredged material have been predicted by evaluation of existing data and biological testing of the proposed dredged material. The results of this evaluation demonstrates suitability for ocean disposal in compliance with the MPRSA.

*Mitigation Measures*

No potential significant impacts on the water column are anticipated at the SF-DODS; consequently, no mitigation measures are required beyond those standard operational practices related to the transport to disposal sites. However, the additional measures listed below would minimize impacts of disposal at the SF-DODS.

The proposed Site Management and Monitoring Plan (SMMP) Implementation Manual for SF-DODS (EPA 1998b) provides a basis for making site use management decisions using data collected in a tiered monitoring program. The plan was devised to avoid or mitigate adverse environmental impacts at and adjacent to this site. The SMMP also lists several provisions for site use that have been incorporated into the disposal site use permit (in the MPRSA Section 103 process) that aim to (1) restrict the inadvertent disposal of materials in transit to SF-DODS, (2) define a target for material release, and (3) provide guidelines for compliance monitoring of these restrictions.

Following dredged material placement, a tiered monitoring approach would be used to address the effects of dredged material on the marine environment. The Physical Monitoring Plan is

focused on the potential transport of dredged material from the site after the material is disposed. Numerical modeling would predict the extent of the dredged material deposit followed by field verification sampling, however numerical modeling has already been performed and will not generally be redone because now empirical data are collected from actual site monitoring. If more than 5 cm of material accumulates outside of the disposal site in a 1-year period, then either additional oceanographic studies will be conducted to improve model predictions or appropriate management actions will be taken. Sediment quality is assessed by measuring contaminant levels on and off site. If unacceptable adverse impacts are detected, several management actions could be used, including reducing the size or location of the disposal zone, revising permit conditions related to placement, and limiting the amount of material that can be disposed in a year. The requirements of the final SMMP would be incorporated as part of the construction of the 50-foot project.

***Hamilton Wetlands Restoration***

*Project Impacts*

HYDROLOGY

*Drainage and Flooding Impacts.* Restoration of tidal and seasonal wetlands at the Hamilton restoration site includes ceasing operation of the pumps that remove storm waters from the Hamilton site and adjacent unprotected low-lying properties. Interior on-site drainage at the Hamilton site and adjacent drainage courses would be altered by levee construction, placement of dredged material, and restoration of the site to a tidal marsh. Surface water drainage in the vicinity of Landfill 26 could be altered by changing local topography through placement of dredged material and introduction of tidal action . Although the existing drainage system would be altered by the construction of the new levee and creation of a wetland, this would not result in increased flooding of the site or adjacent area to the extent of compromising the integrity of the site design or surrounding area. Therefore, the impact would be less than significant.

Where the existing level of flood protection is compromised by the project, new flood protection levees will be built to mitigate the impact. To ensure adequate site drainage is provided after construction of the perimeter levees and the placement of dredged material, on-site discharges would be controlled by site operations. Releases of decanted water from the dredged slurry placed on the site would be controlled by spillways in the outer levee. Provided the proposed wetlands area slopes toward San Pablo Bay, drainage would not be obstructed and no potentially significant impacts would occur.

Adequate drainage in the vicinity of Landfill 26 would be provided by incorporating into project design one of several approaches such as installing a pump or providing adequate drainage capacity downgradient of the landfill, or, to surcharge with dredged material the low-lying areas between the landfill and the Hamilton site so that surface water drainage can enter directly into the restored wetlands without requiring pumps or other conveyance structures (personal communication, Jack Gregg 1997). Though less desirable because of maintenance requirements, a pump could also be utilized to remove water from the area.

The placement of dredged material would allow water from the east end of Pacheco Pond to spill into the northwest corner of the restored wetland, enhancing flood conveyance in Pacheco Pond and in turn its flood protection capacity. The proposed project should also enhance flood protection capabilities for the Pacheco Creek and Arroyo San Jose watersheds by providing an

additional storm water discharge location where none currently exists. Because this would contribute to a beneficial impact to flood protection on a regional scale, no mitigation is required.

*Drainage and Flooding Mitigation.* Final project hydrologic studies shall be conducted to determine the most effective drainage methods and infrastructure required to provide adequate drainage and flood protection at the Hamilton Restoration Site and adjacent areas, including the Landfill 26 area. These methods shall be incorporated into final project designs.

WATER QUALITY

Disposal of dredged sediments at the site would result in vegetation and soils cover that would decrease the rapid runoff which presently occurs on the mostly paved site. Reduction in the runoff would also reduce runoff of accumulated pollutants, such as oil, grease, heavy metals, pesticide residues, fertilizers, and coliform bacteria from roadways, parking lots, rooftops, and other surfaces. This reduction in water quality degradation could be substantial, thereby producing beneficial impacts.

Reopening the restored area to tidal action would create conditions appropriate for typical salt marsh vegetation. Water quality in the restored marsh would be largely a function of circulation. Release of decant water from dredged materials would have no local effect on water salinity, since the discharged water would have virtually the same salt concentration as the Bay water.

Disposal of dredged sediments would result in the saturation of existing acid-sulfate soils. Acid-sulfate soil conditions could potentially affect the quality of runoff because of the low pH levels. The water quality problems associated with low pH include release of sulfuric acid, aluminum toxicity and the potential for release of other metals, and fluctuations in nutrient levels. These constituents could migrate into the perimeter drains and be discharged to San Pablo Bay or leach through on-site soils to groundwater beneath the site. However, the management procedure that would be used to create wetlands would most likely include surface flooding of on-site sediments. Surface flooding of existing acid-sulfate soils would prevent migration of acid-sulfate conditions into the water column and would greatly dilute the small amount of sulfuric acid that may be released. Dredged material would be applied as a wet slurry and would not be allowed to dry out. The material would also act as a cover for existing acid-sulfate soils. Provided surface flooding is implemented, impacts with respect to acid-sulfate soils are considered less than significant.

Potential leaching of constituents from levees or berms constructed within the sediments, the physical erosion and transport of the sediment by surface water currents and runoff, and selective uptake and biomagnification in plants and animals could result with project implementation. However, the sediments selected for use as cover material for tidal and seasonal wetland restoration at the Hamilton Restoration site would need to meet the RWQCB screening criteria which would minimize the potential for bioaccumulation. Maintenance of wet, anoxic sediment conditions would minimize pH changes and increases in leachability of heavy metals and other substances. By restricting disposal of sediments to those passing the cover screening criteria, no direct impacts on surface water should occur. This would be enhanced by the site design, which would promote sedimentation as a physical sink for incoming tidal sediment.

After the perimeter levee is breached and full tidal circulation is restored across the site, some of the dredged material would be remobilized. Tidal flows and velocities at the perimeter levee breach locations would increase localized erosion in the existing tidal slough channels and the

bordering marsh. Remobilization of the dredged material by tidal currents and wind-generated waves across the open fetch of the southern portion of the site would increase local turbidity and sedimentation until the eroded material is redeposited. No significant off-site transport is anticipated. The impacts of increased turbidity and sedimentation would be short term and eventually eliminated when equilibrium is established in the restored tidal marsh and tidal sloughs. These localized short-term impacts are considered to be insignificant because high turbidity is characteristic of the water in dynamic tidal marsh environments.

Short-term increased erosion and sedimentation would occur during construction due to removal of topsoil and associated vegetation in some areas. The majority of the area to receive fill is currently paved; therefore, minimal soil and vegetation would be removed. This increase in erosion and sedimentation would be short-lived and is considered an insignificant impact.

*Mitigation Measures*

Although no mitigation is required for the less than significant impacts described above, the following measures would further reduce any impacts to water quality.

- Adherence to NPDES erosion and sedimentation controls and BMPs and compliance with an NPDES General Stormwater Permit for construction activities of 5 acres or more during site construction, in combination with the containment berms incorporated into the site design, would reduce increased sedimentation into adjacent surface waters.
- Surface water shall be monitored and discharged only after meeting state water quality standards.
- Vegetation shall be established to further reduce contaminant concentrations in surface runoff during the dry oxidized stage.

***Montezuma Wetlands Restoration***

*Project Impacts*

As identified in the Draft EIR/S for the Montezuma Wetlands Project (COE and Solano County 1994), hydrologic impacts associated with the use of this site for dredged material disposal would be limited to surface water impacts. The impact identified is the lack of development of first and second order channels, resulting in poor circulation and inappropriate vegetation establishment. Impacts associated with the disposal of dredged material at the Montezuma Wetlands site, regardless of the source of material, are the responsibility of the project sponsor and have been addressed in the Draft EIR/S for the Montezuma Wetlands Project.

Impacts not addressed in this document would include those associated with the transportation of dredged materials to the site, but this would have no impact on hydrology and hydrodynamics.

*Mitigation Measures*

Mitigation of the impact on surface water hydrology at the Montezuma Wetlands site has been incorporated into the Montezuma Wetlands Project. Residual impacts after implementation of these mitigation measures would be insignificant. No additional mitigation measures are proposed because hydrologic impacts from the 50-foot project would be insignificant.

*Various Landfills*

Water resources at the potential landfill sites would be adequately protected by the permits for those facilities, and thus do not require analysis for this project.

*Mitigation Measures*

No mitigation measures are required.

## 5.3 GEOLOGY AND GROUNDWATER

This section discusses the impacts of the project on geology, soil, seismicity, and groundwater; surface water resources are addressed in section 5.2.

### 5.3.1 Impact Significance Criteria

Significant impacts from geologic hazards are identified if any of the following conditions are met at the project site:

- Damage or elimination of geologic resources with either a present or potential future value;
- Human health and human occupied structures are compromised by geologic hazards such as surface rupture due to faulting, seismic shaking, liquefaction, differential settlement, and slope instability.

Significant impacts on soils are identified if any of the following conditions are met at the project site:

- Agricultural productivity of the soil would be significantly reduced by disruption, displacement, compaction, or overcovering; or
- Erosion rates would be increased to such a level that siltation would cause significant impacts on water quality or aquatic habitats.

Significant impacts on groundwater are identified if any of the following conditions are met at the project site:

- Alteration of existing regional scale hydraulic conditions at the project site to the extent that measurable adverse effects on water quality or biological conditions result; or
- Exceedance of the state water quality standards or objectives (e.g., RWQCB Basin Plan Objectives and state maximum contaminant levels [MCL]), where applicable, based on specific site conditions.

### 5.3.2 Proposed Dredging

***Project Impacts***

The region of influence for the proposed dredge area is the footprint of the 50-foot dredging project to a depth of 52 feet (50 feet of dredging plus 2 feet of overdepth).

*Dredging Option B*

GEOLOGY AND SEISMICITY

Dredging the berths would impact the wharf by destabilizing the existing channel slope, undermining perimeter dikes, and reducing the factor of safety for potential slope surfaces. This would be a long-term significant but mitigable impact.

Liftech and Geomatrix were retained by the Port to update their original 1994 report (Liftech Consultants 1994) to determine impacts to the wharf due to increased dredging to 52 feet (Geomatrix 1997a,b; Liftech 1997). The study calculated revised crane girder capacities, pile capacities at the waterside crane girders, and the static shore slope stability at the new depth.

Dredging to 52 feet at the face of the wharf could potentially result in the loss of some or all of existing slope protection material by sloughing into the berth excavation (Geomatrix 1997b). The sloughing could undermine portions of the perimeter dikes which provide lateral confinement under the wharf structure. In addition, dredging would result in some reduction of the factor of safety for potential slope failure surfaces which could pass through or below the toe of the existing slope. The impacts to the wharves are summarized as follows:

- Additional dredging from 42 feet to 52 feet would cause slope instability along most of the wharves.
- With the increased dredge depth at Berths 24 and 25, 41 piles would be understrength. At berths 35 through 38, an estimated 90 piles would be understrength.
- Approximately 125 to 175 batter piles at the waterside crane rail girder would intrude into Berths 60 through 63 as dredging occurs to 52-feet.

Mitigations that would be implemented to avoid these impacts are discussed in the section titled "Mitigation Measures," below.

SEDIMENT QUALITY

The proposed dredging would result in both deepening and widening in the Inner and Outer harbors. The principal sediment impact would be removal of sediment and exposure of a new sediment surface. The sediment surface is important because it is the area in which the benthic biological community occurs, and to which the water column and water column community are exposed. The key issue is how the quality of the new sediment surface would differ from the existing sediment surface.

In areas that would only be deepened, this difference would be relatively minor. Existing depths are 42 to 44 feet, and surface sediments consist primarily of Younger Bay Muds and Merritt Sands. These sediment units have not been exposed in recent history, and so they contain metals at or near natural background concentrations, and little or no organic contaminants (section 4.3.1). In these areas, dredging would result in little change in these chemical conditions. In areas where there has been recent sediment deposition, the concentration of contaminants in the sediment would be reduced by dredging , as described in the following paragraph. This effect would be minimal, however, because little deposition is likely to have occurred in the short time between dredging for the 42-foot project and dredging for the 50-foot project. In areas where the surface sediment is presently Merritt Sand and dredging would expose Older Bay Muds, the new sediment surface would be finer grained than the existing sediment surface.

In areas that would be widened as well as deepened (in the Outer Harbor channel and turning basin, and in the Inner Harbor channel and turning basin; see section 2.1.1), the existing sediment surface consists primarily of Younger Bay Muds, and dredging would expose either Older Bay Muds or Merritt Sands. This would result in an improvement in sediment quality in terms of contaminant concentrations because Older Bay Muds and Merritt Sands generally have lower

concentrations of both metals and organic contaminants than Younger Bay Muds (section 4.3.2); in some cases these differences are considerable. This would be a long-term beneficial impact of dredging. Where dredging exposes Merritt Sands, the new sediment surface would also have a coarser grain size than the existing sediment surface.

In conclusion, deepening the channels would result in minimal changes in sediment quality; surface sediments may become finer grained in some locations. In widening areas, sediment quality in terms of contaminant concentrations would be improved somewhat, and coarsening of surface sediment would occur in some locations. These changes would not be significant impacts.

GROUNDWATER

Deepening the channels, under either Dredging Option B or F, would have no significant impact on saltwater intrusion into the groundwater, as explained below.

The SF-RWQCB, California Department of Water Resources (CDWR), and the Alameda County Flood Control and Water Conservation District (ACFCWCD) previously expressed concerns that the deepening of the Oakland Harbor Channels might promote saltwater intrusion into the deeper aquifers of the Alameda formation. Subsurface Consultants, Inc. (1997) conducted a hydrogeologic investigation for the 50-foot project, which concluded that there is a low potential for saltwater to intrude into the Alameda aquifer due to the deepened channel.

The primary factor serving to deter the transport of salt from the San Antonio Formation to the Alameda Formation is the Old Bay Mud, which separates the two aquifers. Two dimensional computer modeling performed on geologic cross sections representative of the Inner and Outer Harbor channels confirmed that the proposed increases in channel depths would have minimal impact on the path of groundwater flow with respect to pre-dredging conditions. Simulation results also indicate that the expanded channel/aquifer interface, changes in hydraulic conductivity's through the vertical cross section, and changes in hydraulic gradients imposed an approximate 4 to 5 percent increase in the vertical flux of groundwater through the simulated cross sections. Simulations of TDS concentrations over time at two locations in Alameda Formation sand layers also indicated differences of 4 to 5 percent between pre- and post-dredging for any given time. They also indicated extensive travel time of 125 years associated with vertical transport of water and TDS from the channels to the first sand layer of the Alameda Formation. This demonstrates the significant capacity of the Old Bay Mud and Alameda Formation Clays to attenuate vertical transport of water and TDS.

*Dredging Option F*

GEOLOGY AND SEISMICITY

Impacts on geology and seismicity under Dredging Option F would be the same as for Dredging Option B.

SEDIMENT QUALITY

The sediment impacts of this dredging option would be similar to those described above for Dredging Option B. The beneficial impact of improved sediment quality in the widening areas described above would be reduced compared to Dredging Option B because of the smaller area of the Outer Harbor that would be widened under this option.

GROUNDWATER

There would be no significant impact on groundwater from deepening the channels, as discussed under Dredging Option B.

*Mitigation Measures*

*Geology and Seismicity*

Mitigation of slope and wharf stability would include building sheet pile walls at the toe of the shore slope, building new crane rail girders to the waterside of existing girders, and replacing piles at the waterside crane rail girders.

The specific mitigation measures required to stabilize the wharves are listed in Table 5.3-1. In addition to those listed, other appropriate structural improvements designed and constructed according to the Port's latest wharf design ordinance shall be included.

**Table 5.3-1. Mitigation Required for the 52- foot Dredge Depth**

| *Berth* | *Description* |
|---|---|
| 23 | Build sheet pile wall at the toe of shore slope for the 1,044-foot length of the wharf |
| 24 (Part) | Build sheet pile wall at the toe of shore slope for the 149-foot length of the wharf |
| 24-25 | Add 41 piles at the waterside crane girder; build sheet pile wall at the toe of shore slope for the 1,616-foot length of the wharf |
| 26 | Build sheet pile wall at the toe of shore slope for the 484-foot length of the wharf |
| 30 | Build sheet pile wall at the toe of shore slope for the 1,229-foot length of the wharf |
| 32-33 | Build new rail girder to waterside of existing girder; build sheet pile wall at the toe of shore slope for the 1,532-foot length of the wharf |
| 35-38 | Add 90 piles at waterside crane girder; build sheet pile wall at the toe of shore slope for the 3,024-foot length of the wharf |
| 60-61 | Replace 88 to 109 piles at waterside crane rail girder; build sheet pile wall at the toe of shore slope for the 1,139-foot length of the wharf |
| 62 | Replace 14 to 38 piles at waterside crane rail girder; build sheet pile wall at the toe of shore slope for the 592-foot length of the wharf |
| 63 | Replace 26 to 28 piles at waterside crane rail girder; build sheet pile wall at the toe of shore slope for the 700-foot length of the wharf |
| 67-68 | Build sheet pile wall at the toe of shore slope for the 1,948-foot length of the wharf |

Liftech (1997) provides a comparison of the static and dynamic capacity of the existing wharves for the current berth depths and the proposed 52-foot berth depths. Table 5.3-2 compares the data for the existing state to the proposed 52-foot state after mitigation measures described below are implemented. The table shows that the shore slope factor of safety, the ratio of the wharf calculated capacity to the required capacity, and the relative seismic performance for the shore slope and wharf after mitigation would not be significantly different than the existing conditions (data for the 52-foot depth prior to mitigation were not presented in the source documents).

In some cases the calculated static strength for the 52-foot case decreased slightly after mitigation. These changes in static strength are considered to be insignificant (personal communication, T. Griswold 1997).

**Table 5.3-2. Wharf Evaluations at Current and Proposed 52-foot Dredge Depths**

| | *Current Channel Depth* | | | | | *Channel Depth -52'* | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | STATIC STRENGTH | | RELATIVE SEISMIC PERFORMANCE | | STATIC STRENGTH | | RELATIVE SEISMIC PERFORMANCE | |
| *Berth* | *Channel Depth* | *Shore Slope Factor of Safety* | *Wharf Calc Cap /Reqd Cap* | *Shore Slope* | *Wharf* | *Shore Slope Factor of Safety* | *Wharf Calc Cap /Reqd Cap* | *Shore Slope* | *Wharf* |
| 23 | -46 | 1.3-1.4 | 1.20 | Moderate | Moderate | 1.3-1.4 | 1.09 | Moderate | Moderate |
| 24 Part | -46 | 1.3 | 1.20 | Moderate | Moderate | 1.3 | 1.12 | Moderate | Moderate |
| 34-25 | -46 | 1.4 | 0.58 | Moderate | Moderate | 1.4 | 1.00 | Moderate | Moderate |
| 26 | -46 | 1.7 | 1.62 | Good | Good | 1.7 | 1.62 | Good | Good |
| 30 | -44 | 1.7 | 2.26 | Good | Good | 1.7 | 2.26 | Good | Good |
| 32-33 | -40 | 1.5-1.6 | 0.88 | Moderate | Good | 1.5-1.6 | 1.00 | Moderate | Good |
| 35-38 | -44 | 1.4-1.7 | 0.98-1.0 | Moderate | Good | 1.4-1.7 | 1.02 | Moderate | Good |
| 60-61 | -44 | 1.4 | 1.20 | Poor | Moderate | 1.4 | 1.11 | Poor | Moderate |
| 62 | -44 | 1.8 | 1.10 | Poor | Moderate | 1.8 | 1.04 | Poor | Moderate |
| 63 | -44 | No Calc | Unknown | Poor | Moderate | No Calc | Unknown | Poor | Moderate |
| 67-68 | -44 | 1.3-1.6 | 1.47 | Good | Good | 1.3-1.6 | 1.47 | Good | Good |

*Sediment Quality*

Neither dredging option would result in significant sediment impacts requiring mitigation. The measures described in section 5.2.2 to minimize water quality impacts would also serve to minimize the dispersion of suspended sediments during dredging, and would thus minimize the effects of re-deposition of these suspended sediments.

*Groundwater*

No mitigation measures are necessary.

### 5.3.3 Possible Reuse/Disposal Options

***Vision 2000 Upland Area***

The region of influence for the Vision 2000 Upland Area is the footprint of the Berth 55 Fill Area and the adjacent FISCO property. Impacts of the proposed sediment placement activities are discussed first, followed by the impacts of the proposed sediment rehandling facility. Details of the rehandling facility design, chemical characteristics of materials to be handled, and potential impacts are in section 5.10.3.

*Project Impacts*

GEOLOGY AND SEISMICITY

Approximately 14 feet of fill material is proposed to be placed above mean high tide in the Vision 2000 Upland Area. Placement of fill materials would follow standard engineering practices following the Unified Building Code, and the associated impact would be less than significant. Therefore, no significant impact is expected.

Due to the porous nature of the sediments proposed for upland disposal at the Vision 2000 Upland Area and the potential for ground shaking during an earthquake, the potential for settlement would exist at the site. However, no structures would be constructed as part of the 50-foot project, and the potential for injuries or loss of life is minimal. The potential for liquefaction of the fill material is minimal because it will be placed well above the water table and should not become saturated for a significant period of time. Therefore, no impacts are anticipated.

The probability of failure of the proposed sediment rehandling facility from ground motions or seismic-induced liquefaction of the site during a large earthquake is low. If failure should occur, the spillage of sediment outside of the facility would be localized, minimal, and short term. Therefore, no impacts are anticipated.

SEDIMENT QUALITY

Dredged material from the 50-foot project would be placed at this site only after the fill facility is built. Therefore, the 50-foot project would not have impacts on site sediments. This would also preclude transport of 50-foot project material to adjacent areas through the water column. Reuse materials for the Vision 2000 Upland Area include relatively clean construction quality fill and sediment that would not have soluble contaminants (see Chapter 3). While hazardous waste would not be used at this site, the proposed sediment selection criteria and potential impacts for the Vision 2000 Upland Area are discussed in section 5.10.3.

GROUNDWATER

Because the fill material for the 50-foot project would be placed on top of the fill from the Berth 55-58 project, above the water table, and the groundwater in the area flows from the east toward the Bay (the fill area is down gradient), any leaching of chemical constituents from the fill would not impact the groundwater quality of the existing aquifer system. Therefore, no impacts are expected as a result of the placement of fill at the Vision 2000 Upland Area.

If the material to be placed at the site is contaminated, then there is a potential for chemical constituents to leach downward into the shallow groundwater within the aquatic fill material that would be previously placed as part of the Berth 55-58 project. However, if testing indicates that the fill material has the potential for leaching chemical constituents, then the soil would be treated before filling, in order to prevent any impact to groundwater (see Chapter 2, Project Description, for details).

No long-term impact to the existing groundwater flow direction or gradient due to the placement of fill materials against the existing aquifer is expected. If the fill material has a significantly lower hydraulic conductivity than the existing aquifer, then the flow could be impeded. However, because the fill material for the 50-foot project would be placed above the high tide line (which generally coincides with the water table at the site), the flow of groundwater would not be impacted by the activities associated with the project.

*Mitigation Measures*

GEOLOGY AND SEISMICITY

Because impacts on geology and seismicity would be less than significant, no mitigation is necessary.

SEDIMENT QUALITY

No mitigation is necessary, because the contaminants are not soluble and the material would not contain free water when it is placed.

GROUNDWATER

Because there would be no impacts to groundwater, no mitigation measures are required.

***New Berth 21***

The region of influence for the New Berth 21 area is the footprint of the disposal site, the adjacent Oakland Army Base, and Port of Oakland property.

*Project Impacts*

GEOLOGY AND SEISMICITY

Approximately 14 feet of fill material is proposed to be placed above mean high tide in the New Berth 21 area. If this material were to be placed as unconsolidated fill with steep slopes, the potential exists for slope failure or sloughing to occur. However, the containment dike described in section 2.2.4 should withstand a moderate earthquake without failure. Even if a low-probability

event occurs, spillage into the Bay should be minimal and short term, resulting in less than significant impacts to the Bay. Therefore, no significant impacts are anticipated.

Due to the porous nature of the sediments proposed for upland disposal at the New Berth 21 area and the potential for ground shaking during an earthquake, a potential for settlement would exist at the site. However, no structures are to be constructed as part of the 50-foot project, and the potential for injuries or loss of life is minimal. Therefore, no impacts are anticipated.

SEDIMENT QUALITY

Disposal at New Berth 21 could affect the quality of sediments in adjacent areas of the Outer Harbor, however. Disposed sediments remaining in suspension in the New Berth 21 area could be transported to and deposited in adjacent areas. Surface sediments in the Outer Harbor areas near New Berth 21 (samples OC-001-OM and OC-002-OM) consist of Old Bay Muds now and would remain Old Bay Muds after dredging. These sediments are relatively low in contaminants and are classified as wetland cover material. Both SUAD and NUAD material would be disposed at the New Berth 21 site. If any of the NUAD material were transported in the water column and deposited in adjacent areas of the Outer Harbor, the quality of sediments in those areas could be degraded. This effect would be reduced, however, by the placement of a dike at the mouth of New Berth 21 that would have a "notch" just big enough for the disposal barge to pass through (section 2.2.3). This dike would reduce the flushing of the disposal area and thus reduce the transport of suspended solids out of the immediate disposal area. Any effluent from the New Berth 21 disposal site, including decant water, would have to meet SF-RWQCB permit limits; this water would be tested and subsequently treated or diluted to meet water quality objectives prior to discharge (section 5.2.3). If the decant water does not meet discharge requirements, it would be taken to a liquid recycler. Considering all of these factors, disposal at New Berth 21 would not have significant impacts on sediment quality.

GROUNDWATER

Because the regional groundwater flow direction is westerly toward the New Berth 21 site (the site is down gradient), any potential leaching of chemical constituents from the fill would not impact the existing shallow groundwater quality. Fill material to be used at the site would meet the SF-RWQCB chemical criteria for wetland non-cover use (section 3.1), which limits the potential for an impact to groundwater.

The proposed sediment selection criteria and potential impacts for the New Berth 21 area are discussed in section 5.10.3, Hazardous Materials and Contaminated Wastes.

*Mitigation Measures*

GEOLOGY AND SEISMICITY

Because no significant impacts on geology and seismicity would occur, no mitigation measures are required.

SEDIMENT QUALITY

The dike described in section 2.2.4 would reduce the sediment impacts of disposal at New Berth 21 to insignificance.

GROUNDWATER

Because no significant impacts on groundwater would occur, no mitigation measures are required.

***Middle Harbor Enhancement Area***

*Project Impacts*

GEOLOGY AND SEISMICITY

The MHEA would be designed to minimize the loss of habitat due to seismic-induced settling or liquefaction. Therefore, no impacts are anticipated at the site.

SEDIMENT QUALITY

At this site, Oakland Harbor dredged material of wetland non-cover quality would first be placed; this material would then be covered by 10 to 12 feet of wetland cover quality dredged material. As a result, the existing sediment surface would be replaced by this cover quality material. In general, this would result in an improvement in sediment quality, at least in terms of contaminant levels (compare sediment data for cover material [section 4.3.2] to sediment data for Middle Harbor [section 4.3.3]). Compared to existing Middle Harbor sediments, Oakland Harbor cover material has lower concentrations of most metals. However, a few cover samples had concentrations of cadmium and chromium that were higher than the concentration range for these metals in Middle Harbor samples.

Oakland Harbor cover material is also lower than Middle Harbor sediments in concentrations of organic contaminants. The key organic contaminants of PAHs, PCBs, DDTs, and dieldrin were not detected in most cover material samples; where they were detected, it was generally at lower concentrations than in Middle Harbor samples. Tributyltin showed a similar pattern, so placement of cover material at the Middle Harbor site would result in lower tributyltin levels in site sediments. In addition, total organic carbon in surface sediments of the site would be reduced as a result of disposal.

In terms of grain size, disposal would result in a coarsening of surface sediment at the site because Oakland Harbor cover material is generally coarser than existing Middle Harbor sediments. For disposed sediments that are transported beyond the immediate MHEA area, the effects of deposition of this sediment would be similar to the effects at the New Berth 21 site, but reduced in magnitude because of the smaller amount of material deposited. Overall, the sediment quality impacts represented by these changes would not be significant.

GROUNDWATER

No potential groundwater impacts are associated with in-Bay disposal of dredged sediments (PTI 1989; COE 1979, 1988).

*Mitigation Measures*

Because there would be no impacts on geology and seismicity, no mitigation measures are necessary.

GEOLOGY AND SEISMICITY

Because there would be no impacts on geology and seismicity, no mitigation measures are necessary.

SEDIMENT QUALITY

Because impacts on sediment quality would be less than significant, no mitigation measures are necessary.

GROUNDWATER

No mitigation measures are necessary.

***Former NAS Alameda***

The region of influence for the Former NAS Alameda site is the footprint of the dewatering cell and stockpile area, and the area immediately adjacent to these sites north of the main east-west trending runway.

*Project Impacts*

The 21-acre dewatering cell and the 24-acre stockpile site would be constructed above the existing grade. Materials placed at the site would consist of construction fill only, so leaching of contaminants into the groundwater is not anticipated. Damage to the dewatering cell due to ground shaking and seismically induced liquefaction is possible, but the probability of a large earthquake occurring during the course of the project construction is low, and any impact from damage to the facility would be minimal. Use of this site would thus result in less than significant impacts.

*Mitigation Measures*

No mitigation measures are necessary.

***San Francisco Deep Ocean Disposal Site (SF-DODS)***

*Project Impacts*

GEOLOGY AND SEISMICITY

Seismic-induced settling of disposed of sediments would consolidate the material, and should not cause movement of the material outside of the SF-DODS boundaries. Therefore, there would be no impact related to geology or seismicity associated with use of the SF-DODS.

SEDIMENT QUALITY

The impacts of dredged material disposal at the SF-DODS include accumulation of dredged material over an area of the seafloor, and resulting changes in the physical and chemical characteristics of the sediments of the site. Changes of these types are practically inevitable with disposal of dredged material at the site; the question is the magnitude of the changes. Changes in site sediments themselves are of less concern than the resulting biological effects. The magnitude of these effects depends largely on the depth of accumulated sediment and the area of the seafloor

that is affected; these factors are, in turn, determined by the volume and characteristics of the disposed material, the disposal period, and sediment transport at the site. Under the alternatives under consideration, the volume of material disposed of at this site would range from zero to a maximum 6.9 million cubic yards (mcy). Based on the 4-year construction period for this project, the average annual volume disposed of at the SF-DODS would be 1.7 mcy under the maximum scenario (6.9 mcy divided by 4 years). Because most of the material suitable for ocean disposal would be dredged in the last 3 years of the project, however, the maximum annual volume is likely to be slightly higher, approximately 2 mcy, for these 3 years. This material is expected to be primarily sandy (Merritt Sands), although some finer grained muddy material is also likely to be included.

EFFECT ON SEDIMENT ACCUMULATION ON THE SEAFLOOR

A good indication of the sediment accumulation that would result from the proposed project is the accumulation observed from previous disposal projects at the site. Accumulation of disposed material at the site has been estimated for previous projects through both modeling and actual post-disposal measurements at the site. Two modeling studies have been conducted, one by the U.S. Navy (1993a) related to one-time use of the site for disposal of dredged material from Navy bases in San Francisco Bay, and one by the U.S. EPA (1993a) related to long-term designation of the site for disposal of dredged material from various projects in the San Francisco region. The results of these studies are summarized in Table 5.3-3.

The Navy (1993a) study simulated the instantaneous disposal of 1.6 mcy of material. Results were determined for 50 percent clumped material (clay-silt) and for 10 percent clumped material (sand). As shown in Table 5.3-1, the maximum accumulation thickness was greater for the 50 percent clumped material (26.9 cm) than for the 10 percent clumped material (5.9 cm). The area covered was also greater for the 50 percent clumped material (9.9 $km^2$ vs. 5.2 $km^2$). Over most of this area, the accumulation thickness was substantially less than the maximum.

The EPA (1993a) study simulated the disposal of 6 mcy over 1 year. Results were determined for clay-silt material (C-S) that was assumed to be 50 percent clumped, and for mostly sandy material (M-S) that was assumed to be largely unconsolidated. Because of the larger volume of dredged material, this study showed thicker accumulation of dredged material at the site than did the Navy study: a maximum of 49 cm for the 50 percent clumped clay-silt material, and a maximum of 6.6 cm for the mostly sandy material. The area covered was also greater than in the Navy study: 279 $km^2$ for the clay-silt material, and 449 $km^2$ for the mostly sandy material. Contrary to the Navy study, the EPA study showed the mostly sandy, less clumped material covering a larger area than the more clumped material.

Actual measurements of dredged material accumulation at the site were made for the San Francisco Bay Navy base dredging project (U.S. Navy 1995h), and for the Oakland Harbor 42-foot dredging project (SAIC 1996 and 1997). These results showed reasonable agreement with the modeling predictions discussed above. The monitoring for the Navy disposal project was conducted part way through disposal at the site in 1993; approximately 775,000 cy had been disposed at the time the monitoring occurred. Maximum accumulation thicknesses measured near the center of the site ranged from 5 cm to over 16 cm. Accumulations were 1 cm to 3 cm over most of the site. The area over which dredged material accumulated was not determined. The maximum thickness measured outside the boundaries of the present SF-DODS was about 2 cm. Sixty (60) to 83 percent of the disposed material was estimated to have reached the bottom. The measured maximum accumulation of 16.4 cm was slightly larger than predicted by the Navy's

**Table 5.3-3. Model-Predicted Deposit Thickness, Areal Coverage, and Material Loss at SF-DODS**

| *Study* | *Material Type* | *Maximum Thickness (cm)* | *Percent Loss in Water* | *Area Covered* |
|---|---|---|---|---|
| EPA 1993a [1] | C-S | 49 | 27 | 279 $km^2$ |
| | M-S | 6.6 | 16 | 449 $km^2$ |
| U.S. Navy 1993a [2] | 50% clumped (clay-silt) | 26.9 | 48 | 9.9 $km^2$ |
| | 10% clumped (sandy) | 5.9 | 84 | 5.2 $km^2$ |

*Notes:* 1. The EPA study modeled the release of 6 mcy of material over a one-year period. Current data based on real measurements collected from March 1991 to February 1992 (C-S = clay-silt; M-S = mostly sand). Model assumes C-S material is 50% clumped and disposal took place over a disposal target having a 2-km radius.
2. The U.S. Navy modeled the instantaneous release of 1.6 mcy of material and allowed for a 48-hour settling period. Current data based on real measurements collected during a 45-day period in the summer of 1990.

model (12.9 cm), adjusting for the smaller volume of material. The Navy's monitoring report indicated that the one measurement of 16.4 cm was accounted for by an isolated large clump, and that a more realistic average thickness near the center of the site was 10 cm, based on footprint volume calculations. The actual total volume of material disposed by the Navy was 940,000 cy which, based on the accumulations measured after 775,000 cy was disposed, would have resulted in a maximum accumulation of about 20 cm. Sediment profile photography at the site indicated that most of the deposited material was fine-grained and relatively clumped.

SAIC (1996, 1997) monitored the accumulation of material at the SF-DODS following disposal of dredged material from the Oakland Harbor 42-foot project. Monitoring was conducted in January 1996, following disposal of about 178,000, cy in 1995; and in December 1996, following disposal of about 746,000 cy in 1996. Again, the disposed material behaved more like clumped fine-grained material than less clumped sandy material. The December 1996 monitoring found a maximum accumulation of about 15 cm, slightly less than that measured after disposal of 775,000 cy in the Navy project. Again, the thickness of accumulated material was considerably less than the maximum of 15 cm over most of the affected area. The total area showing some accumulation of dredged material was about 46 $km^2$ in December 1996. This is intermediate between the very different areas predicted by the Navy and EPA model studies (Table 5.3-1). The maximum thickness measured outside the boundaries of the site was about 4 cm; 1 to 2 cm was typical. The 15 cm maximum is approximately twice that predicted by the EPA model, if one simply reduces that model's prediction (49 cm) for 6 mcy/yr of clumped clay-silt by a factor of 6 to account for the 1 mcy actually disposed in the year 1996. However, one must also consider the 230,000 cy of material that was disposed at the site in 1995, and the 940,000 cy disposed at the site by the Navy in 1993. Some of this material, particularly that from 1995, was probably still at the site in December 1996 and indistinguishable from the 1996 material.

The material dredged for the 50-foot project is expected to behave more like clumped than unclumped material upon disposal. This is partly because the material dredged for the 42-foot project behaved like clumped material. The 50-foot project material is somewhat different physically from the 42-foot project material because it is expected to contain more Merritt Sands than the 42-foot project, which was made up primarily of the finer grained Younger Bay Muds. Sands are usually less clumped than finer grained material. The Merritt Sands are an exception to this trend; they are considerably consolidated. This is expected to contribute to a primarily clumped dredged material for the 50-foot project. This project would also dredge some Older Bay Muds, which are also quite consolidated.

Based on the above information, disposal of about 2 mcy/yr is expected to result in accumulation of material at the SF-DODS to a maximum thickness of about 30 to 40 cm annually. Most of the affected area of the seafloor would accumulate considerably less than this. The size of this area is difficult to predict, but would probably be less than 50 $km^2$. Outside the boundaries of the site, maximum accumulation would be less than 5 cm, insufficient to cause adverse impacts. Material deposited over 3 successive years would probably be additive to some extent. The SF-DODS is located on the continental slope, with a trough running through it. This suggests that slumping and other movement of site sediments into deeper areas may occur. There was an indication of this in the December 1996 monitoring of the site, which showed physical evidence of sediment slumping and/or current scour of sediments (SAIC 1997). Earlier studies concluded that the trough axis running along the center of the SF-DODS is largely depositional and that the slopes experience periodic erosion and slumping (SAIC 1991). Slope sediments can be set into motion by earthquakes, internal waves, or downwelling sediment or water (Chin et al. 1992; SAIC 1992f). This suggests that material deposited at the site over several years would not be completely additive, because material would occasionally be transported downslope from the original deposition point. Deposited material is also expected to be mixed by the infaunal community, which will reduce its physical effects over time.

The biological effects of the predicted accumulation are discussed in section 5.4.3. In short, studies have shown that rapid accumulations of sediment exceeding about 10 cm can smother and kill benthic organisms, which are generally able to burrow up through thinner accumulations and survive (Rhoads and Germano 1988). At a maximum deposition rate of 30 to 40 cm per year, rapid accumulations of 10 cm or more are not expected, so that extensive smothering of benthic organisms is also not expected. The exception may be locations where very large clumps of dredged material are deposited, which are likely to be few and to represent a small fraction of the total area affected.

#### Effect on Grain Size

Another type of physical change that dredged material disposal would cause in the sediments of the SF-DODS is alteration in the grain size of these sediments. Prior to designation of the SF-DODS, studies showed that the site's sediments were very fine-grained (EPA 1993a, U.S. Navy 1993a). Sediments dredged for the 42-foot project, while primarily fine-grained, were considerably coarser than native SF-DODS sediments, so that disposal of 42-foot project material was expected to result in a coarsening of the site's sediments (COE and Port of Oakland 1994). As discussed in section 4.3.2, monitoring of the SF-DODS showed this to be the case. This effect would be continued with disposal of dredged material from the 50-foot project. Studies show that this material is coarser and more clumped than the 42-foot project material (section 4.3.1). The biological effects of continued coarsening of the sediments at the SF-DODS are discussed in section 5.4.3.

#### Effect on Total Organic Carbon

Disposal of dredged material at the SF-DODS is also expected to result in lower levels of total organic carbon (TOC) in the site's sediments. As discussed in section 4.3.2, this was also an effect of sediment disposal from the 42-foot project at the site. This is caused by Oakland Harbor sediments being lower in TOC than the native sediments of the SF-DODS. This effect would be continued by disposal from the 50-foot project at the site. The biological effects of this change are discussed in section 5.4.3.

EFFECT ON TOXIC CHEMICALS

Monitoring at the SF-DODS in December 1996 showed that disposal of dredged material from the 42-foot project had resulted in increased levels of certain contaminants (lead, silver, PAHs, and DDD/DDE) in the site's sediments, while there was no clear effect on the levels of most contaminants (section 4.3.3). Disposal of material from the 50-foot project is expected to have a minor effect on the level of contaminants in SF-DODS sediment. One reason for this is that most of the 50-foot project material that would be disposed at the site would come from the Merritt Sands and Older Bay Mud formations in Oakland Harbor. These formations have been shown to be very low in organic contaminants and to have metals concentrations similar to natural background levels (section 3.2 and 4.3.2; EVS 1997a). Most of the existing sediment contamination in Oakland Harbor is associated with Younger Bay Muds. The material to be dredged for the 50-foot project would include some Younger Bay Mud, but this material would not be disposed at the SF-DODS. In addition, the potential that disposal from the 50-foot project would increase levels of sediment contaminants at the site is reduced by the fact that these levels have already been increased somewhat (for some contaminants) by recent disposal projects at the site. Finally, because only material determined to be suitable for unconfined aquatic disposal (SUAD), based on chemical and biological tests, would be disposed at the SF-DODS, no significant adverse biological impacts are expected to result from this disposal (see section 5.4.3).

In summary, disposal of dredged material at the SF-DODS would result in accumulation of disposed material on the seafloor at the site, with associated effects on the physical characteristics of the site's sediments. This accumulation would not be rapid enough, however, to cause extensive smothering of bottom dwelling organisms or other biological effects. The levels of metal and organic contaminants in site sediment would increase slightly, but not enough to have adverse biological effects. Outside the boundaries of the site, accumulations would also be insufficient to cause adverse biological impacts. In conclusion, the impacts of the project on the sediments of the SF-DODS would not be significant.

*Mitigation Measures*

No significant impacts on sediment quality are anticipated at the SF-DODS; consequently, no mitigation measures are required beyond standard operational practices related to dredging and transport of dredged material to the site. As described for water quality mitigation measures (section 5.2), additional measures proposed in the SMMP Implementation Manual (EPA 1998b) would minimize impacts of disposal on sediment quality at the SF-DODS.

The general monitoring required for disposal operations is summarized in the biological mitigation measures section (section 5.4). Specific chemical monitoring outlined in the SMMP follows a tiered approach to addressing effects of dredged material on the sediment quality. The first tier involves collecting sediment samples within the dredged material footprint, outside of the footprint, and outside of the disposal site boundaries. Samples within the dredged material footprint are analyzed as part of Tier I, and the remaining samples are archived. If the concentrations of chemicals of concern in dredged material deposited at the SF-DODS exceed the range of concentrations in the dredged material pre-approved by EPA and the U.S. Army Corps of Engineers for disposal at the site, then archived samples from outside of the footprint and outside of the disposal site boundaries are analyzed (Tier 2). Should these exceed specific trigger levels, then Tier 3 will involve analysis of tissues of appropriate field collected benthic and/or epifaunal organisms to determine if bioaccumulation of contaminants associated with dredged material disposal at the site has occurred (EPA 1998b).

***Hamilton Wetlands Restoration***

*Geology and Soils*

PROJECT IMPACTS

Some settlement of the underlying Bay Mud may occur as a result of the weight and physical characteristics of the dredged sediments to be deposited. Because of the intended use of the site as tidal marshland, potential settlement is a natural and desired occurrence and is not considered a significant impact.

Soil erosion rates on new levee exteriors could increase during the first rainy season after placement if adequate grass cover has not been established. However, the interior peninsulas and southern levee are intended to erode during the conversion process to tidal marshland. New northern levees are intended to prevent flooding off site. Levee failure resulting from increased erosion rates on northern levees before adequate grass cover is established is not expected because the slopes will be moderate (5 horizontal:1 vertical) and the surfaces hydroseeded; no significant impacts are expected.

Following the breaching of the perimeter levees, full tidal circulation would gradually develop over the previously diked site, and tidal channels would evolve by differential erosion and accretion on the adjacent mudflats. The site itself would behave as a net sediment sink, and would accrete to elevations of the adjacent tidal salt marshes. A natural overburden of 1.5 feet would develop over most of the dredged material.

Because most of the restoration site was formerly a tidal marsh and mud flat, wetlands restoration at the site would return the soil conditions to former natural conditions, a beneficial impact.

MITIGATION MEASURES

To minimize soil erosion rates on the levees, Best Management Practices (BMPs) for erosion control would be implemented, which include the seeding of levee slopes with native and/or naturalized grasses.

*Seismicity*

The seismic hazards for the restoration site are expected to be the same as those described for the region. If a large magnitude (5.0 to 7.0 Richter scale) earthquake occurs on a nearby fault, severe ground motion and liquefaction could occur at the site. However, potential seismic impacts at the site are considered minimal, because the site will be unpopulated as a result of its conversion to tidal marshland.

*Groundwater*

PROJECT IMPACTS

Groundwater occurs within the upper few feet of the ground surface at the site. Portions of this groundwater aquifer are hydraulically connected with San Pablo Bay. No aquifers with potable water are known to exist in this area (Woodward-Clyde Consultants 1985). Because of the impermeable nature of Bay muds, any additional sediments deposited at the site would have little effect on groundwater recharge under the airfield area. Although local lateral flow gradients may

be affected, this is not considered a significant impact. Although sediment deposition would increase the hydraulic head at the site, groundwater is expected to move toward San Pablo Bay in the direction of regional groundwater flow. In summary, no adverse impacts on groundwater are expected in association with disposal of dredged sediments at this site.

MITIGATION MEASURES

No mitigation measures are required.

*Sediment/Soil Quality*

PROJECT IMPACTS

Because only sediments meeting the RWQCB's screening criteria for cover sediments would be disposed at the site, no potentially significant impacts affecting on-site soils are anticipated from disposal of dredged sediments at the site. However, several active soil remediation sites are present in the vicinity of the proposed wetlands restoration project, including the revetment area, JP-4 fuel lines, pump stations, former sewage treatment facility, and the burn pit. Migration of contaminants from any of these sites could potentially impact the dredged sediments disposed at the airfield.

MITIGATION MEASURES

Remediation of the contaminated sites to the satisfaction of the appropriate regulatory agency would effectively mitigate any potential impacts from contaminant migration that could impact the proposed project.

Because low permeability Bay muds underlie the site, the potential for infiltration of leachate and pore water from the dredged material to deep groundwater aquifers is considered minimal. Shallow groundwater beneath the site is not used as a drinking water source due its poor quality. The Bay muds underlying the site also greatly reduce the possibility of movement of contaminants present in shallow groundwater into San Pablo Bay.

Groundwater quality (deep aquifer) shall be monitored for compliance with state water quality standards with respect to contaminant concentrations and general water quality.

*Landfill 26 Groundwater*

PROJECT IMPACTS

Tidal fluctuations from a restored tidal marsh could affect local groundwater elevations and gradients adjacent to and within Landfill 26 which may contribute to contaminant flux from the landfill. The extent to which contaminant flux may occur under proposed future conditions is currently under investigation.

MITIGATION MEASURES

If these investigations identify a potential impact that warrants mitigation, two measures could be employed. First, the low-lying areas between the landfill and the Hamilton airfield panhandle could be backfilled with fine-grained material to fill in the areas in which groundwater discharge to surface waters could occur. Second, a non-tidal buffer zone between the tidal restoration area

and the landfill toe could be incorporated into wetland design (personal communication, J Gregg. 1997).

*Outboard Marsh Contaminants*

The contaminants found in various locations in the coastal salt marsh and mudflats outboard of the eastern Hamilton levee have the potential to pose an environmental risk under existing and proposed wetland restoration conditions. As part of the base closure process it is the responsibility of the U.S. Army to clean up these contaminants to levels protective of human health and the environment prior to transferring the property. The Regional Water Quality Control Board and the Department of Toxic Substances Control, the two oversight agencies for the contaminant cleanup program at Hamilton, are working to ensure the Army cleans up these contaminants to levels acceptable for transferring the Hamilton property for wetland restoration use.

***Montezuma Wetlands Restoration***

*Project Impacts*

Impacts associated with the use of the Montezuma Wetlands site for dredged material disposal have been evaluated in the *Montezuma Wetlands Project Draft EIR/S* (COE and Solano County 1994).

GEOLOGY AND SEISMICITY

Impacts related to geology and seismicity include damage to facilities and structures from strong ground-shaking during a future earthquake; creation of mudwaves from material placement on poorly consolidated soils; long-term settlement of the constructed marsh plain; and damage to critical project components (e.g., cell and perimeter levees, holding pond levees) due to a future earthquake. Residual impacts would be less than significant following implementation of mitigation measures. All impacts associated with the disposal of dredged material at the Montezuma Wetlands site, regardless of the source of the material, are the responsibility of the project sponsor and are being addressed in the *Montezuma Wetlands Project EIR/S*.

SEDIMENT QUALITY

Of most concern regarding sediment quality at the Montezuma site is the introduction to the environment of contaminants contained in the dredged material. While several of the contaminants of concern are micronutrients (e.g., chromium, copper, nickel, and selenium) and are necessary for plant and animal growth, when present in high concentrations, some of these micronutrients can produce toxic and even lethal effects to certain affected biota. For further discussion, see section 5.4.

The transport of dredged material from Oakland Harbor to the Montezuma site is not expected to affect soil or sediment quality. As discussed in the SF-DODS discussion in section 5.2, barge loading and transport procedures are expected to preclude or severely limit spillage of dredged material during transport. Any material that might be spilled would be infrequent and small in quantity, so that resulting effects on water quality would be transitory and minor. Most of any spilled material would be dispersed in the water column, so that the amount reaching the bottom sediments would be very small and insufficient to adversely affect sediment quality in any given location.

GROUNDWATER

No impacts on either the shallow or deep groundwater aquifers were identified in the *Montezuma Wetlands Project Draft EIS/R*.

*Mitigation Measures*

Mitigation of geological and seismic impacts, sediment quality impacts, and groundwater impacts at the Montezuma Wetlands site will be incorporated into the Montezuma Wetlands Project. Residual impacts following mitigation measures have been determined to be less than significant.

***Various Landfills***

Dried dredged material would be transported by truck from the rehandling facility to one of three possible landfills following regulatory requirements and standard of care that would virtually eliminate potential impacts to the project site. The material would be transported following all CCR Title 22 Regulations. Therefore, there would be no impact associated with the use of the Various Landfills disposal option.

## 5.4 BIOLOGICAL RESOURCES

### 5.4.1 Impact Significance Criteria

The criteria used to evaluate impacts to biological resources are derived from legal requirements to protect sensitive species and habitats and also take into account the extent to which a biological resource is afforded special considerations by natural resource management agencies or scientific authorities. Other criteria are derived from potential project impacts and address areas of concern for the remaining biological resources that comprise the proposed project area. Biological impacts would be significant if proposed project activities would:

- Result in either direct or indirect harm to, harassment of, or destruction of individuals of any species listed as endangered, threatened, or rare under federal or California law, regardless of duration. Species to which this applies include state and federally listed and proposed species, as well as candidates, species of concern, or other species that are demonstrably rare, threatened, or endangered.

- Interfere substantially with the movement of any resident or migratory fish or wildlife species, to the extent that the species survival or reproductive success are expected to be affected, for a duration greater than a single breeding season.

- Substantially diminish habitat for fish, wildlife, or plants over the long term, resulting in reduced biodiversity on a local to regional scale.

- Cause substantive chronic or acute toxicity or bioaccumulation of contaminants in biota, or inhibit revegetation or recolonization of the site as a result of discharge of toxic compounds at the surface of a disposal site, or through exposure of toxic compounds during dredging activities.

- Cause the loss or long-term degradation (including changes in species composition and abundance) of a sensitive habitat, defined as habitat that (1) provides essential resources that are otherwise limited on a regional scale; (2) serves as a concentrated breeding, nursery, or foraging area; or (3) supports substantial concentrations of sensitive species.

- Violate local, state, or federal laws with respect to the protection of biological resources, regardless of duration.

- Result in contaminated food webs or exacerbate existing contaminated food webs.

For the purpose of this evaluation, short-term impacts are defined as impacts whose effects last less than 1 year. Long-term impacts are defined as impacts whose effects last longer than 1 year.

Potential impacts can be classified as direct, indirect, or cumulative. Direct impacts result from an activity or action that effects, through no other means, a change of existing conditions or practices in a given species or population. Indirect impacts result from an activity or action that, through associated effects, can be reasonably linked and thereby shown to be causative, to the change of existing conditions or practices of a given species or population. Cumulative impacts are impacts that result from the additive effect of otherwise unrelated projects on the species or populations in their vicinity. Cumulative impacts can result from recent, ongoing, or planned projects that, in

conjunction with proposed project activities, might adversely affect species and populations that are known to comprise the biological resources in the project area.

Beneficial impacts that may result from proposed project activities are also evaluated in this section. Beneficial impacts could include habitat creation and enhancement activities that result in a beneficial change to the environment.

***Project Impacts***

A general discussion of the potential adverse impacts to biological resources that may result from proposed dredging and disposal activities is presented below. Subsequent sections specify the duration and significance of these and other impacts for each of the biological resources identified for each dredging option and reuse/disposal option; where appropriate, mitigation measures are identified.

*Increased Turbidity*

Proposed dredging activities would introduce suspended sediments into the water column with resultant increases to turbidity. MEC recently completed an evaluation of a turbidity plume generated by a clamshell dredge operating on the 42-foot dredging project at the mouth of Inner Harbor. Of the types of dredges used for either maintenance or new construction projects, the clamshell is likely to produce the highest degree of suspended sediment and results summarized here should therefore present a worst-case scenario (MEC 1997). Turbidity plumes associated with the proposed project are expected to be similar to the plume evaluated by MEC.

Increases in turbidity would be expected to be localized, with the most concentrated portion of the turbidity plume located along the bottom 7 meters of the water column and decreasing in concentration toward the surface. In the MEC study, the plume was documented to extend down-current of the dredging site for a variable distance, up to 2,000 feet (MEC 1997). The extent of the plume would be greatest during strong tidal events and in areas with strong current regimes. The diurnal tidal cycles would spread the plume alternately in-harbor and out-harbor as tides rise and fall. The width of the turbidity plume would also vary depending on tide and current conditions.

Increased turbidity levels associated with the dredging activities could result in a slight reduction in light penetration (measured as transmissivity) in the water column. The MEC study indicates that light transmissivity in the water column would be expected to decrease from approximately 40 percent transmissivity to 35 percent transmissivity in the near surface waters (down to approximately 21 feet) immediately adjacent the dredging operations. The most significant decrease in transmissivity occurs within the bottom 7 meters of the water column, where it decreases to approximately 5 percent in areas immediately adjacent to dredging activities.

Turbidity plumes are expected to quickly dissipate after the completion of dredging activities. The finest silts settle at a rate of approximately 4 feet per day, and fine sands settle much faster, sinking to the bottom of the harbor in a matter of minutes or seconds. Clay-size particles (approximately 0.5 micrometer diameter) can remain in suspension for long periods with settling rates of approximately 1 inch per day (Sverdrup, Johnson, and Fleming 1942). The majority of the dredged materials are expected to be Merritt Sands, and since there is a fairly high rate of tidal flushing within the proposed project area, turbidity plumes associated with dredging would be expected to dissipate within 1 week or less after the completion of dredging activities.

*Increased Suspension of Toxics and Organics*

Reconnaissance survey data have shown that the concentrations of heavy metals in Port sediments (cadmium, copper, zinc, arsenic, chromium, lead, mercury, nickel, and selenium) are rarely elevated above regional background concentrations, and characterization of organic compounds in Port sediments revealed only slightly elevated levels of chlorinated pesticides, PCBs, and PAHs (EVS 1997a). These elevated levels of organics are typically associated with the Younger Bay Muds that are found in the Inner and Outer Harbor turning basins, channel margins, and berthing areas. However, the according to the water quality modeling conducted by EVS (1997) all releases during dredging are anticipated to meet water quality standards. The newly exposed sediments that now characterize the majority of the proposed dredging area are largely composed of Merritt Sands that were deposited thousands of years ago and are essentially free of any anthropogenic contaminants.

The small volumes of contaminated sediments expected to remain in the proposed dredging area are likely limited in spatial extent, and studies by the Army Corps of Engineers (Corps) Waterways Experiment Station (WES), Brannon et al. (1979), and others conclude that soluble phase releases of heavy metals (cadmium, copper, zinc, arsenic, chromium, lead, mercury, nickel, and selenium) associated with dredging activities are generally minimal (EVS 1997b). These metals are typically sorbed to particulates and are expected to settle from the water column very quickly and thereby further reduce the potential for bio-uptake or bioaccumulation. As mentioned previously, potential contaminant releases during dredging are expected to meet water quality standards as evaluated by EVS (1997b).

Organic compounds, including the majority of PAHs, chlorinated hydrocarbon pesticides, PCBs, and PCDDs/PCDFs, are usually sequestered on particulate matter and are typically associated with the natural organic matter fraction of bedded sediments. However, in contrast to metals, organic compounds can be released to surrounding water when bedded sediments are disturbed or suspended as would likely occur during dredging activities. But under existing sediment conditions, substantial releases of organic compounds are not anticipated (EVS 1997b).

*Physical Disturbances*

The presence of dredging barges, cranes, backhoe dredges, and tender vessels could result in disturbances to fish and birds due to elevated noise levels (both in and out of the water) and physical activities under water and onboard the vessels. Additionally, if dredging occurs on a 24-hour basis, there may be disturbances from night lights in the work area. These physical disturbances could result in fish and birds avoiding the immediate vicinity of the dredging vessels.

*Habitat Alteration*

Potential impacts associated with habitat alteration would consist of the physical removal of soft-bottom substrates (such as the shallow subtidal shoal area in Outer Harbor) and hard-bottom rocky substrates during proposed dredging activities and the removal of piling habitat and burial of existing habitats during proposed disposal and fill activities. The widening of the Outer Harbor under dredging option B would reduce the area of shallow subtidal habitat in the Outer Harbor shoal by 14 acres, or about 8 percent, resulting in a moderate decrease in species richness over the affected area.

The following subsections discuss how the types of impacts mentioned above could affect the various biological resources and the significance of those impacts.

### 5.4.2 Proposed Dredging

*Dredging Option B*

*Project Impacts*

PLANKTON COMMUNITY

Studies (Alpine and Cloern 1988) have indicated that phytoplankton production in the Bay is limited by turbidity. However, the increase in turbidity resulting from the proposed project is not expected to significantly affect the phytoplankton productivity in the study area for the following reasons.

First, the most concentrated portion of the turbidity plume, resulting in the greatest decrease in transmissivity, would be located along the bottom substrate within the immediate vicinity of the dredging activity. Phytoplankton production typically occurs in the upper portion of the water column where decreases in transmissivity are expected to be minimal (transmissivity 40 percent to 35 percent per meter). Further, existing conditions in other portions of the Bay sustain natural ambient transmissivity levels significantly lower than those documented to occur as a result of dredging activities in the study area. For example, the South Bay typically has transmissivity levels of 27 percent and San Pablo Bay has transmissivity levels of approximately 2 percent (Nichols and Thompson 1985).

Second, the turbidity plume at the surface would be localized (out 2,000 feet from the dredging vessel) and would last up to 2 months at any specific dredging spot. As the dredging operation progresses through the harbors, so would the turbidity plume. Following completion of dredging activities at each specific location, the turbidity plume would resettle within a few days. Any reduction in phytoplankton productivity resulting from project-related turbidity would be expected to return to pre-project conditions within days.

Lastly, as part of the larger San Francisco Bay, the Outer and Inner Harbors are dynamic and are constantly flushed with new water bringing in new plankton populations. In general, phytoplankton mature to reproductive life stages within 3 days and can remain viable for days to weeks (Beers 1986), resulting in a new community of plankton every few days. Typical zooplankton forms such as copepods have generation times on the order of a month (Beers 1986).

Potentially toxic metals and organics from the suspended dredged material could be released into the water column, but limited exposure to the plankton community would be expected. The majority of the exposed and resuspended heavy metals and organics would be concentrated along the bottom of the Bay (where the turbidity plume would be concentrated), and not in the upper water column. The heavy metals and organics that would be resuspended in the upper water column would likely attach to particles and resettle in a short time. Due to the relatively short exposure, the limited concentration, and minimal solubility of contaminants found in the Bay Mud in the study area and resuspended in the upper water column, toxic effects to the plankton community are expected to be insignificant.

BENTHIC COMMUNITY

Potential impacts to the existing benthic community in the Port would include removal of the existing benthic communities in the areas to be dredged, increased exposure to toxic contaminants, and increased turbidity. The magnitude of these impacts would vary with location and the specific benthic community affected.

The existing benthic community in the Outer and Inner harbors deep-dredged channels can be characterized as unstable due to frequent disturbances, such as the 42-foot dredging project, annual maintenance dredging and prop-washes associated with ship movements, and is thought to consist primarily of opportunistic species. The proposed project would cause productivity to be reduced temporarily in the deep dredged channels following dredge removal. Recolonization of the dredged areas would occur by larval recruitment or immigration of organisms from nearby areas. Where the bottom substrate consists of Old Bay Muds (approximately 5 percent of the substrate), recolonization would start immediately. However, where dredging activities would remove silty sediments that cover Merritt Sands (approximately 95 percent of the substrate), recolonization would take longer and would first require the build up of silty sediments, which could take 2 to 3 months. The community likely to recolonize in the deep dredged channels would be similar in nature to the existing benthic community. Because the existing benthic community is unstable and frequently disturbed, and recolonization would occur within a relatively short time, dredging impacts in the deep dredged channels are considered to be insignificant.

Dredging option B would involve more widening of the Outer Harbor (than dredging option F), and would result in the removal of 14 acres of shallow subtidal habitat on a shoal located along the northern boundary of the Outer Harbor deep-dredged channel. This would represent approximately 8 percent of the existing shallow subtidal habitat in the shallow subtidal/shoal area in Outer Harbor. The benthic community in the shallow subtidal soft substrate is dominated by crustaceans and is a much more diverse benthic community than that occurring in the deeper dredged channels. Following dredging activities, the newly created deeper dredged area would recolonize with a less diverse and less productive benthic community. Although this impact would be considered adverse, due to its limited size (8 percent of the shallow subtidal habitat in Outer Harbor), the impact is not considered to be significant.

The pilings and rocky intertidal habitats along the southern shoreline of the Outer and Inner harbors could be affected by increased turbidity. Filter feeding organisms in these areas could be impaired due to clogged gills and feeding apparatus, resulting in an increase in mortality or reduced reproduction. Following subsidence of the turbidity plume, the community would recover in a short time. Due to the short-term nature of this impact, it is not considered to be significant.

As mentioned previously, some organics and metals could be resuspended into the water column and would resettle on the surface of the sediment. Sessile organisms on the pilings and in the rocky intertidal habitats would have limited exposure to low concentrations of organics and metals. However, the settled particles would be available to deposit feeding organisms, such as amphipods and polychaetes but the EVS water quality modeling indicated no exceedance of water quality standards with the equipment proposed for use on the most contaminated material (clamshell dredge). In addition, the sediment testing results from the Outer Harbor turning basin did not indicate elevated organic contamination. Therefore, exposure to contaminants is not expected to be a significant impact to the benthic communities in the study area.

FISH AND DECAPOD CRUSTACEANS

The fish and decapod crustaceans in the study area could be affected by the project due to increased turbidity, avoidance of the dredging area due to physical disturbances such as underwater noise, toxic effects due to increased levels of organics and metals resuspended, and the loss of prey associated with temporary reduction in the benthic community and the reduction of the shallow-water habitat.

The pelagic fish in the deep-dredged channels and shallow subtidal in the Inner and Outer harbors include the shiner surfperch, anchovy, and herring. Increases in turbidity would result in decreased visibility for foraging activities and impaired oxygen exchange due to clogged or lacerated gills within the immediate vicinity of the turbidity plume. However, because the pelagic fish tend to avoid areas with high levels of turbidity, and to return following the completion of dredging, this is a short-term impact that is not considered to be significant.

Fish eggs attached to structures (such as pilings, algae, eel grass, etc.) could be adversely affected by increased sedimentation levels within the immediate vicinity of the turbidity plume, due to particles settling directly on the eggs. Of particular concern would be herring eggs. Herring, a commercially important species, are known to spawn (in some years) in areas in the Inner Harbor and along the Oakland-Alameda waterfront. Pacific herring prefers throughout its range to spawn on eelgrass, but is known to use other firm substrates, such as pilings and riprap, in San Francisco Bay. Herring have been observed to spawn in Oakland Harbor in some years, but not in others. The herring eggs could be adversely impacted if dredging occurs during spawning season (December through February) (COE and Port of Oakland 1994). This potential impact is considered to be significant but mitigable. Mitigation of dredging impacts includes monitoring for herring and cessation of dredging if the fish are spotted in the area.

Underwater noise, generated by the dredging operations, could affect fish species. Depending on the frequency, the noise could disturb the fish in the immediate vicinity of the dredge operations. Avoidance reactions in fish have been observed in studies of dredged material disposal impacts. Fish have been observed migrating from the immediate vicinity of disposal operations and returning following disposal activities (COE and Port of Oakland 1994). However, the fish are exposed to the underwater noise periodically during maintenance dredging. The effects of noise are therefore considered to be temporary and insignificant.

Another potential effect of the project could be an increase in organics and metals resuspended due to dredging activities. Of most concern would be the potential effects on bottom dwelling fish, which include a variety of flat fish, bay goby, staghorn sculpin, white croaker, Pacific tomcod, and plainfin midshipman as well as crangonid (bay) shrimp and Dungeness crab. These fish and decapods could ingest the sediment particles with metals or organics adhered to them, ingest benthic organisms that have bioaccumulated the toxins. However, this is unlikely since fish and decapods tend to avoid areas of elevated suspended solids. Fish and decapods are not likely to ingest large quantities of sediment and moreover the exposure to toxins is expected to be short-term (2-3 months). Therefore, ingestion of toxins is not expected to be a significant impact.

As mentioned previously, the water quality modeling performed by EVS (1997b) indicated all water quality standards would be met, so the impacts are expected to be insignificant.

Another potential impact would be the loss of benthic prey species due to the removal of sediments. This would be temporary, persisting until recolonization of the benthic community

occurs. Also, fish would be expected to shift foraging activities to nearby areas. Therefore, the proposed dredging would not have a significant impact on the fish or their habitat.

BIRDS

Potential impacts to birds in the study area could result primarily from loss of foraging opportunities due to increased turbidity and disturbance from operation of the dredging equipment (primarily noise and light effects), loss of prey, and potential exposure to contaminants.

An increase in turbidity in the study area could reduce visibility in the immediate vicinity of dredging activities, thereby reducing foraging success due to the decrease in the visibility of prey items. In addition, birds are likely to avoid the immediately vicinity of dredging operations due to noise and night lighting. However, because it is anticipated that fish would also avoid the immediate area, avoidance of the immediate area would not result in a significant decrease in foraging success. Due to their mobility, the birds would likely follow the fish and forage in nearby areas as they are exposed to similar disturbances during maintenance dredging. Additionally, the area to be avoided would be limited to the immediate vicinity of the dredge site, which is a small fraction of the total foraging area for the birds. Once dredging in a specific area is complete, fish and birds would return to the area. There should be no significant reduction in short-term food availability for birds due to avoidance of the dredge area.

Another potential impact of concern would be the loss of prey species and altered benthic habitat due to the dredging of the shallow shoal habitat in the Outer Harbor. The greatest numbers of birds were observed over the Outer Harbor shoal, where thousands of diving ducks (especially scaups and scoter) and hundreds of grebes of various species were counted during the recent surveys. Dredging option B would dredge approximately 14 acres of this habitat, which represents approximately 8 percent of the shoal area. This would reduce the abundance of prey species and invertebrates in the 14-acre area. Although this would represent a permanent loss of 14 acres of the shoal habitat, due to the abundance of foraging habitat within the vicinity of the study area, this is not considered a significant impact.

The contaminants identified to potentially occur in the area are not water soluble; therefore no impacts are anticipated due to water quality. Theoretically, organisms can be exposed to contaminants adhered to sediment particles. The birds that forage on the fish and invertebrates in the project area could potentially bioaccumulate metals and organics ingested by their prey. However, the exposure to macroinvertebrates and fish that could have ingested toxins adhered to resuspended sediment would be minimal (due to the low levels of toxins in the substrate to be dredged) and only temporary. In addition, most fish and birds would avoid the vicinity of the dredging operations where the exposure to resuspended contaminants would be greatest. Considering all of these factors, bioaccumulation of toxins should be negligible for marine birds.

SPECIAL-STATUS SPECIES

Impacts to California brown pelicans, California least terns, and double-crested cormorants could result from increased turbidity in the vicinity of proposed dredging operations, physical disturbances associated with dredge equipment operation, and toxicity associated with bioaccumulation of contaminants exposed during dredging operations.

Increases in turbidity could result in reduced foraging success in the immediate vicinity of dredging operations for California brown pelicans, California least terns, and double-crested

cormorants because these birds forage by sight, so increased turbidity may decrease the visibility of prey items. Other, parallel reductions in foraging success may result because many of the more mobile prey species are expected to avoid the more concentrated portions of the turbidity plume (COE 1997a). However, the majority of the turbidity plume does not impact surface waters and the small footprint of surface waters impacted by the surface plume generally only experiences a 5-percent reduction in light transmissivity (MEC 1997). This slight reduction to light transmissivity is not likely to significantly affect prey acquisition for California brown pelicans, California least terns, and double-crested cormorants because these animals successfully forage in other portions of the Bay that have been shown to sustain natural turbidities (measured in light transmissivity) far greater than those documented as resulting from dredging activities. Though these effects would exist over the duration of the dredging project (anticipated to be 2.5 years), they would be inconsequential and very localized within the immediate vicinity of the turbidity plume; as dredging activities would remain in one location only for a short period, they are therefore considered short-term impacts. Further, since California brown pelicans, California least terns, and double-crested cormorants are highly mobile species that range over large areas to forage, and because of the widespread distribution of prey species, there should be no significant reduction in the short-term availability of food. Therefore, impacts to these species from turbidity are expected to be insignificant.

California brown pelicans, California least terns, and double-crested cormorants are likely to avoid the immediate dredge area because of dredge equipment movements and the resultant noise generated during dredging operations. These effects are expected to be very localized and short term because dredging operations are expected to progressively move through the project area, thus, they should not impact a given area for more than a few months. Since effects from noise and dredge equipment movements are very localized, and these birds are known to forage, roost, and range over a wide area, impacts to California brown pelicans, California least terns, and double-crested cormorants are expected to be insignificant.

Exposure of California brown pelicans, California least terns, and double-crested cormorants to contaminants that are suspended in the water column would likely be minimal for four reasons: (1) the majority of the sediments proposed for removal are essentially clean Merritt Sands, (2) the contaminants are generally not available for bio-uptake (they have minimal solubility and are generally sequestered by organic matter), (3) the water quality modeling results (EVS 1997b) indicate no exceedance of water quality standards, and (4) these species are likely to avoid foraging in the immediate dredging site, which further reduces their exposure to potentially contaminated prey. Therefore, short-term dredging-related contaminant impacts would be localized and are probably not sufficiently concentrated or available for bio-uptake to cause any significant impact.

Winter-run chinook salmon and central California steelhead trout may occasionally be present in Oakland Harbor, because these fish range widely during migration. Localized increases in turbidity might reduce foraging success, and individuals may be exposed to contaminants released during dredging. However, these species are not likely to use the proposed dredge areas with great frequency or duration, and they are likely to avoid local disturbances from dredging equipment. Migration to and from spawning areas elsewhere in the Bay/Delta region would not be affected. Therefore, effects on these species would be expected to be insignificant.

Harbor seals and sea lions occasionally forage in aquatic habitats in the proposed dredge area, but the dredge area does not represent critical foraging habitat to these animals and they are known to range widely. Harbor seals and sea lions are also expected to avoid the immediate vicinity of

proposed dredging operations because prey items are likely to avoid the area, and increased turbidity could potentially limit the foraging effectiveness of these visually-cued predators. Therefore, potential impacts from increased turbidity, reduction in food resources, toxicity, or bioaccumulation would be limited in magnitude and duration and would be expected to be adverse but not significant.

Resuspension of contaminants could create the potential for bio-uptake, but this potential is expected to be low since the resuspension of contaminants would be localized and of sufficiently low concentration (as detailed above) that acute and chronic effects would not be expected; therefore, the impact is expected to be insignificant.

There are no known or anticipated impacts to the American peregrine falcon or western snowy plover because dredging activities are not expected to impact foraging or roosting activities.

In conclusion, potential impacts to eelgrass beds, the only identified sensitive habitat that would be affected by dredging option B, are expected to be significant and mitigable, as addressed in the following section. Potential impacts to the remainder of the special-status species identified under dredging option B are expected to be insignificant because the anticipated avoidance and limited use of the dredge area by such species during dredging operations would make any short-term effects (turbidity, food reduction, or toxicity from bio-uptake of contaminants) negligible.

*Mitigation Measures*

The Port/COE would implement the following mitigation measures: (1) a qualified observer would be present on site during all dredging operations near potential herring spawning areas between December 1 and March 1, and (2) if spawning is observed within 200 meters of the work site, all dredging-related activities would be stopped in the area for 2 weeks (personal communication, J. Zaitlin 1997). With implementation of this mitigation measure, the potential impact would be reduced to a less than significant level.

***Dredging Option F***

Dredging option F would be similar in scope to dredging option B, with the exception that the Outer Harbor shoal would not be cut away to the same extent. Therefore, anticipated impacts to biological resources would be similar to those described in Chapter 8, the no-action alternative. The primary difference between the dredging options is that dredging option F would not affect the benthic community of the shallow shoal area to the same extent as option B. As a consequence, the existing foraging habitat for fish and birds in the shoal area would not be adversely affected. Mitigation measures would be the same as for Dredging Option B.

### 5.4.3 Possible Reuse/Disposal Options

***Vision 2000 Upland Area***

*Project Impacts*

Disposal at this site is assumed to occur only after existing structures have been removed and the site has been diked and filled as part of the Berth 55-58 project as described in section 1.2. As such, impacts of disposal at this site would be insignificant. Subsequent construction and operation of the rehandling facility on the site would also have insignificant biological impacts.

*New Berth 21*

*Project Impacts*

Sediment reuse at New Berth 21 would result in the fill of 27 acres of existing deep dredged habitat. The aquatic communities found in the Berth 21 area are established in a degraded industrialized environment which is subject to regular disturbances from ship movements and periodic maintenance dredging. As a result, the existing infaunal community is not well established, is of limited diversity, and marginal abundance or productivity. Proposed fill activities would result in the direct loss of available habitat to these organisms as well as to fish and crustaceans. Therefore, impacts to benthos, fish, and crustaceans would be considered significant but mitigable.

SPECIAL-STATUS SPECIES

Double-crested cormorants have been observed in the proposed fill area and a large nesting colony is established on the adjacent Bay Bridge. With the close proximity of the nesting colony, adjacent waters would be expected to support intense foraging pressure (to meet the energy demands of rearing chicks) and, therefore, might be deemed critical habitat. However, results from the 1997 biological surveys indicate that the New Berth 21 fill area is not highly utilized (only 12 sightings of cormorants during two seasonal surveys). Current conditions probably contribute to this lack of use. It is a highly trafficked, industrialized embayment that offers marginal open-water habitat that is relatively isolated from the surrounding Bay. Additionally, because of the fill area's relative isolation, it is not likely to support a highly-productive fish fauna (the primary forage for double-crested cormorants) on a regular or sustained basis. As a result, foraging is concentrated in other open-Bay waters that are more likely to sustain a dependable food supply. For this reason, the fill area is not likely to be critical foraging habitat and, although proposed fill activities would result in a loss of available open-water habitat, this is considered an adverse but not a significant impact.

Proposed fill activities could disturb roosting double-crested cormorants in the immediate vicinity of disposal activities. However, double-crested cormorants are known to range widely (5 to 10 miles) to forage for their chicks and can roost opportunistically in many regions of the Bay. Additionally, proposed fill activities pose no potential to disturb nesting birds since dredging activities and ship movements occurred during the 1997 biological surveys with no observed disturbances (personal observation, C. Herrala 1997). Therefore, potential impacts from roosting and nesting disturbances to double-crested cormorants would be adverse but not significant.

Potential impacts to California least terns and California brown pelicans could result from a loss of foraging habitat and physical disturbances associated with dredge disposal activities. However, these animals were not observed to use the proposed fill area during the 1997 biological surveys and are known to concentrate foraging activities in other portions of the Bay (see Appendix L). These birds are wide ranging and the fill area does not provide critical foraging habitat to either species; therefore, impacts to foraging and roosting would be adverse but not significant.

Though the American peregrine falcon was not documented in the New Berth 21 fill area during the above-mentioned biological surveys, it is known to occasionally use Port structures for perches (U.S. Navy and Port of Oakland 1997a). Therefore, it may be impacted by localized and temporary roosting or perching disturbances associated with dredge disposal activities. Dredge disposal activities may also contribute to localized and temporarily reduced foraging success in the

proposed disposal area as a result of disturbances to prey species. However, the peregrine falcon is known to forage over a large area and is not limited to perching or roosting on adjacent structures and, since it was not documented in the proposed fill area during recent surveys, it is not likely to frequent this area for any of the above-mentioned activities. Therefore, impacts to the species would be adverse but not significant.

Winter-run chinook salmon and central California steelhead trout migrate seasonally through the San Francisco Bay, but current migration corridors are north of the proposed fill area. Although these fish occasionally stray from their migration corridors and are known to forage in waters adjacent to the fill area, they are not expected to occur there or be affected by disposal activities. Therefore, impacts to winter-run chinook salmon and central California steelhead trout are not expected to occur.

Proposed fill activities could result in a net loss of available foraging habitat for California sea lions and harbor seals. They are known to occasionally forage in adjacent waters, but are not expected to frequent habitats within the New Berth 21 fill area. The area is a highly-trafficked, industrialized embayment that offers marginal foraging habitat; it is relatively isolated from the surrounding Bay; it offers no potential haulout areas; and is not considered critical foraging habitat. Therefore, potential impacts to California sea lions and harbor seals are expected to be adverse but not significant.

Contaminant effects and increases to turbidity would not result from proposed fill activities because the fill would be contained by a rock dike and be isolated from adjacent waters.

In conclusion, potential impacts to individual special-status species, including winter-run chinook salmon, central California steelhead trout, double-crested cormorants, California least terns, California brown pelicans, American peregrine falcons, California sea lions, and harbor seals are expected to be adverse but not significant. As noted previously, however, the overall impact on marine biological resources from filling 27 acres of marine habitat is significant.

*Mitigation Measures*

To mitigate the loss of 27 acres of marine habitat, an equivalent acreage of Bay fill would be removed elsewhere to restore previously filled marine habitat. The location of the mitigation area would be determined by the Port in consultation with the Corps and resource agencies.

***Middle Harbor Enhancement Area***

*Project Impacts*

The following subsections describe the adverse and beneficial impacts to the various biological resources affected by this reuse option, which is described in section 2.2.4.

PLANKTON

During the initial filling operations, turbidity levels would increase, but the turbidity plumes would be very limited in size, affecting planktonic productivity only in the immediate vicinity of the plume for a short time during and immediately after filling. These short-term impacts would be insignificant. There would be a long-term beneficial impact due to the increased productivity of the created shallow-water habitat.

BENTHIC COMMUNITY

There would be short-term adverse (insignificant) but long-term beneficial impacts on the benthic community of the Middle Harbor. A total of 123 acres of benthic habitat within the existing deep water channels and basins would be buried by dredged material. The existing benthic community is sparse and limited in its diversity (Entrix 1997b). The cover material, which would make up the new substrate where the benthic community would re-establish, would consist of Merritt Sand and some clays and silts. Recolonization of the area would occur gradually, concurrent with the buildup of additional silty sediments. It is expected that within 1 to 2 years, extensive colonization would occur, and the new benthic community would be much more productive and diverse than the existing community.

FISH

The MHEA option would result in short-term adverse but insignificant effects on fish in the Middle Harbor area. Over the long term, the impact would be beneficial as fish species in the Middle Harbor would be expected to be more diverse and more abundant.

There would be short-term disruption of benthic and water-column habitats, and some bottom fish such as bay goby, plainfin midshipman, and speckled sanddab could be buried by the placement of sediments in the fill area.

Fish in the area could be temporarily exposed to toxins adhering to sediment particles suspended in the water column. However, the water quality modeling indicated that water quality standards would not be exceeded (EVS 1997b). These impacts are short term and not significant.

Following disposal activities, approximately 190 acres of shallow-water habitat would be created. The newly-created habitat would be a more biologically productive habitat, similar to the shallow intertidal shoal area. As with the shoal, the fish expected to re-establish in the area would be greater in number than currently existing in the Middle Harbor.

Approximately 3 acres of hard-bottom habitat currently exists in the Middle Harbor. Under the proposed MHEA, hard-bottom habitat would be expanded to between 4 and 8 acres, with the principal expansion of this substrate being associated with the construction of the jetty that would protect the site. Additional habitat is associated with scattered fish enhancement structures. These enhancement structures would attract new fish to the area.

If the construction phase of the MHEA occurs in years in which the herring would ordinarily have used the Oakland waterfront for spawning, then the use of Middle Harbor for this purpose would be lost in those years. However, the addition of the breakwater as well as the eelgrass bed offer much improved spawning habitat in the future. Thus if this short-term impact occurs, it will be adequately mitigated in the long run. If it does not occur (i.e., herring do not choose the Oakland waterfront for spawning during the construction years), then all MHEA improvements represent a net potential benefit (positive impact) to this species.Birds

The MHEA would create additional roosting habitat for aquatic birds and foraging habitat for shorebirds and waterfowl, a long-term beneficial impact. Four small roosting islands and a section of the U.P. Mole have been designed to provide continued and improved bird habitat within the Middle Harbor. These areas have been designed to reduce the potential threat of mammalian predators and use avoidance due to human disturbance. The islands would be a maximum of

5,000 square feet each. In addition, the eastern jetty would be designed to have a flat surface crest just below the mean-high-tide elevation with an additional layer of large boulders placed individually and discontinuously along the jetty crest. The string of larger rocks would provide roosting habitat for water birds. The new beach area would also provide storm refuge to Bay waterfowl and shore birds and low-tide foraging habitat for more tolerant shorebird species. A small marsh totaling 3 to 5 acres would be created in the southeastern corner of the site. The marsh would promote wildlife diversity in the area and provide foraging opportunities for the birds.

Increased turbidity and noise levels could result in decreased foraging opportunities in the immediate vicinity of the disposal operations. Because this area does not appear to be heavily used for foraging, and the effects of the disposal operation would be temporary, the impacts are considered adverse but not significant.

During the disposal of the non-cover material, as classified by the RWQCB, there may be some toxin exposure to fish in the immediate vicinity of the turbidity plume but the water quality modeling data indicates water quality standards would not be exceeded (EVS 1997b). However, because fish are likely to avoid the turbidity plume, as are the birds, the likelihood of bioaccumulation of toxins in birds during the disposal activities is considered negligible.

Although there would be adverse impacts during disposal activities, the MHEA would eventually result in habitats that are more highly productive than existing habitats. Therefore, through designed enhancements, the MHEA would result in a net increase in habitat values. This net increase in habitat values is expected to offset any habitat losses incurred and to more than offset any potential impacts to foraging success experienced by special-status species during construction of the enhancement area. The expected habitat changes under the MHEA reuse option are summarized in Table 5.4-1.

SPECIAL-STATUS SPECIES

Potential impacts to winter-run chinook salmon, the central California steelhead trout, double-crested cormorant, California least tern, California brown pelican, California sea lion, and harbor seal are expected to be adverse and short term but insignificant. This is because anticipated avoidance and limited use of the disposal site by these species would render negligible any effects such as turbidity, food reduction, or toxicity from bio-uptake of contaminants.

Some or all of the eelgrass bed at the western margin of the U.P. Mole is likely to be removed during proposed dredging activities as a result of the proposed widening of the Inner Harbor channel. The removal of some or all of this eelgrass bed is expected to reduce the overall productivity and biodiversity of the aquatic environment that comprises the proposed dredge area; this constitutes a significant long-term mitigable impact. Remaining portions of the bed (if any) may be impacted by increased turbidity, sedimentation, and resuspended contaminants from proposed dredging operations.

The shallow water habitats have been designed to enhance habitat for least tern prey species which may improve foraging opportunities for this endangered species (Entrix 1997b). Tidal flow through the new jetty opening would be similar to tidal flows near the breakwater on the south side of Alameda Island where it has been found that least terns forage frequently and preferentially. Therefore, similar benefits could occur in this area.

**Table 5.4-1. Habitat Changes under the Middle Harbor Enhancement Area (MHEA) Reuse Option**

| *Habitat Type* | *1997 Condition (ac)†* | *With Berth 55-58 Proj. (ac)†* | *Concept MHEA (ac)†* | *MHEA Pre-Eng. (ac)† *** |
|---|---|---|---|---|
| Deep Water (channels and basins >20 ft. deep) | 123 | 131 | 5-10 | 5-10 |
| Shallow Water (channels and flats <20 ft. deep, n/incl. eelgrass) | 55 | 55 | 115-120 | 114-119 |
| Covered Water Area (piers, wharves, other pile supported structures)* | 9-12 | 1-4 | 1-4 | 1-4 |
| Eelgrass Beds/Shallow Flats (expected yield of 30% eelgrass) | <0.2 | <0.2 | 50-55 (15+) | 46-51 (15) |
| Hard Bottom (rocky shoals and sub- and intertidal shoreline) | 3 | 3 | 4-8 | 3-7 |
| Sand Beach | <0.5 | 3-6 | 4-12 | 4-12 |
| Salt Marsh | — | --- | 3-5 | 3-5 |
| Avian High Tide Refugia (access-limited beaches and islands) | <0.5 | <0.5 | <0.5 | <0.5 |
| **Total All Habitats Evaluated (Estimated Yield)** | **190-193** | **190-193** | **190-193** | **186-189** |

† Acreage values only reflect MHEA footprint and do not include former Navy pier fill area outside of MHEA.
* The extent of pile-supported wharf at Point Arnold has not been fully determined.
** Pre-engineering includes modifications of the alignment of the outer jetty to accommodated navigation channel slopes and excludes beach elements which are to be completed within the Berths 55-58 project (as indicated in the table).

Exposure and resuspension of sediment-borne contaminants is likely to be greatest during the disposal of non-cover material as proposed for the initial stages of the Middle Harbor fill activities. Actual volumes and the duration of non-cover disposal activities have not been determined. However, these contaminants are generally not available for bio-uptake or bioaccumulation. Furthermore, non-cover material considered suitable for use in wetlands projects (by the RWQCB) is not expected to contain highly elevated levels of contaminants.

*Mitigation Measures*

Proposed dredging activities would result in the direct removal and loss of the eelgrass bed habitat that exists at the western margin of the U.P. mole. Mitigation for the potential loss of the eelgrass bed would consist of the establishment and long-term monitoring of an eelgrass bed with equal or greater spatial extent and density as that which already exists. This eelgrass habitat would be established in the proposed Middle Harbor Enhancement Area (as described in section 2.2.4) and monitored.

***Former NAS Alameda***

*Project Impacts*

TERRESTRIAL VEGETATION AND WILDLIFE

The dewatering cell and sediment stockpile area facility would be constructed on developed land and mowed grassland that provide limited resting, foraging, and possibly nesting habitat for birds and mammals. Wildlife use of the site would be disrupted or eliminated while the facility is in

use. This impact is adverse but not significant since the affected area is not especially important to wildlife, and other parts of NAS Alameda provide similar habitat values.

SENSITIVE HABITATS

No impacts on sensitive habitats are expected.

SPECIAL-STATUS SPECIES

Special-status species that could occur in the vicinity of the proposed NAS Alameda stockpiling facility and vicinity include the winter-run chinook salmon, central California steelhead trout, double-crested cormorant, California least tern, California brown pelican, western snowy plover, American peregrine falcon, California horned lark, northern harrier, burrowing owl, Alameda song sparrow, merlin, loggerhead shrike, California sea lion, and harbor seal.

The winter-run chinook salmon, central California steelhead trout, California sea lion, and harbor seal may occasionally forage in waters adjacent to the stockpiling facility but, since the proposed activities would occur in a terrestrial environment, no direct adverse impacts to these species would occur. Slurry water from the dewatering cell would be discharged back to the Bay in accordance with Water Discharge Requirements (WDRs) from the RWQCB, which would result in the discharge having insignificant impacts on the aquatic environment.

California brown pelicans, California least terns, western snowy plovers, American peregrine falcons, California horned larks, northern harriers, burrowing owls, Alameda song sparrows, merlins, loggerhead shrikes, and double-crested cormorants are known to forage in nearby habitats and may occasionally use structures adjacent the proposed stockpiling facility for roosting or perching. In addition, there is the potential that California least terns and snowy plovers could use the stockpile of dredged material as a nesting area. Potential short-term impacts may occur as a result of localized disturbances from machinery movements or stockpiling activities; however, as detailed in the discussion of impacts at New Berth 21, these animals are wide ranging, they are not limited to roosting or perching on structures in the stockpiling facility, and they are not expected to use structures near the facility on a frequent basis. Therefore, potential impacts would be adverse but insignificant.

Several of the above-listed species are also known to forage in grasslands and wetlands on NAS Alameda and may use portions of the stockpiling facility for foraging activities. However, this is a managed landscape that provides low habitat quality and foraging activities are expected to be quite limited. Therefore, potential impacts are expected to be adverse but insignificant.

The burrowing owl has been documented to use portions of NAS Alameda grasslands for nesting activities and, therefore, nest sites may be directly impacted by the proposed stockpiling activities. This would constitute a significant but mitigable impact.

*Mitigation Measures*

Potential disturbance or destruction of burrowing owl nesting habitat may occur during construction and use of the proposed stockpiling facility. Mitigation measures could include surveys for nesting activities by a qualified biologist, with avoidance or, if necessary, removal and relocation of any documented burrowing owls to another site. Surveys and potential relocation efforts would be conducted under guidelines established by the CDFG and USFWS.

A variety of mitigation measures may be used to deter the California least terns and snowy plovers from nesting, including the following: (1) undulating the landscape to decrease the probability of use; (2) vegetation planting to reduce the area of suitable bare ground; (3) use hazing techniques such as loud noises, colored flags and streamers, and dummy predators; (4) human presence; and (5) aerial devices such as balloons and kites (Biological Assessment).

*San Francisco Deep Ocean Disposal Site (SF-DODS)*

*Project Impacts*

PLANKTON COMMUNITY

Dredged material disposal results in an increase in suspended particulates and a corresponding increase in turbidity within the water column. During disposal, potential effects of increased water column turbidity on planktonic organisms primarily include decreased phytoplankton primary productivity due to reduction of light penetration; entrapment and sinking of plankton due to ingestion by or adhesion of particles to the plankton; and decreased survival, growth rates, and body weight concentrations of zooplankton resulting from clogged and damaged feeding appendages (EPA 1993a; O'Connor 1991; Pequegnat et al. 1978). The extent to which these effects would occur depends on the proportion of fine-grained sediments in the dredged material, which tend to remain suspended within the water column for longer periods than coarser material such as sand. However, the turbidity increase during disposal is localized, and most of the disposed material settles to the bottom within minutes or a few hours (EPA 1993a). Because the bulk of the material settles rapidly, reductions in light attenuation and associated reduction in primary productivity would be slight and short term, continuing only until the dredge plume dissipates (EPA 1993a).

Toxic effects caused by contaminants associated with suspended sediments are not expected to occur, because only Merritt Sand (MS) and Older Bay Mud (OBM) that has been determined to be suitable for unconfined aquatic disposal (SUAD) would be disposed of at this site. This old and deeply lying material has not been exposed to toxic chemicals. Chemical testing conducted for this project confirmed the low levels of toxic chemicals in this material (sections 3.2 and 3.3.1).

As described in section 4.4, the NMFS conducted monitoring surveys of pelagic species, including zooplankton, at the SF-DODS during 1996. The surveys included transects through the disposal site as well as through adjacent reference areas. Results of the surveys showed no apparent impacts to zooplankton by dredged material disposal at the SF-DODS. During the surveys, zooplankton abundances tended to be higher inside the disposal site than in the surrounding area. The abundance and distribution of zooplankton in the area appeared to be more influenced by region-wide oceanographic conditions than by dredged material disposal at the SF-DODS (EPA 1998a).

Potential impacts on the plankton community, such as decreased productivity, growth, survival, and possible toxic effects as a result of increased turbidity, are expected to be minimal and only temporary since the dredge plume dissipates relatively quickly within hours or a few days. Results of toxicity tests indicate that no toxic effects on planktonic biota should occur. Monitoring surveys indicated no apparent effects on zooplankton associated with dredged material disposal at the SF-DODS. Thus, impacts on planktonic organisms present within the ocean disposal area are expected to be insignificant.

BENTHIC COMMUNITY

Possible impacts on the benthos due to disposal of dredged material depends on the type and amount of material being deposited, the rate of deposition, the rate of accumulation and burial time, the frequency of disposal, and the type of organisms present at the disposal site. Suspension and surface deposit feeders would be most susceptible to burial. Mobile infaunal deposit feeders would be more likely to survive burial by their ability to burrow upward through the newly deposited material. Critical burial depths appear to range from 5 cm for suspension and surface deposit feeders to 30 cm for active burrowers, based on various studies on critical burial depths for different benthic organisms (Nichols et al. 1978; Maurer et al. 1978). Ten cm is treated as the critical thickness at which impacts on benthic organisms could occur because the surface and suspension feeders that are subject to a 5 cm critical thickness are also the benthic organisms that most rapidly recolonize following deep ocean disposal (see discussion below). Slow-moving epifaunal invertebrates such as the predominant species within the site, seastars, sea cucumbers, and brittlestars, also have a potential for burial and possible mortality. The thinner the disposal layers (e.g., less than 10 cm), the more likely these organisms would survive.

Dispersion modeling was performed for the impact of disposing 6 mcy of sand, silt, and clay over a period of 1 year at the SF-DODS (EPA 1993a). The results indicated that most of the dredged material footprint was less than 10 cm thick and that the part that would be thick enough to cause substantial burial and mortality is a relatively small central mound within the site. This mound would most likely consist of rapidly-settling cohesive material and would persist throughout the use of the site. When models representing a worst-case scenario were run using 1.6 mcy of sediment disposed at one time, the results indicated that a mound of dredged material approximately 27 cm thick at the site center would be formed (U.S. Navy 1993a).

Monitoring results for the disposal of dredged material from Navy base projects at the SF-DODS indicated that the pattern of deposition was similar to that modeled and that no dredged material reached the Gulf of the Farallones National Marine Sanctuary. As discussed in section 5.3.3, a midpoint monitoring survey was conducted for the Navy disposal project after 775,000 cy of material was disposed at the SF-DODS during a period of approximately 4 months. Accumulations were 1 to 3 cm over most of the site, and maximum accumulation thicknesses, measured near the center of the site, ranged from 5 to 16 cm. Sediment vertical profile images taken during the monitoring survey indicated biological activity at nearly all locations throughout the dredged material footprint, although there were apparently azoic sediments occurring along the northwest-southeast axis running through the center of the disposal site. However, large organisms continued to feed underneath the dredged material at other locations near the center of the disposal site. Benthic organisms were recolonizing the dredged material and in some locations (in particular the thinner flank deposits) actively bioturbating the material into the ambient sediment at a faster rate than anticipated (PRC et al. 1995).

Monitoring surveys were also conducted following disposal at the SF-DODS of approximately 178,000 cy (1995) and 746,000 cy (1996) of material from the Oakland Harbor 42-foot deepening project. The December 1996 monitoring survey found a maximum accumulation of about 15 cm. The survey showed the presence of Stage III or Stage I/III infauna in all areas of the SF-DODS, including the site center. Stage III taxa are large, deep-burrowing infauna that represent a high-order successional stage typically found in low-disturbance regimes. Stage I infauna are very small organisms that live at or near the sediment-water interface that are typical of pioneering populations. Similar to the findings of the monitoring survey following the Navy disposal project, the benthic community observed along the thin flanks of the deposit during the December 1996

survey was actively bioturbating the dredged material into the ambient sediment. Recolonization of Stage III organisms was apparent at the site center. The survey results suggested that the benthic community within the SF-DODS may be pre-adapted to sediment instability in the dynamic deep-slope environment and, consequently, resilient to physical disturbance by dredged material disposal (SAIC 1997).

The maximum amount of suitable Oakland Harbor dredged material proposed for unconfined ocean disposal is up to 6.9 mcy over 4 years. Although dispersion modeling was not performed for this quantity of material and time frame, the dredged material footprint is expected to be significantly less extensive and thinner during each year of disposal than the modeled footprint for the 6-mcy-per-year disposal. As discussed in section 5.3.3, approximately 1 year of disposal of the Oakland Harbor sediments at the ocean site should result in a deposition footprint less than 50 $km^2$ in size with a maximum thickness of 30 to 40 cm on an annual basis. However, most of the footprint would be much thinner (1 to 10 cm). A relatively small central mound would be expected to continue to occur at the site. Presumably, the predicted depositional thickness would increase during the subsequent 2.5 years of disposal at the ocean site. Most of the footprint would be expected to be less than 10 cm, the critical thickness at which impacts on benthic organisms could occur, and rapid accumulations of more than 10 cm are unlikely. Predictions do not account for losses due to sediment transport processes such as bottom-current resuspension and transport and/or mass movement, which would reduce the estimated thickness of the deposit, but also increase the bottom area affected. Depositional characteristics of the site, however, minimize bottom current-induced dispersion of deposited material. Yet, physical and biological processes may transport and mix the deposited and ambient material so that differences between the dredged material and existing sediments are reduced over time.

Oakland Harbor sediment is generally coarser than the ambient sediments, with a sand fraction ranging between about 20 and 80 percent (ambient has 14 percent sands). Total organic carbon would be expected to be reduced in the area affected by dredged material. This reduction in total organic carbon was observed during the December 1996 monitoring survey, which indicated a decrease in 0.01- to 1.15-percent organic carbon. With a change in substrate type and available organic food source, a change in the benthic community present may be expected to occur. The community that develops after disposal would more likely be represented by species that are adapted to disturbance and typical of coarser material. This may include species already present at the site that recolonize the area following disposal activities, and species introduced with the dredged material.

Recolonization after disposal of the dredged material generally occurs by vertical migrations of deposit-feeding organisms through the deposited material and by larval recruitment or immigration of organisms from adjacent areas. Although studies of recolonization following deep ocean disposal are lacking (aside from the above monitoring surveys), studies in shallower waters indicate that recolonization is rapid for establishing an opportunistic pioneering community (EPA 1993a). Species that are most likely to first recolonize by larval recruitment include small, near-surface dwelling, opportunistic polychaetes such as those in the Spionidae and Capitellidae families. Thus, although the predominant species observed in the area prior to disposal activities, *Prionospio delta*, is susceptible to the deposition of dredged material, it is also more likely to rapidly recolonize the area. Other species recolonizing the site include those that are able to tolerate disturbance and changes to their environment. The monitoring surveys indicated apparent recolonization by both opportunistic species and species more characteristic of well-established communities that have burrowed up through the dredged material deposit.

Based on the dispersion models for disposal of dredged material at the ocean site, the monitoring surveys, and various burial and recolonization studies, impacts such as mortality of organisms resulting from burial and smothering by dredged material disposal are expected to be minimal in areas covered by less than 10 cm of dredged material, but somewhat greater in thicker deposits such as a central mound that may be formed at the release site. These effects are expected to be temporary, however, because recolonization is expected to be relatively rapid, as discussed above. The benthic community initially formed is expected to consist of opportunistic species and those that are more tolerant of disturbance. Because the total organic carbon concentration and grain size of the dredged material differs from the ambient sediment at the disposal site, the community that recolonizes the site may also be more representative of a sandier community. Even these effects, however, are expected to be temporary (a few months to a few years) for much of the disposal site, as the disposed material becomes mixed with native material through natural deposition, slumping, resuspension, and other physical processes, and the benthic community responds accordingly. For most of the disposal site, burial and other physical effects of disposal on the benthic community are expected to be localized, short term, and insignificant. However, impacts on the community where the central mound forms would persist for a longer period.

Disposal is not expected to result in toxicity to benthic organisms or in bioaccumulation of toxic chemicals in these organisms. This is because only MS and OBM material that has been determined to be suitable for unconfined aquatic disposal would be disposed of at this site. This old and deep-lying material has not been exposed to modern toxic chemicals, and chemical testing conducted for this project has confirmed the low level of toxic chemicals in this material (sections 3.2 and 3.3.1).

In conclusion, with exception areas where accumulations are greater than 10 cm (e.g., the center of the site), significant impacts on the benthic community of the ocean disposal site are not expected. Long-term alteration of this community is not expected for much of the site as a result of this project, although impacts would persist while material is being disposed at the site, and may persist for several years at the release site where a central mound generally forms. There may be some burial and other physical effects, but this would be very localized and temporary. No significant toxicity or bioaccumulation of toxic chemicals is expected in the benthic community as a result of disposal.

FISH

Potential impacts of dredged material disposal on fish from increased suspended solids include impaired oxygen exchange due to clogging or laceration of gills, reduced food availability due to burial of benthic organisms, reduced visibility for foraging activities, and burial of slower-moving bottom fish (O'Connor 1991). Initially, some of the species may be attracted to introduced prey such as invertebrates that were released from the dredged material (EPA 1993a). However, avoidance of the disposal plume is expected to be the dominant reaction by fish, which are highly mobile, so that effects of turbidity are expected to be negligible. Many of the demersal species should also be able to avoid burial during the disposal, although they may be displaced from the area until the disposal area is recolonized by prey species (e.g., polychaete worms). The effects of this temporary displacement are expected to be minimal because the displaced fish would be able to feed in adjacent areas. Some of the more sedentary species present, such as eelpouts (Zoarcidae) may have more difficulty avoiding burial. However, fish densities and biomass are low at the site, and potential impacts are expected to be localized and minimal, and therefore not significant.

Toxic effects and bioaccumulation in fish are also not expected to be significant at this site. This is because only MS and OBM material that is known to be very low in toxic chemicals, and has been determined to be suitable for ocean disposal, would be disposed of at the site. As discussed above, bioaccumulation of toxic chemicals in benthic organisms, which are prey for many of the fish species found at the site, would be negligible. In addition, the high mobility of fish means that the disposal site itself makes up only part of their range, and so would reduce their exposure to material disposed of at the site and to prey at the site, as compared to less mobile species.

During disposal of the Oakland Harbor -42 foot deepening project sediments in 1996, the NMFS conducted seasonal pelagic monitoring surveys. Overall, fish abundances were similar within and outside of the site, and five fish species were more abundant inside the disposal site than outside of the site (EPA 1998a). However, midwater trawls conducted after disposal periods had approximately 30 percent lower larval fish abundances than those conducted 1 to 2 days prior to disposal at the SF-DODS. This suggests that the disposal operations may have short-term impacts on larval fish populations at the disposal site (USFWS 1998). Dry weight measurements were taken to evaluate the physiological condition of fish inside and outside of the disposal site. Based on these measurements, two species (blue lanternfish and California headlightfish) appeared to be in better physiological condition in the disposal site (EPA 1998a; USFWS 1998). In contrast, otolith measurements taken to assess growth rates of the fish, indicated that Pacific hake was growing at a slower rate in the disposal site relative to the reference locations. However, other species such as the shortbelly rockfish showed no differences in growth between reference and disposal site locations (USFWS 1998). In general, there appeared to be a greater influence of region-wide oceanographic conditions (e.g., currents, temperature, salinity) on the distribution and abundance of fish than dredged material disposal effects (EPA 1998a).

In conclusion, impacts such as loss of food or habitat for fish are expected to be localized and temporary. Because the turbidity conditions are temporary, the disposal should not interfere with any possible migratory species, and any changes in the fish community are expected to be temporary. Based on the results of the SPP toxicity and bioaccumulation evaluations, the ability of the fish to avoid the dredged plume, the relatively low fish population at the disposal site, and the lack of adverse impacts observed during monitoring surveys, impacts of dredged material disposal on fish are expected to be minimal and insignificant.

MARINE MAMMALS AND BIRDS

Generally, impacts on marine mammals and birds in the vicinity of the disposal site would be localized and temporary. Possible impacts include reduced visibility for foraging activities, reductions in available prey, alteration of passage routes to avoid the turbidity and ship traffic, occurrence of ship-following behavior patterns in birds, and ingestion of contaminated prey items. Although reductions in water clarity due to increased turbidity during disposal may limit the foraging efficiency of both birds and mammals, significant reductions in clarity are generally concentrated at the release site, and are of short duration (several hours to a few days). Availability of prey items, such as fish, krill, and other zooplankton, may be temporarily reduced in the disposal area because these organisms likely would escape or avoid the disposal plume. Thus, foraging success within the immediate disposal area would be limited temporarily. However, the birds and mammals are capable of foraging in unaffected areas within the region and should not be significantly affected by any reduction in prey. Normal feeding activities and passage routes may be altered by the increased ship traffic during disposal activities as a result of birds following the barges and tugs, or mammals avoiding the noise created by the ships

transiting to the site (EPA 1993a). However, these behavior alterations would be temporary, occurring predominantly during disposal activities.

Another possible impact of dredged material disposal may be ingestion of prey items that have been contaminated by the dredged material. However, since only material that is suitable for unconfined aquatic disposal would be disposed at the ocean site, this is unlikely. As described above, bioconcentration in fish species is expected to be minor. For the most part, birds and mammals will feed on pelagic fish species, which are only temporarily exposed to the dredged material. Bottom dwelling organisms occur in the diets of some marine mammals, such as the northern fur seal which feeds on crabs, squid, sablefish, anchovies, and rockfish (EPA 1993a; Ainley and Allen 1992). However, the disposal site is very deep and is likely to be a small part of the foraging range of any bird or mammal, so that the diet of a bird or mammal will be made up primarily of organisms that would not have been exposed to the dredged material. Therefore, biomagnification of contaminants is expected to be insignificant.

As described in section 4.4, H.T. Harvey & Associates and the PRBO conducted regional and periodic surveys of marine birds and mammals from November 1995 to September 1996 (EPA 1998a). Overall, disposal of dredged material at the SF-DODS did not appear to affect the distribution or feeding behavior of marine birds and mammals. There was minimal attraction of birds to the scows and tugs transporting the dredged material to the site, and no marine mammals were observed near the scows. At the disposal site, no birds were observed feeding within visible dredged material plumes. Variations in occurrence of some of the bird and mammal species appeared to be more related to regional climate variations than to disposal of dredged material at the SF-DODS (EPA 1998a).

In conclusion, impacts such as loss of prey items, reduction of foraging efficiency, alterations of passage routes, and changes in behavior patterns are expected to be temporary and localized at the release site. The birds and mammals are able to avoid the dredge plume and forage in areas where fish may have escaped. Biomagnification of contaminants in birds and mammals is expected to be negligible. Therefore, impacts on marine mammals and birds would not be significant.

SPECIAL-STATUS SPECIES

Special-status species that have the potential to occur at the SF-DODS and vicinity include winter-run chinook salmon, central California steelhead trout, double-crested cormorants, California brown pelicans, American peregrine falcons, California sea lions, Steller sea lions, humpback whales, blue whales, fin whales, and sperm whales. Proposed disposal activities could impair visibility for foraging and reduce food availability within the disposal area, which could alter normal feeding or passage activities, however impaired visibility and reduced food availability would be temporary and localized at the release site (COE 1994).

The listed whales and pinnipeds (sea lions) range widely and forage throughout the region, so reduction of food supplies in the disposal area would be insignificant. Many of the whales and pinnipeds typically forage and range over the continental shelf waters, so few would be affected by disposal activities. Additionally, whales and pinnipeds are highly mobile and are capable of avoiding the dredge plume. Therefore, potential impacts to special status whales and pinnipeds are expected to be minimal and insignificant.

California brown pelicans are known to roost on the Farallon Islands but do not breed in north-central California. They are known to range widely to forage and regularly occur as far as 109

miles offshore in southern California (Appendix K). However, their foraging activities are typically associated with continental shelf waters (COE 1994). Similarly, winter-run chinook salmon and central California steelhead troutare expected to forage mostly in waters over the continental shelf (Allen and Hassler 1986; Barnhart 1986). As these species are not likely to spend much time foraging at the SF-DODS and as they all range widely to forage, potential impacts to California brown pelicans, winter-run chinook salmon, and central California steelhead trout are expected to be adverse but not significant.

Peregrine falcons roost on the Farallon Islands, which are approximately 25 miles from the ocean disposal site. The peregrine falcon formerly bred on the Farallones but has not done so within the recent past. Wintering birds and migratory visitors use the ocean cliffs for perching and feed almost exclusively on other bird species near the islands (LTMS 1996). Though they would potentially range as far as the SF-DODS to forage, this is unlikely. Since they are known to range widely to forage and occur throughout the offshore central California coast area, potential impacts could be adverse but not significant.

The double-crested cormorant is known to nest and forage at the Farallon Islands, but typically feeds in shallow waters (Zeiner et al. 1990); it is therefore not expected to range as far as the SF-DODS to forage as water depths there are in excess of 6,000 feet. Since occurrence at the disposal site is unlikely, no adverse effects to this species are expected to occur.

As described above, surveys conducted to monitor dredged material disposal operation impacts to fish, birds, and mammals at the SF-DODS indicated that disposal of dredged material at the site did not appear to adversely affect the distribution of these species. Variations in occurrence of the species appeared to be more related to region-wide oceanographic or climatic conditions than to disposal operations. The feeding behavior of birds and marine mammals was not significantly affected. Mammals were not observed near the scows, and birds were minimally attracted to the scows. No significant impacts to special status fish, bird, and marine mammal species were observed.

Although no significant disturbances to special status species during transport of the dredged material to the disposal site were observed during the monitoring surveys, there remains a potential for disturbance during transport, especially if accidents occur. This would be particularly important if accidents were to occur within the Gulf of the Farallones National Marine Sanctuary, near the Farallon Islands. However, the Site Management and Monitoring Plan provides measures to avoid and minimize such impacts (see *Mitigation Measures* below). Therefore, significant impacts to special status species associated with transport of the dredged material are not expected.

Exposure to contaminants and bioaccumulation is not expected to result in a significant impact to the special-status species that have potential to occur at the SF-DODS. Only material suitable for aquatic disposal could be disposed at the site, and contamination effects are unlikely because the material would be relatively uncontaminated and would settle quickly. Additionally, special-status species are likely to avoid the immediate disposal vicinity, and prey species would only be exposed for short periods. Since the special-status species range widely to feed, and several are unlikely to occur in the vicinity of the SF-DODS, their potential for exposure would be further limited. Therefore the potential for direct toxicity or biomagnification of contaminants in winter-run chinook salmon, central California steelhead trout, double-crested cormorants, California brown pelicans, American peregrine falcons, California sea lions, Steller sea lions, humpback whales, blue whales, fin whales, and sperm whales would be adverse but not significant.

*Mitigation Measures*

Significant impacts to special status species at the proposed SF-DODS are not expected. Therefore, no mitigation is required.

Mitigation measures to reduce impacts on the biological community in general at the SF-DODS include accurate positioning to ensure that dredged material is confined within the disposal site boundaries so that adjacent communities are not affected. Measures would also include monitoring the disposal operations and potential effects on the existing pelagic and benthic communities according to the monitoring program specifically designed for SF-DODS and for this project. The monitoring program outlined in the EIS for the EPA Section 102 deep water ocean disposal site (EPA 1993a) and the Site Management and Monitoring Plan (SMMP) Implementation Manual for the ocean disposal site (EPA 1998b) specify monitoring for both long- and short-term (project-specific) impacts of dredged material disposal. The project-specific monitoring program described in that EIS and the SMMP, including disposal monitoring and surveillance, would be implemented for this project. Disposal monitoring would include the following:

- Daily records of dredging operations, transportation schedules, wind and sea state observations, barge load volumes disposed, and exact location and time of disposal.
- Inspection of dredging operations by a qualified inspector who will submit a report describing operations.
- Reporting of any violations to the District Engineer and Regional Administrator within 24 hours, and all modifications required to bring disposal operations into compliance will be made prior to continuation of disposal activities at the site.
- Shipboard surveys of marine birds and mammals by qualified independent observers for at least one disposal trip in any calendar month in which dredged material is transported to the site.
- Monitoring of dredged material transport following disposal will occur in order to assess whether the material remains within the disposal zone or is transported out of the disposal site, and potentially into the Gulf of the Farallones Marine Sanctuary.
- Submission of pre-dredging and post-dredging bathymetric surveys of the areas dredged, and reports on whether any dredged material was dredged outside of authorized areas or was dredged deeper than authorized.

The surveillance and inspection of discharge operations may include the following:

- On-board inspection by EPA Region IX, the Corps's San Francisco District staff, or a certified inspector to ensure that transportation and disposal of sediments occur within the designated discharge zone; that dredged material is not leaked or spilled during transit; that disposal vessels are not filled above their load limitations; that the transportation occurs under appropriate sea state conditions; that only one disposal vessel is present within the target area at a time; and that compliance with all other permit terms and conditions is met.

- Accurate and precise navigation and positioning is required to ensure that disposal occurs within the designated site boundaries, and that a minimum distance (3 nautical miles) from the Farallon Islands is observed. A record of the barge navigation course will be maintained throughout transport to the site and disposal operations while inside the disposal boundaries.

The SF-DODS SMMP Implementation Manual (EPA 1998b) involves a tiered approach to addressing effects of dredged material on the biological community. Each tier is comprised of two components: monitoring of pelagic communities (fish, birds, and marine mammals) and monitoring of benthic communities. There are three tiers for each type of monitoring as summarized below.

For the pelagic communities, Tier I monitoring includes regional surveys of birds, marine mammals, and midwater column fish populations in order to determine if adverse impacts on these populations have occurred as a result of disposal site use. These surveys include a combination of annual regional and random shipboard surveys. The regional surveys involve transects within the SF-DODS and in adjacent areas. The shipboard surveys are performed aboard vessels involved in transport of material to and from the disposal site. If apparent disposal-related impacts to pelagic populations are indicated, Tier 2 will involve additional observations and supplemental surveys similar to the Tier I surveys. The Tier 2 surveys will also include data collections from outside the influence of the disposal site to assess far ranging population impacts. If significant impacts have occurred to the pelagic communities, Tier 3 monitoring will include advanced studies of birds, marine mammals, and midwater column fish. These may include additional sampling locations, greater frequency of sampling, and more advanced study methods. Sublethal changes in the health of the pelagic organisms (e.g., presence of lesions and tumors and decreased fecundity) may also be studied.

Tier I for the benthic communities will involve collection and preservation of boxcore samples of benthic communities. If a significant accumulation of dredged material is found outside of the designated disposal site, the samples will be analyzed as part of the Tier 2 studies. The benthic community structure within the disposal site will be compared to adjacent areas outside of the dredged material footprint to determine whether there are adverse changes in benthic populations outside of the disposal site. If significant impacts have occurred to the biological communities, Tier 3 will include advanced studies of the benthic communities to evaluate how the populations are affected by disposal site use. Similar to the pelagic monitoring, these advanced studies may include additional sampling locations, a greater frequency of sampling, more advanced sampling, and evaluation of sublethal changes.

In addition to the tiered biological monitoring, the SMMP calls for periodic confirmatory monitoring. This monitoring would occur at least once every 3 years, and would include both bioassay and bioaccumulation testing. The bioassay testing would involve testing sediment samples from the dredged material footprint using one or more appropriate sensitive marine species. The bioaccumulation testing would involve deploying near-surface arrays of appropriate filter feeding organisms in and around the disposal site, during active site use, in order to assess whether substantial bioaccumulation of contaminants may occur from exposure to the dredge plume.

### *Hamilton Wetlands Restoration*

*Project Impacts*

Proposed use of the Hamilton Army Airfield and the Antenna Field for sediment reuse would entail (1) construction and operation of barge access, pipeline, and pump-out facilities to convey sediment from barges to the airfield; (2) placement of sediment on the site, resulting in the burial of existing soil and vegetation in order to raise the ground surface to desired elevations; and (3) breaching the eastern levee in order to re-establish tidal circulation. Because this project is proposed by the State of California independent of the Oakland Harbor Improvement project, these impacts are likely to occur whether or not this disposal option is implemented.

The Sonoma Baylands project (COE 1994c) provides a conceptual model for the restoration of wetlands at the Hamilton restoration site. Final designs for marsh restoration at the airfield have not been completed, however, and a variety of habitat configurations might be possible. Existing ground elevations are such that, if the eastern levee were breached today, virtually all of the site would become permanently flooded shallow-water habitat. Final engineering of the site, using dredged materials to establish elevations prior to breaching the levee, must take into account the need to provide tidal flushing throughout the site. Elevations must be low enough to allow the shear forces of tidal flows to naturally erode channels into the evolving marsh plain (COE 1994c). Using Sonoma Baylands as a guide, it is expected that elevations would be raised to 4.6 feet MLLW within the Hamilton restoration site. This would initially provide appropriate habitat for low marsh, i.e., cordgrass. Development of higher marsh communities would then occur gradually as elevations increase through natural sedimentation.

The design of the breach or conduit has not been determined. Because the elevation of the outboard marsh is approximately 5 to 6 feet MLLW, the marsh is only flooded intermittently during the higher tides. Considering that ground elevations would be raised to high-marsh elevations, it is unlikely that simply creating a "breach" in the levee would allow adequate tidal flushing of the site, much less the development of a natural configuration of tidal channels and bordering flats. Instead, it would probably be necessary to excavate a new tidal channel through the levee to allow sufficient tidal exchange between the Bay and the restored wetland airfield site. Using the Sonoma Baylands project as an example, it is assumed that one or more channels extending through the existing tidal marsh into the site would need to be excavated to provide an adequate tidal prism (COE 1994c). The appropriate dimensions of these openings have not yet been determined. A further reasonable assumption is that these tidal connections would be made through existing tidal channels on the outboard side of the levee. One large channel that appears especially suitable exists on adjoining property due south of the airstrip. A smaller channel that could also be used exists opposite the old water treatment plant.

It is assumed that the sediments used for wetland restoration would meet criteria of the Regional Water Quality Control Board and other agencies for use in wetland restoration, and that these sediments would be cleaner than those present in the outboard marsh. As the dredged material is dewatered on the site, runoff would be contained and tested as necessary and, if suitable, discharged through the existing ditch system to San Pablo Bay. Once deposition is complete, sediments should consolidate in about 6 months (COE 1994c).

Finally, it is assumed that the project would include a detailed monitoring plan, which would be based in part on the experience gained through the Sonoma Baylands project, and which would

address water and sediment quality concerns as well as the attainment of project goals regarding the biological community.

The following sections discuss impacts on plant communities and wildlife habitats, special-status taxa, and special-status communities/habitats.

PLANT COMMUNITIES AND WILDLIFE HABITATS

Based on USFWS (1997b) computations, the entire Hamilton Restoration Project would eliminate 256 acres of upland grassland and 199 acres of recently disturbed lands at the Hamilton Army Airfield site and approximately 220 acres of upland grassland at the State Lands parcel. These impacts would not be considered significant given the low wildlife habitat functions served by these ruderal areas. The elimination of seasonal wetlands occurring on the two sites would however need to be mitigated. Mitigation for the lost seasonal wetlands occurring within the drainage ditches, the exiting 12.5-acre freshwater wetland mitigation site at the airfield, and other low-lying areas subjected to seasonal inundation is proposed as an aspect of the restoration project. This mitigation would be in conformity with Section 404 of the Clean Water Act (as amended). Other potential wetland impacts may occur from sediment transport operations and from the re-establishment of tidal connections between San Pablo Bay and the airfield site. The latter impact would be minimized if, as assumed, the levee is breached to provide the closest possible connections to existing tidal channels. Natural scouring, the magnitude of which cannot be determined at present, would follow. Creating a wide breach in the existing levee could also reduce the forays of predatory mammals into the high-marsh habitat, a beneficial impact.

Assuming a project design that includes the placement of dredged material in a similar fashion as at the Sonoma Baylands site, it is estimated that approximately 500 acres of intertidal marsh and associated tidal channels would be re-established at the airfield/State Lands parcel project site by implementation of the entire restoration project. Additionally, upland habitat areas that would function as buffer and transitional areas between the site and the adjacent land uses would be created. The entire restoration project would result in significant beneficial impacts on estuarine vegetation and fish and wildlife species.

SPECIAL-STATUS SPECIES. The California clapper rail, salt marsh harvest mouse, and California black rail are known to occur in the tidal marsh east of the bayward levee, and could be adversely affected in the short term by sediment transport operations and/or by levee breaching. Because of the endangered status of these species, any loss of individuals or disruption of breeding activities is considered a significant impact. These impacts are likely to be mitigable by avoidance (see below), and in any case would be more than offset in the long run by the re-creation of a large area of suitable habitat on the airfield site (COE 1997a).

Effects on other special-status species are as follows:

- The California brown pelican is a transient in the project vicinity, and therefore potential impacts are to this species are insignificant.
- The short-eared owl, northern harrier, burrowing owl, and San Pablo song sparrow are federal and/or state special concern species and could be present as nesters or foragers in areas impacted by the project. Destruction of active nest sites would be a significant impact, avoidable as discussed below.

- The salt marsh common yellowthroat is expected in scrub-shrub wetland or brackish marsh at the eastern end of the property and would not be affected by the project.

Impacts from the dredged sediment transfer operations could result from: (1) pipeline construction and removal and/or pipeline failure; (2) dredged material transfer operations (including spills); (3) discharges from vessels and anchoring disturbances; and (4) plankton entrainment. Construction activities could interfere with wildlife behavior and result in stress or habitat abandonment. Activities associated with installation of the pipeline could result in nest abandonment by special status avian taxa (e.g., California clapper rail) in the area. This a potentially significant impact. During construction, sensitive receptors would be subject to noise levels ranging from 40 to 70 dBA. Noise generated from operation of the unloading station and booster pumps and site preparation activities could affect sensitive vertebrate wildlife receptors in the area. Peak noise levels associated with a 2,000-hp suction dredge pump at the unloading station and an 800-hp booster pump are assumed to be 80 dBA and 75 dBA, respectively, at a distance of 50 feet from each pump. The northern coastal salt marsh along San Pablo Bay supports sensitive species. Because of the relatively low background noise levels and the potential for noise adversely affecting special-status taxa in the area, this impact could be significant.

Pipeline placement and removal and discharges from vessels and anchoring disturbances could create turbidity plumes that could impact plankton and benthic organisms and cause physical disturbance of the intertidal and nearshore subtidal substrata. Operational disturbances at the point of transfer from barges to the pumping units could affect benthic communities in and around the point of activity. These disturbances could affect benthic communities along the pipeline route and at the transfer station by disrupting feeding and respiration. The plankton could be minimally impacted by the sediment plume at a greater distance from the pipeline route. Impacts on the primary production (phytoplankton) and the secondary production (zooplankton) would be slight. These construction and operational impacts could temporarily interfere with phytoplankton productivity and zooplankton feeding and larvae farther away. Contaminant spills (e.g., fuel or light lubricating oils) could also affect plankton and benthic communities some distance from the spill point depending on the volume and type of contaminant spilled. The use of heavy anchors for barges and other support ships would disturb the benthic communities around the staging areas from dredged sediment transfer. The placement and removal of anchors could cause disturbance of the sediments and thus affect feeding and respiration of benthic organisms.

Plankton entrainment during the pumping operations would result in the physical destruction of local plankton sucked into the pump intakes. The removal of the plankton could affect local benthic communities by reducing the available food. This effect would occur during the duration of the sediment transfer operations. Young striped bass migrate through the estuary in late spring. The potential for bass entrainment is limited to the late spring during the migration. As the striped bass increase in size, the chance of entrainment/impingement decreases. Potential removal of larval shrimp and crab during pumping could affect the localized abundance of these food sources for small striped bass. Potential impacts on chinook salmon, which also migrate through the estuary, and other sensitive fish species (e.g., Sacramento splittail, longfin smelt) would also need to be assessed.

In the case of a pipeline break, sediment would be discharged until pumping was terminated and the volume of sediment in the pipe flowed out. The discharge of the sediment would directly impact the benthic communities by physically covering the organisms. The size of the area impacted would depend upon the volume of sediment discharged, the duration of the spill, and

the prevailing wind and tidal currents during the spill event. Some effect on plankton would also occur because of the turbidity plume caused by the loss of sediment from the pipeline. Impacts from pipeline breaks are potentially significant.

*Mitigation Measures*

Because there is no existing CEQA/NEPA documentation for the Hamilton Wetlands project, generic biological mitigation measures for this project are listed here.

1. Project sponsor for the Hamilton Wetland Restoration project shall initiate Endangered Species Act Section 7 consultation with USFWS.

2. Final design of the of the Hamilton Wetland Restoration project shall incorporate mitigation (1) for the loss of seasonal wetland, and (2) for loss of any acreage of existing tidal marsh as may be required to construct the tidal connection to the airfield.

3. Mitigation for potential effects on northern harrier and short-eared owl shall comprise (1) completing pre-construction field surveys to identify nesting sites, (2) establishing construction exclusion or buffer zones of 300 feet around identified nesting sites, (3) marking construction exclusion zones with a highly-visible boundary composed of posts and yellow flagging tape (or similar material) and instructing workers to avoid disturbing these areas.

4. Mitigation for potential effects on burrowing owl shall entail habitat compensation and creation in accordance with the CDFG's "Staff Report on Burrowing Owl Mitigation" dated October 17, 1995.

5. Impacts from the construction of the pipeline and pumping operation shall be local and considered insignificant if proper precautions are taken to confine the necessary disturbances to the smallest area possible along the pipeline route. Anchoring disturbances shall be minimized by setting mooring anchors for the duration of the project, thus avoiding the placement and removal of the barge anchors. Careful handling of fuel during transfer and storage on the pumping platform shall reduce the likelihood of spills.

6. Construction work on the bayfront levee and placement or removal of the pipeline during the California clapper rail nesting season shall be avoided, unless surveys by a qualified biologist indicate that clapper rails are not nesting within 500 feet of the construction area. Proper precautions shall be taken to confine the necessary disturbances related to pipeline placement across the tidal wetlands and pumping operations to the smallest area possible.

7. Noise generated from the off-loading platform and booster pump shall need to be controlled. Pumps shall be fitted with mufflers and surrounded by an insulated enclosure that reduces noise to no more than 65 dBA at a distance of 50 feet from the pump and reduces this impact to a less than significant level. Anchoring disturbances shall be minimized by setting mooring anchors for the duration of the project, thus avoiding the placement and removal of the barge anchors. Careful handling of fuel during transfer and storage on the pumping platform shall reduce the likelihood of spills. Pumping operations should occur outside of the striped bass migration period.

8. Potential impacts from breaks in the slurry pipeline shall be mitigated by installing a warning device attached to the end of the pipeline and making observations at the discharge point and along the levees to ensure the sediments are flowing from the pipe and are confined to designated areas.

***Montezuma Wetlands Restoration***

Potential impacts on biological resources at the Montezuma Wetlands site are described in the *Montezuma Wetlands Project (MWP) Draft EIR/S* (COE and Solano County 1994) and are summarized below. As a result of public and agency review of the draft, the MWP has been redesigned. An environmental evaluation of the new design has not been completed, and the impacts, both positive and negative, are likely to differ from those identified below. In any case, impacts of the construction and operation of the MWP are the responsibility of that project's sponsors and should not be attributed to the 50-foot project.

*Project Impacts*

PLANT COMMUNITIES AND WILDLIFE HABITATS

The MWP as originally designed would eliminate 534 acres of seasonal wetlands and 27 acres of saline basins (also seasonally flooded). These impacts are significant, and not fully mitigated by the MWP design or by mitigation measures identified in the Draft EIR/EIS (COE and Solano County 1994). Other adverse impacts of the MWP include the exposure of wildlife to potentially toxic contaminants, noise and other disturbances to wildlife caused by the transport of sediment to the site and the implementation of the project, and the potential for newly disturbed areas to be invaded by noxious weeds (e.g., *Lepidium latifolium*). These potential impacts are mitigated by the project design or through measures identified by the Corps and Solano County (1994). Beneficial impacts of the MWP would result from the restoration of tidal and brackish marsh habitats, and increased areas of shallow-water habitat that would be of value to water birds as well as fisheries (see below).

FISH

A beneficial impact on marine fish and wildlife associated with the MWP includes construction of tidal and deep-water (permanently flooded) channels. (Beneficial impacts would occur regardless of whether sediment would be received specifically from the 50-foot project.) Provided the channels are appropriately designed, this increase in tidal channels could expand the habitat available for fish for use as a nursery and foraging area (COE and Solano County 1994; USFWS 1995). This increased habitat would be particularly important for the endangered and sensitive species occurring in the vicinity of the site, such as the delta smelt, Sacramento splittail, and winter-run chinook salmon. As a result of the increased fish habitat, the habitat value for foraging of marine birds (e.g., waterfowl and shorebirds) would be enhanced.

Impacts on marine fish, mammals, and birds associated with barge transport of dredged materials to the Montezuma site may include avoidance of the area due to increased noise and activity, ship-following behavior in birds, and the potential for dredged material to spill from the barges. Barges used to transport dredged material to the Montezuma site would pass through San Pablo and Suisun bays and the Sacramento River, and would moor at an off-loading facility structure at the southern end of the site. The dredged material would then be pipelined to the appropriate location at the site (COE and Solano County 1994). The additional vessel traffic in the San

Francisco Bay systems and on the Sacramento River associated with the project is not expected to be significant in relation to the existing traffic, so that impacts on the biological community would be minimal. Impacts could be significant if a large proportion of the dredged material were to spill in one location enroute to the Montezuma site. However, if normal precautions are taken to avoid spillage or barge overflow, this type of impact should not be of concern. Therefore, impacts on the biological community related to dredged material transport are expected to be less than significant.

SPECIAL-STATUS TAXA

Development of Phase I of the MWP would eliminate 15 acres of pickleweed marsh that provides potential habitat for the salt marsh harvest mouse. If successful, the MWP would provide restored salt marsh habitat to the benefit of this species. The likelihood of successful marsh restoration has been questioned by the COE and Solano County (1994), as well as the USFWS (1995). USFWS has also indicated the need for further consultation with the COE on endangered species issues. Accordingly, the Phase I impact is considered significant but mitigable through redesign and other measures that would need to be developed in consultation with the USFWS.

In addition to the salt marsh harvest mouse, several other sensitive species are known to occur on or in the vicinity of the site. These wildlife species include birds, reptiles and amphibians, mammals, and fish. Impacts on these species could result from implementation of the MWP. The specific wildlife species and potential impacts include the following (from COE and Solano County 1994; species' status updated based on USFWS 1997b).

Habitat loss for the following terrestrial species:

- Burrowing owl (federal Species of Concern [FSC], California Species of Special Concern [CSC])
- Loggerhead shrike (FSC, CSC)
- Horned lark (FSC, CSC)
- Northwestern pond turtle (FSC, CSC)
- California red-legged frog (federal threatened, CSC)
- California tiger salamander (federal candidate, CSC)
- Western spadefoot toad (FSC, CSC)
- Giant garter snake (federal threatened, California threatened)

Adverse impacts resulting from increased turbidity and contaminant levels and beneficial impacts from increased habitat:

- Delta smelt (federal threatened, CSC)
- Winter-run chinook salmon (federal endangered, California endangered)
- Sacramento splittail (federal proposed threatened, CSC)

One legally protected plant species has been observed on the site. Mason's lilaeopsis (FSC, California Rare, CNPS 1B) is on the southern and western perimeter of the site within the emergent tidal vegetation. Habitat and species loss could occur due to off-loading facility construction, marine traffic wake, walkway shade, levee breaches, and changing tidal patterns. However, marsh restoration on the site would create potential habitat for the Mason's lilaeopsis, and provide mitigation for potential impacts on this species. Masons' lilaeopsis readily colonizes disturbed areas and is shaded out by tules and bulrushes in natural wetlands; hence, some level of disturbance can benefit this species. Impacts on Mason's lilaeopsis can be minimized through careful installation of necessary facilities, careful operation of heavy equipment, and by establishing physical buffers and setbacks from sensitive areas.

Delta tule-pea, Suisun marsh aster, and northern California black walnut (all FSC, CNPS 1B) could be affected by levee strengthening and breaching. Alkali milkvetch (FSC, CNPS 1B) could be impacted by construction activities. San Joaquin saltbush (FSC, CNPS 3) would be affected by dredged material placement during Phase I. Dwarf peppergrass (CNPS 4) could be affected by dredged material placement and levee construction for Phase I and II and other activities. Small spikerush (CNPS 4) could be subject to the same impacts as Mason's lilaeopsis. Additional detail on these impacts is provided in Corps and Solano County (1994).

SPECIAL-STATUS COMMUNITIES/HABITATS

Although the project has substantial beneficial impacts on certain types of habitats and associated species, Phase I of the MWP would eliminate 560 acres of seasonal wetlands and saline basins. These are Section 404 jurisdictional habitats whose loss would require mitigation.

*Mitigation Measures*

Mitigation measures for the previous MWP have been suggested by the COE and Solano County (1994) and by USFWS (1995). MWP project impacts would be mitigated either as part of the redesign or as conditions of project approval. No additional mitigation measures specific to the 50-foot project are suggested at present.

***Various Landfills***

*Project Impacts*

No adverse impacts on biological resources would occur at the landfills under consideration.

*Mitigation Measures*

No mitigation measures are required.

## 5.5 CULTURAL RESOURCES

### 5.5.1 Impact Significance Criteria

Impacts on cultural resources are considered significant if a resource fulfilling National Register of Historic Places (NRHP) criteria (see pages 4.5-1 to 4.5-2, supra) would be physically damaged or altered, would be isolated from the context considered significant, or would be affected by project elements that would be out of character with the significant property or its setting. Title 36 CFR Part 800 defines effects and adverse effects on historic resources as follows:

> Section 800.9(a) Criterion of Effect: An undertaking has an effect on a historic property when the undertaking may alter characteristics of the property that may qualify the property for inclusion in the National Register. For the purpose of determining effect, alteration to features of a property's location, setting, or use may be relevant depending on a property's significant characteristics and should be considered.
>
> Section 800.9(b) Criteria of Adverse Effect: An undertaking is considered to have an adverse effect when the effect on a historic property may diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Adverse effects on historic properties include. but are not limited to:
>
> - Physical destruction, damage, or alteration of all or part of the property;
> - Isolation of the property from or alteration of the character of the property's setting when that character contributes to the property's qualification for the National Register;
> - Introduction of visual, audible, or atmospheric elements that are out of character with the property or alter its setting;
> - Neglect of a property resulting in its deterioration or destruction; and
> - Transfer, lease, or sale of the property without adequate provisions to protect historic integrity.

The American Indian Religious Freedom Act of 1978 requires federal agencies to allow access to federal lands and objects used in the practice of traditional Native American religious ceremonies. Title 36 CFR Part 900 addresses the consideration of Native Americans and other interested parties in the process of evaluating impacts on cultural resources. Any action that could directly or indirectly affect properties including archaeological sites, biological habitats, or topographic features associated with Native American religious practices would be considered significant under these statutes.

### 5.5.2 Proposed Dredging

*Project Impacts*

The National Register-eligible South Training Wall/Jetty of the Oakland Inner Harbor Jetties and Federal Channel would not be affected by the dredging, and previous geotechnical studies indicate that dredging would not destabilize the foundation of the South Training Wall/Jetty

(COE and Port of Oakland 1994). The National Register-eligible North Training Wall/Jetty would not be affected by the dredging from the proposed project (it would be demolished by dredging associated with the Port's proposed Berth 55-58 project [see section 9.1.2], which is being evaluated under separate environmental review).

The expansion of the Inner Harbor Turning Basin would, under all alignment options other than Option 7, result in the demolition of certain structures associated with the former Todd Shipyard facility in Alameda. See Appendix M. If Todd Shipyard is eligible for the NRHP, the removal of some of these structures might give rise to a significant impact.

The Corps has requested a determination from the State Historic Preservation Office whether Todd Shipyard is NRHP-eligible as a historic district. The project sponsors do not yet know what that determination will be. Several factors favor NRHP eligibility. The majority of the Todd Shipyard structures now exceed 50 years of age. Some of those structures are "associated with events that have made a significant contribution to the broad patterns of our history" because of their connections to early public transit, World War II tugboat construction and ship repair, and postwar conversion of ships to civilian uses. One or more structures, which would not be affected by any of the proposed turning basin alignments, may be individually eligible for NRHP listing.

As to Todd Shipyard as a whole, however, it is questionable whether the NRHP criteria are met. One NRHP requirement is that the site retain "integrity of location, design, setting, materials, workmanship, feeling, and association" (see page 4.5-1). Todd Shipyard comprises an assortment of structures built over a span of more than 50 years, for a wide variety of purposes, in a wide variety of designs, materials, and workmanship. Whatever integrity the site once possessed has been compromised by the demolition or relocation of many of its structures. See Appendix M. The project sponsors cannot predict whether a "Todd Shipyard Historic District" will be registered under the NHPA.

Even if a Todd Shipyard Historic District were listed, it is unclear whether the removals necessitated by the expanded Inner Harbor turning basin would constitute a significant impact. The proposed project would retain the maritime industrial character of Todd Shipyard's setting while removing very few of the structures that contribute to its historic value. Of the 27 structures identified as comprising Todd Shipyard, the preferred turning basin alignment would remove up to eight structures. Of those eight structures, one is submerged, two have already been partially or completely demolished, and two more are too recent to be considered even "contributing" structures. As is noted above, none of the structures to be removed has independent historic importance. See Appendix M. Thus, only three above-ground "contributing structures" would be removed. In addition, it should be noted that this EIS/R examines the environmental impacts of a 1,500-foot turning basin in order to be certain of capturing the maximum environmental impacts of the project. The precise diameter of the turning basin, and therefore the precise identification of structures to be removed, will not be fixed until the final design of the turning basin is completed; it is possible that even fewer than three above-ground "contributing" structures would be removed under the preferred turning basin alignment.

For all these reasons, it is unclear whether the removal of structures from Todd Shipyard as part of the Inner Harbor turning basin expansion would constitute a significant impact on a cultural resource. Accordingly, this is considered a potentially significant impact. With the mitigation measures described below, however, this potential impact is reduced to a less-than-significant level.

*Mitigation Measures*

Mitigation measures for the potentially NRHP-eligible Todd Shipyard would include consultation with the Pacific Great Basin Systems Support Office, National Park Service, San Francisco, prior to the demolition of any contributory structures to determine an appropriate level of recordation and documentation. At a minimum, documentation and recordation would meet the standards of the Historic American Building Survey/Historic American Engineering Record (HABS/HAER). Relocation of buildings to other locations within the shipyard would also be considered in consultation with the property owners. Treatment measures would be formalized in a Memorandum of Agreement among the Corps (San Francisco District), the California State Historic Preservation Officer, and the Advisory Council on Historic Preservation.

### 5.5.3 Possible Reuse/Disposal Options

*Vision 2000 Upland Area*

*Project Impacts*

Dredged material would be used to fill part of the NSCO Historic District. The site could also be used as a rehandling facility. The NSCO Historic District is the subject of an existing MOA signed in 1994 and amended in 1997 between the Navy, SHPO, and Advisory Council on Historic Preservation, which was developed to ensure appropriate treatment of historic properties within the district (see U.S. Navy and Port of Oakland 1997a, Appendix G). Impacts to the Vision 2000 Upland Area already have been covered under the terms of the MOA.

*Mitigation Measures*

No treatment measures other than the existing MOA are necessary.

*New Berth 21*

*Project Impacts*

Dredged material would be placed as aquatic fill at the northern end of the Outer Harbor to create a new berth. The dredged material would fill a 27-acre submerged area. No cultural resources would be impacted.

*Mitigation Measures*

Because no cultural resources would be affected by the use of this site, no mitigation measures are required.

*Middle Harbor Enhancement Area*

*Project Impacts*

This option involves placing dredged material in currently navigable water in the Middle Harbor to create a 196-acre more biologically productive, shallow-water habitat. No cultural resources would be impacted.

*Mitigation Measures*

Because no cultural resources would be affected by the use of this site, no mitigation measures are required.

***Former NAS Alameda***

*Project Impacts*

Dredged material would be placed on the former NAS Alameda in the northwestern portion of the former base for future development use. The area affected would cover an approximate 117-acre triangular site bounded by Runway 13 on the west, Runway 7/25 on the south, and the Inner Harbor Channel on the north and east. Dredged material would be placed in the areas to the north of the runways and access roads. The NAS Alameda Historic District is located to the south-southwest of the reuse/disposal site (Woodbridge 1992) and would not be affected by the sediment placement activities. No impacts to cultural resources would occur.

*Mitigation Measures*

Because no cultural resources would be affected by the use of this site (JRP 1996; Maniery et al. 1996), no mitigation measures are required.

***San Francisco Deep Ocean Disposal Site (SF-DODS)***

*Project Impacts*

Dredged material would be dumped at a deep ocean disposal site, which is located approximately 50 nautical miles west of the Golden Gate Bridge in over 8,000 feet of water. There would be no impact on cultural resources.

*Mitigation Measures*

Because no cultural resources would be affected by the use of this site (COE and Port of Oakland 1994), no mitigation measures are required.

***Hamilton Wetlands Restoration***

*Project Impacts*

Any impacts on cultural resources associated with development of the Hamilton Wetlands Restoration site will be addressed by the Corps and local project sponsors, the California Coastal Conservancy and the BCDC. If this reuse site is permitted by these agencies, no additional facilities or other ground-disturbing activities would be required to accommodate materials specifically from the Oakland project. Therefore, no additional impacts on cultural resources are expected to result to the Hamilton site from transportation and disposal of Oakland Harbor sediments there.

*Mitigation Measures*

No mitigation measures are required.

***Montezuma Wetlands Restoration***

*Project Impacts*

Impacts on cultural resources associated with development of the Montezuma Wetlands site are being addressed by the Corps and Solano County (COE and Solano County 1994). If this disposal site is permitted by these agencies, no additional facilities or other ground-disturbing activities would be required to accommodate dredged materials specifically from the Oakland project. Therefore, no additional impacts on cultural resources are expected to result from transportation and disposal of Oakland Harbor sediments to Montezuma Wetlands.

*Mitigation Measures*

No mitigation measures are required.

***Various Landfills***

*Project Impacts*

There would be no impact on cultural resources from disposal at the three identified landfills.

*Mitigation Measures*

Because no cultural resources would be affected by the use of this disposal option, no mitigation measures are required.

### 5.5.4 Unanticipated Discoveries

There is a very low potential for encountering significant subsurface archaeological resources during construction since the general Port of Oakland and former NAS Alameda areas are, in large part, the result of filling over the past 80 to 100 years. However, there is a slight possibility that historic era cultural materials may be present within the fill along the edge of the channel and within material to be dredged from the channel. Such material may be comparable to the EuroAmerican, Chinese, and Japanese artifacts recovered from behind the sea wall constructed on the northeastern and eastern periphery of San Francisco. In that particular case, the artifacts appear to have been deliberately deposited as fill behind the sea wall segments built mostly in the 1880s and 1890s through 1924 (e.g., Pastron et al. 1981). The preparation of a formal *Unexpected Discovery Plan* for the proposed project does not seem warranted based on both the archival research and the low probability of recovering significant cultural materials due to prior disturbance (e.g., previous dredging, construction, maintenance, etc.). Unanticipated cultural resources would be treated in accordance with 36 CFR Part 800.11.

## 5.6 SOCIOECONOMICS

This impact analysis considers the economic impacts of the project. This information is provided to allow a full disclosure of project impacts and allow the public and decisionmakers to assess the comparative costs and economic benefits of the project and its alternatives.

### 5.6.1 Impact Significance Criteria

Under NEPA, preparation of an EIS is required only when a federal action has the potential to significantly affect "the quality of the human environment." "Human environment" is a comprehensive phrase that includes natural and physical environments and the relationship of people with those environments. Economic and social effects are not, by themselves, intended to require preparation of an EIS. However, when an EIS is prepared and economic, social, natural, or physical effects are interrelated, the EIS must discuss all of these effects on the human environment (40 CFR 1508.14). NEPA provides no specific thresholds of significance for socioeconomic impact assessment. Significance varies depending on the setting of the proposed action (40 CFR 1508.27[a]).

CEQA Guidelines exclude discussion of significance criteria for economic impacts. These impacts in themselves are not considered effects on the environment and thus no significance criteria are established. As described in section 4.6, where impacts on socioeconomic resources occur that could be considered direct effects on the environment (e.g., loss of a recreational use) and are separate from strictly economic impacts (e.g., loss of revenue from a recreational use), these impacts are addressed in the appropriate sections of Chapter 5.

### 5.6.2 Regional

The Port of Oakland's proposed dredging project would have a beneficial impact on the San Francisco Bay Area regional economy. The project would also support various other projects planned by the Port, resulting in a substantial change in the Port's operations and economic prospects over the medium and long term. The following section discusses the economic analysis of the proposed dredging and reuse/disposal options in the Port of Oakland.

### 5.6.3 Oakland Harbor

The proposed project has the potential to increase intermodal container cargo movement through the Port of Oakland's existing terminal facilities. In addition to the proposed dredging project and other projects planned by the Port, various market conditions would affect the rate and pattern of increases in cargo container activity and would affect the rate and pattern of economic impacts.

***Dredging Options B and F***

*Project Impacts*

Implementation of the project under both of these dredging options would entail deepening of the Harbor and turning basins. The Port's evaluation of container movement growth indicates that dredging alone would result in a small increase in the container handling capacity of the Port (see Table 5.6-1). Specifically, the Port would experience a 7 percent increase in container throughput

**Table 5.6-1. Economic Analysis of Dredging Project Alone**

| | *1995* | *2000* | *2003* | *2010* |
|---|---|---|---|---|
| Direct Jobs | 8,800 | 8,900 | 9,000 | 9,400 |
| Induced Jobs | 5,300 | 5,300 | 5,400 | 5,500 |
| Total Direct and Induced Jobs | 14,100 | 14,200 | 14,400 | 14,900 |
| Gain over 1995 | — | 100 | 300 | 800 |
| State, County, and Local Taxes (millions) | $89 | $90 | $91 | $94 |
| Gain over 1995 (millions) | — | $1 | $2 | $5 |
| Total Personal Income (millions) | $702 | $707 | $716 | $738 |
| Gain over 1995 (millions) | — | $5 | $14 | $36 |
| Total Business Revenue (millions) | $1,269 | $1,271 | $1,305 | $1,388 |
| Gain over 1995 (millions) | — | $2 | $36 | $119 |

*Source:* Martin Associates 1996; JWD 1997.

between 2003 (after completion of the dredging project) and 2010. This increase represents an average annual increase of 1 percent for the 7-year period.

Annual business revenue, including customs revenue, for year 2010 with the proposed project would total approximately $1,388 million. The total number of direct jobs anticipated in 2010 would reach 9,400. Induced jobs would comprise an additional 5,500 jobs. The total personal income from direct and induced jobs is expected to be approximately $738 million. State and local taxes generated by maritime activity would be $94 million. About 941,419 containers would be handled, with approximately 10 percent sent to or from the Port by rail.

The anticipated increase in shipping activity resulting from these options would increase annual business revenues to the Port, generate new jobs, and augment personal income from direct and induced jobs. Increased business revenue and personal income would result in greater contributions to the state, county, and local tax base. These impacts would be considered beneficial.

EMPLOYMENT AND INCOME

Dredging options B and F would result in the generation of approximately 800 additional new jobs (direct and induced) above 1995 levels. Total personal income would increase by about $36 million over 1995 income levels through the implementation of the dredging options. Worker spending from increased personal income would create additional economic benefits throughout the Bay Area.

The increase in employment and income from new jobs would be beneficial to the Bay Area economy, particularly to Alameda, Contra Costa, and San Francisco counties, which presently supply approximately 72 percent of the Port's labor force. Most of the jobs associated with the Port's activities are related to the surface transportation of maritime services sectors; many of the jobs would be filled by unionized longshoremen and railroad workers.

POPULATION AND HOUSING

The additional 800 workers needed for positions resulting from the dredging options would constitute only 0.02 percent of the Bay Area's projected labor force for 2010 and only 0.04 percent of the projected labor force for Alameda, Contra Costa, and San Francisco counties. Further, the 800 new workers would represent only 0.09 and 0.2 percent of the total new jobs anticipated for the Bay Area region and the three-county area by 2010, respectively. The combination of labor

availability in the region and extraregional residential location of some railroad employees working at Port facilities would result in no impact on the population and housing in the project region.

*Mitigation Measures*

No mitigation measures are required.

### 5.6.4 Possible Reuse/Disposal Options

***Vision 2000 Upland***

*Project Impacts*

The project includes the possible placement of fill material in the Middle Harbor area currently containing piers. Removal of the piers is part of the Port's proposed Berth 55-58 project and is not included in this evaluation. The use of this area for both the placement of fill and development of the rehandling facility would not result in the displacement of Port activities currently generating revenues and, therefore, supporting jobs. There would be minor beneficial impacts on the Port in the provision of clean fill material that might otherwise have to be imported from off site, with associated purchase and transport costs.

*Mitigation Measures*

No mitigation measures are required.

***New Berth 21***

*Project Impacts*

This reuse option provides for the placement of dredged material at the end of the Outer Harbor to create new Berth 21. The development of this berth and other facilities in the Outer Harbor area is proposed as part of the Vision 2000 Maritime Development Program. To the extent that the proposed dredging project supports and facilitates increased shipping activity at the Port, the implementation of this reuse option would indirectly result in beneficial impacts from the dredging project.

*Mitigation Measures*

No mitigation measures are required.

***Middle Harbor Enhancement Area***

*Project Impacts*

The placement of dredged materials in the Middle Harbor Enhancement Area would create a more biologically productive, shallow water habitat and would also serve to cap existing contaminated sediment. The use of this site for dredged material placement would support remediation efforts required on the former FISCO property. No adverse economic impacts occur from the use of this disposal option. Minor beneficial economic effects could result from cost savings realized through the use of clean fill materials obtained in the vicinity of this disposal site.

*Mitigation Measures*

No mitigation measures are required.

***NAS Alameda***

*Project Impacts*

Under this reuse option, the Port's dredging project would provide 750,000 cy of uncontaminated material to the 117-acre site for use as future construction material in the reuse of the former NAS Alameda. The rehandling facility would cover approximately 45 acres of the site. Use of this site for the disposal of dredged sediment would have no adverse economic effects on the site or its future uses. The project would have a minor beneficial impact on the site through the provision of construction and fill materials that may otherwise need to be imported to the site.

*Mitigation Measures*

No mitigation measures are required.

***SF-DODS***

*Project Impacts*

The SF-DODS site is located in an area where minor commercial and recreational fishing occurs. An earlier analysis prepared by the U.S. EPA indicated that impacts of disposal on commercial and recreational uses would be less than significant due to the relatively limited resources of this area compared to other deep sea locations available to commercial and sport fishermen. Since this disposal site occurs outside of designated commercial shipping lanes, the increase in tugboat traffic would have no impact on commercial shipping.

*Mitigation Measures*

No mitigation measures are required.

***Hamilton Wetlands Restoration***

*Project Impacts*

Placement of dredged material on the Hamilton restoration site and the eventual wetland restoration would not adversely affect employment, personal income, or the tax base. Under federal ownership, the site currently generates no property tax revenues for city or county governments. The owner of the wetlands restoration site has yet to be determined. However, in the event that the site would continue to be owned by the federal government, the property would continue to be exempt from taxation. Any socioeconomic effects that would occur from the project would be indirect effects that would result from reuse of this site as a restored wetland (e.g., potential benefits to the local economy if the presence of a restored wetland draws additional visitors to the area and possible increased property values because of the views of open space and wildlife).

The site currently has no economic activity, but the Hamilton Restoration Project could generate employment opportunities. Assuming at least a portion of the employees generated from the wetlands project live, work, or spend money in Marin County, a minor positive economic effect on cities such as Novato could be realized through the direct benefits of increased sales taxes. Marin

County could receive increased population-sensitive revenues including vehicle in-lieu fees, fines, forfeitures and penalties, licenses, permits and franchise fees, and other revenues.

In addition to the direct benefits of spending by employees, the project could also have a positive economic multiplier effect caused by materials purchased. The magnitude of this effect is not estimated in this analysis. From a regional perspective, the project would provide a partial solution to the problem of locating a viable site for depositing dredged materials, an issue that is threatening the region's ports and water-related industries.

*Mitigation Measures*

No mitigation measures are required.

***Montezuma Wetlands***

*Project Impacts*

Since the MWP is a privately sponsored project independent of the 50-foot project, the socioeconomic impacts from development and operation of the MWP, described in detail in that project's Draft EIR/S (COE and Solano County 1994), are largely unattributable to the 50-foot project. However, fees paid for use of this site for disposal of Oakland sediments would incrementally increase revenues in Solano County, which would be a small but beneficial impact of the proposed project. No adverse economic consequences attributable to the 50-foot project would result from use of this disposal site.

*Mitigation Measures*

No mitigation measures are required.

***Various Landfills***

*Project Impacts*

Fees paid to the landfills for disposal of Oakland sediments would incrementally increase revenues in Alameda County for Altamond and Vasco Road landfills, and in Marin County for Redwood Landfill; this would be a small but beneficial impact of the proposed project. No adverse economic consequences attributable to the 50-foot project would result from this disposal option.

*Mitigation Measures*

No mitigation measures are required.

## 5.7 TRANSPORTATION

This section discusses the impacts of the project on vessel transportation (section 5.7.1) and ground transportation (section 5.7.2).

### 5.7.1 Vessel Transportation

*Impact Significance Criteria*

Waterborne transportation impacts would be considered significant if the projected vessel traffic would cause:

- An increase in accidents/incidents due to violation of vessel transportation safety guidelines established for RNAs (Regulated Navigation Areas).
- Unreasonable (unplanned, regularly occurring) delays to commercial vessels plying their trade.

All of these potential significant impacts are a function of the combined effects of increases in waterborne traffic and other navigation hazards. Some navigation hazards are caused by natural phenomena such as shoals and islands, fog, inclement weather, tides, and currents. Other man-made hazards include bridge abutments, piles, and moored vessels.

***Proposed Dredging***

*Dredging Option B*

CONSTRUCTION IMPACTS

Dredging equipment would be present for a period of about 46 months. Although the equipment would restrict the channel, it would be highly visible and well-marked in accordance with U.S. Coast Guard regulations. The equipment would be generally stationary and moved only when a new location were to be dredged. The San Francisco Bar Pilots, who board all commercial vessels before they enter the Harbor, would be able to direct these vessels around the dredge. Since ferries are highly maneuverable, they, too, would be able to avoid the dredges during their daily runs, as would recreational vessels.

Slow bells would be required when barge-mounted clamshell dredges are used. The term "slow bells" refers to U.S. Coast Guard requirements, published in the Local Notice to Mariners, for all vessels transiting within a specified area to "maintain minimum steerage." The purpose of slow bells is to reduce wake-induced damage and hazard exposure. Hydraulic cutterhead dredges would be used throughout the entire project approximately 20 hours a day, 7 days a week, assuming 4 hours a day downtime for maintenance. They would be used in the Inner Harbor Channel for about 75 percent of the work. Slow bells would not be required during this time since these dredges are fairly large and stable, and their anchoring system is such that these dredges would not be affected by ferries moving at their usual speeds. Barge-mounted clamshell dredges would be used for deepening in confined areas and dredged material rehandling (approximately 25 percent of the work). Although difficult to quantify, discussions with dredging companies indicate that there may be a 25 percent increase in requests for slow bells as a result of the

proposed project, which would translate to about 6 hours per week (personal communication, L. Cardoza 1998). This impact would be significant if it occurred during peak transit hours of the ferry service, but since the work associated with the request for slow bells would not normally proceed 24 hours a day, 7 days a week due to the need to position anchors, pipeline, and electrical cable, the work could be scheduled around peak ferry operating hours, which would reduce the impact to a less than significant level.

The Outer Harbor Channel would be widened to 1,000 feet under this option, and dredging would occur in the immediate vicinity of the berths. This could impede vessel access to the berths, which would be a significant impact that could be mitigated through proper scheduling. Dredging could also cause structural damage to the berths, which would be a significant but mitigable impact.

Impacts to vessel traffic and the berth areas in the Inner Harbor generally would be as described for the Outer Harbor. Constructing the 1,500-foot-diameter Inner Harbor turning basin would require the removal of two finger piers that already have been partially removed as part of the 42-foot project. The eastern end of the dock used by the Alameda Ferry also would be removed, although the actual portion of the dock used by the ferry would remain. The ferry dock is located several hundred feet from the turning basin; therefore, demolition and construction activities would not adversely affect ferry operations.

**Table 5.7-1. Number and Average Size (DWT) of Container Vessels Calling at Port of Oakland (50-Foot Deepening Alternatives)**

| | 1996 | | 2003 | | 2010 | |
|---|---|---|---|---|---|---|
| *TEU Range* | *Vessel Calls* | *% of Total* | *Vessel Calls* | *% of Total* | *Vessel Calls* | *% of Total* |
| > 5,000 | 49 | 3.0 | 521 | 30.0 | 965 | 50.0 |
| 4,000 – 5,000 | 119 | 7.3 | 347 | 20.0 | 483 | 25.0 |
| 3,000 – 4,000 | 396 | 24.3 | 347 | 20.0 | 386 | 20.0 |
| 2,000 – 3,000 | 577 | 35.4 | 435 | 25.0 | 96 | 5.0 |
| < 2,000 | 489 | 30.0 | 87 | 5.0 | 0 | 0.0 |
| Totals | 1,630 | 100.0 | 1,737 | 100.0 | 1,930 | 100.0 |

Impacts associated with barges used to transport dredged material to disposal sites are addressed below under "Possible Reuse/Disposal Options."

OPERATIONS IMPACTS

Vessel traffic would increase as a result of the project, because the constraints to growth imposed by the 42-foot channels would be eliminated. The projected increases for various vessel sizes are shown in Table 5.7-1 for the years 2003 and 2010. The proposed deepening project would improve overall conditions in Oakland Harbor by eliminating tidal delays for containerships and other vessels attempting to enter the Harbor, and by creating channels and turning basins sized to accommodate the newer, deeper-draft class of vessels.

The existing turning basin in the Outer Harbor would be widened to 1,600 feet and the Outer Harbor Channel would be widened to 1,000 feet, which would continue to permit one-way, but not two-way traffic. This is not considered essential, since the projected increase in traffic would not be enough to require two-way travel. The channel and turning basin dimensions were designed in consultation with the San Francisco Bar Pilots to ensure that they would accommodate the largest class of vessels safely. Given the continued use of standard practices, such as use of the

Bar Pilots on board incoming and outgoing vessels and compliance with the U.S. Coast Guard Navigation Rules, no safety impacts would occur in the Outer Harbor area.

The Inner Harbor Channel would be widened through the removal of jetties that currently line the Union Pacific Intermodal Yard; this would allow the larger vessels to transit the channel safely. The 1,200-foot-diameter turning basin under construction as part of the 42-foot project would be widened to 1,500 feet, which, as described in section 2.1, should be adequate to safely accommodate the larger vessels expected to call on the Port. It is estimated that the largest type of vessels that would use the turning basin would require between 30 and 45 minutes to turn (personal communication, B. Duke 1997). Conversations with Bar Pilots, along with personal observation (personal communication, L. Cardoza 1998), indicate that when an approximately 1,000-foot long vessel is turning, there would be a period of 5 to 10 minutes during which a ferry vessel may be precluded from passing. Assuming that the increase of 5.7 vessel calls per week by the year 2010 is divided equally between the Inner and Outer harbors, this would mean a worst-case scenario of 30 minutes a week when a ferry could be impacted. This waiting period can be reduced by detailed coordination through bridge-to-bridge communications. For example, given the appropriate notifications, a ferry could pass to the north or south of a turning container vessel using the side slope areas between the proposed 50-foot channel toe and the shoreline. This impact would not be significant.

MITIGATION MEASURES

The following U.S. Coast Guard requirements would apply during dredging and disposal operations. The U.S. Coast Guard routinely enforces their regulations. These are not considered mitigation measures *per se*, because they are standard requirements for dredging projects.

1. The dredging contractor shall be required to prepare, submit, and adhere to a dredging operations plan. This plan shall identify the specific equipment to be used, the sequence of operations, the precise route of the tugboat/barge, and contingency plans to deal with inclement weather and other natural phenomenon described in this report.

2. The U.S. Coast Guard publishes specific "rules of the nautical road," which govern dredging operations in inland waterways. Specific markings and lighting of dredging equipment allow mariners to readily recognize the operations and take appropriate maneuvering actions. These specific rules for marking equipment apply to the dredge site and the pipes use to transport dredged material associated with the proposed project. The dredging contractor shall be required to adhere to these requirements.

3. U.S. Coast Guard Vessel Traffic Service (VTS) shall be contacted (1) when the dredge first commences dredging operations; (2) each time a vessel moves a barge between the dredge location and a disposal site; and (3) each time the dredge operators change dredge location. Upon notification, the VTS shall advise affected shipping traffic.

4. Once the dredge is positioned, VTS shall be informed of the extent of any channel obstruction that may occur from dredging operations. Because the numbers and types of dredging vessel equipment associated with the proposed project are not anticipated to block the channels of operation, other shipping traffic is not expected to be blocked from normal vessel movements. In any event, the VTS shall be informed of the positions of dredging equipment at all times.

5. All vessels associated with the project and operating in or near a navigation channel shall monitor VHF-FM Channel 13.

6. In the event project vessels are likely to restrict or affect navigation of other vessels, vessel operators shall transmit and confirm their intentions and any other necessary information via Channel 13 to promote safe navigation of all vessels in the project vicinity.

7. Tugboat/barge operators shall be required to be licensed masters. Tugboat/barge operations are inherently more difficult than vessel operations, and maneuverability is quite limited. In view of the inherent risk to other vessels, a competent tugboat master is the key to safe operations.

8. Tugboat/barge operations shall be confined to marked navigation channels to the maximum extent possible. These channels are intended specifically for large, less maneuverable vessels; smaller vessels can and should stay away from these channels. Because operations within the channels are restricted, tugboat/barge maneuvers should be made among like vessels with experienced licensed masters.

Additionally, the Port of Oakland and Corps of Engineers shall require the dredging contractor to use properly maintained equipment that is appropriate for the project. Many navigation incidents with tugboats and barges involve parted towing bridles that lead to "runaway barges." Very often the proximate cause of these incidents is improper or inadequately maintained equipment.

All of the above requirements, when applied together, would reduce vessel maneuvering hazards to the lowest possible level.

The following mitigation measures would reduce significant construction impacts to less than significant levels:

- Special precautions shall be used while dredging in the vicinity of the berths to ensure that no structural damage occurs (refer to the mitigation measures described in section 5.3, Geology and Groundwater). The condition of the berths shall be documented prior to dredging and any damage specifically attributable to the dredging project shall be repaired by the Port of Oakland or the Corps of Engineers; the Port shall be responsible for damage caused by dredging the berth areas, and the Corps shall be responsible for damage attributable to dredging the federal channel, including the turning basins.

- Dredging activities that could impede access to terminal berths shall be scheduled in consultation with the terminal managers to ensure that access to the berths is available at all times when vessels are expected to call.

- Clamshell dredges shall not be used in the Inner Harbor Channel during peak morning and afternoon ferry transit hours. Allowable times shall be established in consultation with the ferry operator.

*Dredging Option F*

PROJECT IMPACTS

The primary difference between dredging options B and F is that the latter would result in a 750-foot-wide channel in the Outer Harbor rather than a 1,000-foot-wide channel. The 750-foot

channel would be adequate to accommodate the projected vessel traffic safely, and no significant impacts would occur, other than those described above for dredging option B.

MITIGATION MEASURES

Mitigation measures would be as described for dredging option B.

***Possible Reuse/Disposal Options***

Dredged sediment would be transported to various disposal sites by tugboats pushing barges. The following impact analysis assumes the maximum volume that would be transported to each site by barges carrying 4,000 cy per trip. (Note that this volume represents only that which would be dredged by clamshell dredge and barged to the disposal sites. It therefore may be different than

**Table 5.7-2. Maximum Number of Barge Trips Required by Disposal Site**

| *Source* | *Volume (cy)* | *Destination* | *Barge Trips*[a] | *Days*[b] |
|---|---|---|---|---|
| IH[c] and IH Turning Basin | 2,600,000 | Vision 2000 Upland | 650 | 650 |
| OH[d] | 1,165,000 | New Berth 21 | 292 | 233 |
| IH Berths | 1,000,000 | MHEA | 250 | 200 |
| OH Berths | 583,000 | MHEA | 146 | 117 |
| IH and OH | 6,900,000 | SF-DODS | 1,725 | 690 |
| IH and OH | 4,400,000 | Hamilton Airfield | 1,100 | 440 |
| IH and OH | 4,400,000 | Montezuma | 1,100 | 440 |

*Notes:*
a. Roundtrips, based on 4,000 cy per barge trip. Barge trips required only for material dredged by clamshell dredge.
b. Based on amount of equipment used and distance to disposal site.
c. IH = Inner Harbor
d. OH = Outer Harbor

the total volume of material disposed of at the site, which includes that transported by pipeline as well. The volume for the Vision 2000 Upland area also includes both the 2.5 mcy that could be placed at this site as well as the 0.1 mcy that would go to the rehandling facility.) Table 5.7-2 presents in summary form the maximum volume of material that could be disposed at each site, the number of barge trips (for this analysis, "trips" means "round trips"), and the number of days barge trips would occur.

The total number of barge trips that would be required ultimately would depend upon the selected alternative, but it is likely that at least two thousand trips could be required. Some of these would be confined within the Oakland Harbor area, and others would require transport into the Bay. Given the number of barge trips involved, it is likely that at least one accident involving a tugboat/barge would occur, but it is very unlikely that it would be serious enough to be considered significant. If a collision did occur between one of the barges under tow and another vessel, it is difficult to predict the resulting effects because of the dependence of surrounding circumstances. Collision between a barge and a small vessel such as a tugboat, ferry, or private yacht would probably result in little damage to the barge, but it could potentially cause the other vessel to sink. Fuel could be spilled in the water, and loss of life would be possible; again, this impact is unlikely.

A collision between a barge and a larger vessel could be a more serious incident. At a minimum, damage to one or both vessels would result. A worst-case scenario would involve physical injury, death, extensive damage to both vessels, fire and spillage of a medium or large quantity of oil (over 1,000 gallons) into Bay waters. This outcome is considered extremely unlikely because tugboat/barge trips and tanker trips are both a very small percentage of total movements within the Bay.

Although also a low probability, the most likely incident would be a tugboat or barge running aground, or having a collision with a small private vessel. Damage would likely be confined to property loss or personal injury. Therefore, no significant adverse impacts on vessel transportation are considered likely as a result of channel deepening. More detailed information for each reuse/disposal site is provided below.

*Vision 2000 Upland Area*

PROJECT IMPACTS

Approximately one barge trip per day would be required for a period of up to 650 days to deliver 2,600,000 cy of dredged material at this site. The FISCO wharves are no longer in use; thus, no conflicts with vessels using those wharves would occur, nor are any conflicts with the activities of the tug service expected. No long-term impacts would occur, since the area would not be used by commercial vessels in the future.

No significant impacts would result from use of this site as a reuse or rehandling facility.

MITIGATION MEASURES

No mitigation measures are required; however, the standard requirements listed above under "Proposed Dredging" would apply to disposal activities.

*New Berth 21*

PROJECT IMPACTS

Disposing of 1,165,000 cy of clamshell-dredged material at this site would require 292 barge trips over a period of 233 days, or roughly 1.25 trips per day. No significant short-term or long-term impacts would occur.

MITIGATION MEASURES

No mitigation measures are required; however, the standard requirements listed above under "Proposed Dredging" would apply to disposal activities.

*Middle Harbor Enhancement Area*

PROJECT IMPACTS

No impacts to tug service or transportation are expected.

MITIGATION MEASURES

No mitigations are required.

*Former NAS Alameda*

PROJECT IMPACTS

No barge trips would be required for this site since all material would be placed by pipeline from hydraulic cutterhead dredges. No significant short-term or long-term impacts would occur.

MITIGATION MEASURES

No mitigation measures are required; however, the standard requirements listed above under "Proposed Dredging" would apply to disposal activities.

*San Francisco Deep Ocean Disposal Site (SF-DODS)*

PROJECT IMPACTS

Use of the SF-DODS disposal site would not result in significant vessel transportation impacts. This site is located outside designated commercial vessel traffic lanes and away from restricted passage areas, precautionary zones, and anchorages for commercial shipping. Approximately 1,725 barge trips would be required to transport the maximum sediment volume of 6.9 mcy over a period of 690 days. Proportionately fewer trips would be necessary for the smaller volumes that could go to this site under other alternatives. In relation to the volume of traffic in the San Francisco Bay area, the increase would be minor, and no significant impacts would occur.

MITIGATION MEASURES

No mitigation measures are required; however, the standard requirements listed above under "Proposed Dredging" would apply to disposal activities.

*Hamilton Wetlands Restoration*

PROJECT IMPACTS

Use of the Hamilton reuse site is not expected to result in any significant vessel transportation impacts. Depending upon which disposal scenario is selected, a maximum of 1,100 tugboat and barge trips would be necessary to transport 4.4 mcy of dredged material to this site over a period of 440 days. In relation to the volume of traffic in the San Francisco Bay area, the increase would be minor, and no significant impacts would occur.

Sediment off-loading would be by pipeline, and potential impacts (and mitigation) of any channel dredged would be analyzed in a separate CEQA/NEPA process.

The pipeline and offloading station would be properly marked and lighted to prevent navigational hazards to watercraft using the area at all times of the day and night. Most of the pipeline would be floating on the bay surface; segments of the pipeline could be submerged to allow small boat traffic to cross over if deemed necessary. It may be possible to convert the existing military jet fuel pipeline and offloading facility for dredged material offloading, in which case no change in conditions in western San Pablo Bay would occur. The U.S. Coast Guard would be notified to include an update in its Information Notice to Mariners. Because of these measures included in the project, an insignificant navigation impact is anticipated and no additional mitigation measures are proposed.

MITIGATION MEASURES

No vessel transportation mitigation measures are required.

MITIGATION MEASURES

No mitigation measures are required; however, the standard requirements listed above under "Proposed Dredging" would apply to disposal activities.

*San Francisco Deep Ocean Disposal Site (SF-DODS)*

PROJECT IMPACTS

Use of the SF-DODS disposal site would not result in significant vessel transportation impacts. This site is located outside designated commercial vessel traffic lanes and away from restricted passage areas, precautionary zones, and anchorages for commercial shipping. Approximately 1,725 barge trips would be required to transport the maximum sediment volume of 6.9 mcy over a period of 690 days. Proportionately fewer trips would be necessary for the smaller volumes that could go to this site under other alternatives. In relation to the volume of traffic in the San Francisco Bay area, the increase would be minor, and no significant impacts would occur.

MITIGATION MEASURES

No mitigation measures are required; however, the standard requirements listed above under "Proposed Dredging" would apply to disposal activities.

*Hamilton Wetlands Restoration*

PROJECT IMPACTS

Use of the Hamilton reuse site is not expected to result in any significant vessel transportation impacts. Depending upon which disposal scenario is selected, a maximum of 1,100 tugboat and barge trips would be necessary to transport 4.4 mcy of dredged material to this site over a period of 440 days. In relation to the volume of traffic in the San Francisco Bay area, the increase would be minor, and no significant impacts would occur.

Sediment off-loading would be by pipeline, and potential impacts (and mitigation) of any channel dredged would be analyzed in a separate CEQA/NEPA process.

The pipeline and offloading station would be properly marked and lighted to prevent navigational hazards to watercraft using the area at all times of the day and night. Most of the pipeline would be floating on the bay surface; segments of the pipeline could be submerged to allow small boat traffic to cross over if deemed necessary. It may be possible to convert the existing military jet fuel pipeline and offloading facility for dredged material offloading, in which case no change in conditions in western San Pablo Bay would occur. The U.S. Coast Guard would be notified to include an update in its Information Notice to Mariners. Because of these measures included in the project, an insignificant navigation impact is anticipated and no additional mitigation measures are proposed.

MITIGATION MEASURES

No vessel transportation mitigation measures are required.

County Congestion Management Agency (CMA) has developed standards for roadway segments on its designated network, including freeways in the region of influence.

The City of Oakland has identified Level of Service (LOS) D as the minimum acceptable operating conditions for intersections. Therefore, an alternative would be considered to create a significant impact if the addition of its traffic resulted in a LOS E or F.

The Alameda County CMA has established LOS E as the standard for all roadways on the Metropolitan Transportation System (a system of freeways, state highways, principal arterials, and transit routes). Therefore, an alternative would be considered to create a significant impact if the addition of its traffic resulted in LOS F.

For other freeway segments that would operate at LOS F without the project, an increase in the volume/capacity ratio of 0.03 would constitute a significant impact. An increase of less than 0.03 would not be perceived by the public.

***Proposed Dredging***

*Dredging Options B and F*

The only land traffic generated by the dredging operations would be the trips associated with project-related employment. A maximum of 20 people would be employed for dredging operations. The employees would generate a maximum of 10 trips during the peak commute hours. This level of activity would not generate significant impacts for ground transportation.

No analysis of ground transportation impacts was performed for dredging operations. The standard practice is to analyze traffic impacts for projects that would generate 100 or more trips during the peak commute periods.

***Possible Reuse/Disposal Options***

The only reuse/disposal option that would affect ground transportation is the Various Landfills option.

*Various Landfills*

This section addresses the impacts of trucking dredged materials from the proposed sediment rehandling facility to three possible landfill disposal sites. Dredged materials would be transported to the sediment rehandling facility entirely by scows operating within the harbor area. The three landfills include:

- Altamont Landfill, located north of I-580 between Livermore and the Altamont Pass;
- Redwood Landfill, located east of US 101 north of the SR 37 junction; or
- Vasco Road Landfill, located north of I-580 west of the Altamont Landfill.

The project would generate 100,000 cy of material that would be hauled by truck to one of the landfill sites after drying at the sediment rehandling facility. Dried sediment would be hauled at a rate of 38 truck loads per hour during peak hauling periods. Sediment hauling could begin as early as 2000 and could continue through 2004.

*Analysis Methodology*

The analysis of transportation impacts for hauling operations was performed using the 2000 Alameda Countywide Transportation Model. The model incorporates a representation of land use and demographic characteristics of the nine-county Bay Area, which allows it to produce travel demand forecasts that incorporate influences of regional travel demand on transportation facilities in Alameda County. The Alameda Countywide Transportation Model has been structured to provide forecasting detail that addresses the evaluation needs of both countywide and corridor-specific transportation strategies.

The land use assumptions contained in the 2000 Alameda Countywide Transportation Model were developed by the Association of Bay Area Governments (ABAG) with input from local member jurisdictions on planned development. The CMA provided a transportation model for the analysis of year 2000 conditions. This model features a year 2000 transportation network and ABAG Projections '96 2010 land use data. This land use/transportation combination was used because the Countywide Model has not yet been updated to include ABAG Projections '98 land use data. When the Countywide Transportation Model land use assumptions were updated from Projections '94 to Projections '96, it was apparent that Projections '96 tended to underestimate employment in high growth areas in Alameda County and other Bay Area counties, including Silicon Valley. The use of the Year 2000 transportation network with Projections '96 Year 2010 land use assumptions provides the most conservative estimate of project impacts.

Using the traffic forecasts from the 2000 Alameda Countywide Transportation Model, the analysis of project impacts was performed using the TRAFFIX™ impact analysis software package. Traffic generated by the hauling of sediment was added to the Alameda Countywide Transportation Model volumes, along with the traffic associated with employment for the dredging operations. After adding the traffic to the CMA forecast volumes on area freeways, the resulting levels of service were computed using the methods contained in the 1985 Highway Capacity Manual (Institute of Transportation Engineers 1985), as required by the CMA.

Baseline traffic at study area intersections was developed by increasing existing traffic volumes (modified to include the effects of the I-880 Cypress Freeway completion) by 5 percent. This increase was determined by comparison of the 2000 Alameda Countywide Transportation Model link volumes to existing traffic volumes. The analysis of intersection capacity was performed for potentially affected intersections using methods described in the 1994 Highway Capacity Manual (Institute of Transportation Engineers 1994).

All traffic volumes shown in this document are reported in terms of passenger car equivalents (PCEs). Each truck trip was considered to be equivalent to two auto trips as suggested in the Highway Capacity Manual.

*Haul Routes*

Traffic operations were studied along the haul routes to the three possible landfill disposal sites.

The route to the Altamont Landfill would be from the sediment rehandling facility, along Middle Harbor Road and Adeline Street to 5th Street. At 5th Street, trucks would turn right to access I-880 and then follow I-880 south to I-238 east and I-580 east to Livermore. At the Greenville Road interchange, trucks would exit the freeway, turn left on Southfront Road, turn left on Greenville Road, then turn right on Altamont Pass Road to the landfill. On the return trip, traffic would

proceed west from the Altamont Pass Road/Greenville Road intersection along Northfront Road to the I-580 interchange ramps, and proceed on the freeways in the reverse direction back to the Port area. Trucks would exit I-880 at the Market Street interchange and proceed straight through the intersection to Adeline Street, and turn left to take Middle Harbor Road back to the rehandling facility.

The route to the Redwood Landfill would be from the sediment rehandling facility, to the 7th Street/I-880 interchange. At the northbound I-880 off-ramp, trucks would turn left and proceed along the frontage road located east of the freeway. At West Grand Avenue, trucks would continue straight north to the I-80 east connector ramps, then north along I-80, to I-580 west across the Richmond-San Rafael Bridge, to U.S. 101 north. From U.S. 101, trucks would turn right to access Sanitary Landfill Road, which leads to the Redwood Landfill. On the return trip, traffic would turn left out of Sanitary Landfill Road and follow the route described above in the reverse direction back to the rehandling facility.

The route to the Vasco Road Landfill would be the same as to the Altamont Landfill except that trucks would exit I-580 at the Vasco Road interchange and proceed north along Vasco Road to the Vasco Road Landfill. The return trip would be served by a direct access to I-580 from Vasco Road.

*Capacity Analysis*

An analysis was performed to determine how well the roadways along each of the possible haul routes would operate during hauling operations. A summary of this analysis for intersections along the haul routes is shown in Table 5.7-3 and Table 5.7-4. A summary of the analysis of freeway segments is shown in Appendix S. A summary of freeway junction operations is shown in Table 5.7-5 and Table 5.7-6.

**Table 5.7-3. Intersection Operations for Project Construction -- Year 2000 A.M. Peak Hour**

| Intersection | No Project | | Altamont Landfill Disposal[1] | | Redwood Landfill Disposal[1] | | Vasco Road Landfill Disposal[1] | |
|---|---|---|---|---|---|---|---|---|
| | LOS | Delay[2] | LOS | Delay[2] | LOS | Delay[2] | LOS | Delay[2] |
| 1. Maritime St./W. Grand Ave. | C | 21.6 | | | | | | |
| 2. Maritime St./Burma Rd. | B | 10.2 | | | | | | |
| 3. Maritime St./14th St. | B | 10.8 | | | | | | |
| 4. Maritime St./7th St. Extension | B | 12.5 | | | | | | |
| 5. 7th St./7th St. Extension | C | 24.5 | | | C | 24.6 | | |
| 6. 3rd St./Adeline St. | C | 24.7 | D | 28.9 | | | D | 28.9 |
| 7. 3rd St./Market St. | | | | | | | | |
| NB Left Turn | B | 6.2 | | | | | | |
| NB Through-Right Turn | A | 4.8 | | | | | | |
| SB Left Turn | B | 5.9 | | | | | | |
| SB Through-Right Turn | A | 3.9 | | | | | | |
| EB Left Turn | A | 2.6 | | | | | | |
| WB Left Turn | A | 2.2 | | | | | | |
| 8. W. Grand Ave./I-880 Fr. Rd. | C | 19.1 | | | C | 19.7 | | |
| 9. 7th St./I-880 SB On Ramp | A | 2.8 | | | | | | |
| 10. 7th St./I-880 NB Off Ramp | C | 16.6 | | | C | 16.7 | | |
| 11. 5th/Union/ I-880 N. Ramps | C | 16.6 | | | | | | |
| 12. 5th St./Adeline St. | B | 12.4 | C | 17.3 | | | C | 17.3 |
| 13. I-880 Off Ramp / Market St. | B | 9.8 | | | | | | |
| 14. Southfront Rd./ I-580 EB Ramps | B | 5.2 | B | 6.5 | | | | |
| 15. Southfront Rd./ Greenville Rd. | B | 13.8 | | | | | | |
| 16. Altamont Pass Rd./Greenville Rd. | | | | | | | | |
| NB Left Turn | B | 5.3 | B | 5.9 | | | | |
| NB Right Turn | A | 2.7 | A | 2.9 | | | | |
| WB Left Turn | B | 5.5 | B | 5.5 | | | | |
| 17. Northfront Rd./ I-580 WB Ramps | | | | | | | | |
| NB Left Turn | A | 4.8 | B | 5.6 | | | | |
| NB Right Turn | B | 6.3 | B | 6.3 | | | | |
| WB Left Turn | A | 2.4 | A | 2.6 | | | | |
| 18. Sanitary Landfill Rd./ NB U.S. 101 | | | | | | | | |
| EB Through | D | 22.3 | | | D | 24.5 | | |
| WB Through | D | 26.4 | | | **F[3]** | 65.5 | | |
| WB Right Turn | B | 6.5 | | | B | 6.8 | | |
| 19. Sanitary Landfill Rd./ SB U.S. 101 | | | | | | | | |
| SB Left Turn | A | 2.1 | | | A | 2.1 | | |
| WB Left Turn | F | High | | | **F[3]** | High | | |
| 20. Vasco Rd./ Northfront Rd. | C | 15.8 | | | | | C | 15.9 |

*Notes:* 1. LOS and delay are shown only where the disposal alternative delay is higher than the delay for the no-project alternative.
2. Delay in seconds per vehicle.
3. Bold text indicates a significant impact.

*Source:* Dowling Associates, Inc. 1997.

**Table 5.7-4. Intersection Operations for Project Construction — Year 2000 P.M. Peak Hour**

| | No Project | | Altamont Landfill Disposal[1] | | Redwood Landfill Disposal[4] | | Vasco Road Landfill Disposal[1] | |
|---|---|---|---|---|---|---|---|---|
| *Intersection* | *LOS* | *Delay*[2] | *LOS* | *Delay*[2] | *LOS* | *Delay*[2] | *LOS* | *Delay*[2] |
| 1. Maritime St./W. Grand Ave. | C | 21.6 | | | | | | |
| 2. Maritime St./Burma Rd. | B | 10.7 | | | | | | |
| 3. Maritime St./14th St. | B | 13.6 | | | | | | |
| 4. Maritime St./7th St. Extension | B | 13.3 | | | | | | |
| 5. 7th St./7th St. Extension | C | 24.4 | | | | | | |
| 6. 3rd St./Adeline St. | D | 33.5 | **E**[3] | 51.0 | | | **E**[3] | 51.0 |
| 7. 3rd St./Market St. | | | | | | | | |
| NB Left Turn | B | 6.6 | | | | | | |
| NB Through-Right Turn | A | 4.7 | | | | | | |
| SB Left Turn | B | 6.4 | | | | | | |
| SB Through-Right Turn | A | 3.5 | | | | | | |
| EB Left Turn | A | 2.5 | | | | | | |
| WB Left Turn | A | 2.4 | | | | | | |
| 8. W. Grand Ave./I-880 Fr. Rd. | C | 20.0 | | | | | | |
| 9. 7th St./I-880 SB On Ramp | B | 6.7 | | | | | | |
| 10. 7th St./I-880 NB Off Ramp | C | 16.9 | | | | | | |
| 11. 5th/Union/ I-880 N. Ramps | C | 16.0 | | | | | | |
| 12. 5th St./Adeline St. | C | 19.5 | | | | | | |
| 13. I-880 Off Ramp / Market St. | B | 10.6 | B | 11.1 | | | B | 11.1 |
| 14. Southfront Rd./ I-580 EB Ramps | F | High | **F**[3] | High | | | | |
| 15. Southfront Rd./ Greenville Rd. | B | 12.7 | B | 13.3 | | | | |
| 16. Altamont Pass Rd./Greenville Rd. | | | | | | | | |
| NB Left Turn | B | 6.8 | B | 8.1 | | | | |
| NB Right Turn | A | 3.2 | A | 3.4 | | | | |
| WB Left Turn | A | 2.4 | A | 2.4 | | | | |
| 17. Northfront Rd./ I-580 WB Ramps | | | | | | | | |
| NB Left Turn | B | 8.6 | C | 10.3 | | | | |
| NB Right Turn | A | 2.9 | A | 2.9 | | | | |
| WB Left Turn | A | 3.0 | A | 3.2 | | | | |
| 18. Sanitary Landfill Rd./ NB U.S. 101 | | | | | | | | |
| EB Through | E | 42.3 | | | | | | |
| WB Through | F | 89.5 | | | | | | |
| WB Right Turn | B | 9.0 | | | | | | |
| 19. Sanitary Landfill Rd./ SB U.S. 101 | | | | | | | | |
| SB Left Turn | A | 2.1 | | | | | | |
| WB Left Turn | F | 90.4 | | | | | | |
| 20. Vasco Rd./ Northfront Rd. | F | 65.7 | | | | | **F**[3] | 81.7 |

*Notes:*
1. LOS and delay are shown only where the disposal alternative delay is higher than the delay for the no-project alternative.
2. Delay in seconds per vehicle.
3. Bold text indicates a significant impact.
4. The Redwood Landfill is not open during the P.M. peak hour, and no hauling would occur during that time period.

*Source:* Dowling Associates, Inc. 1997.

**Table 5.7-5. Freeway Junction Operations for Project Construction, Year 2000 A.M. Peak Hour**

| *Location* | *No Project* | | *Altamont Landfill Disposal* | | *Redwood Landfill Disposal* | | *Vasco Road Landfill Disposal* | |
|---|---|---|---|---|---|---|---|---|
| *Greenville Road Interchange* | *LOS* | *Density*[1] | *LOS* | *Density*[1] | | | | |
| I-580 Eastbound Diverge | B | 10 | B | 11 | | | | |
| I-580 Westbound Merge | B | 18 | B | 18 | | | | |
| *Sanitary Landfill Rd. / SB U.S. 101* | *LOS* | *Density*[1] | | | *LOS* | *Density*[1] | | |
| U.S. 101 Merge From Median Acceleration Lane | F | 43 | | | F | 44 | | |
| *Vasco Road Interchange* | *LOS* | *Density*[1] | | | | | *LOS* | *Density*[1] |
| I-580 Eastbound Diverge | C | 26 | | | | | C | 27 |
| I-580 Westbound Merge | B | 20 | | | | | C | 20 |
| *I-580 / Vasco Road Ramps* | *LOS* | *V/C*[2] | | | | | *LOS* | *V/C*[2] |
| EB Off Ramp After Freeway Diverge | F | 1.27 | | | | | F | **1.32**[5] |
| EB to Northbound Loop Ramp | D[3] | 0.20 | | | | | D[3] | 0.25 |
| SB to Westbound Ramp | C | 0.74 | | | | | D | 0.79 |
| WB On Ramp Before Freeway Merge | F | 1.13 | | | | | F | **1.18**[5] |
| *Vasco Road Weaving Section* | *LOS* | *Speed*[4] | | | | | *LOS* | *Speed*[4] |
| Northbound Weaving Vehicles | E | 31 | | | | | E | 30 |
| Northbound Non-Weaving Vehicles | D | 37 | | | | | D | 36 |

*Notes:* 1. Density is measured in passenger cars per mile per lane.
2. V/C = Volume/Capacity measured in number of vehicles.
3. Level of service is limited by the restricted ramp design speed.
4. Speed is measured in miles per hour.
5. Bold text indicates a significant impact.

*Source:* Dowling Associates 1997

**Table 5.7-6. Freeway Junction Operations for Project Construction, Year 2000 P.M. Peak Hour**

| *Location* | *No Project* | | *Altamont Landfill Disposal* | | *Redwood Landfill Disposal*[6] | | *Vasco Road Landfill Disposal* | |
|---|---|---|---|---|---|---|---|---|
| *Greenville Road Interchange* | *LOS* | *Density*[1] | *LOS* | *Density*[1] | | | | |
| I-580 Eastbound Diverge | D | 31 | D | 31 | | | | |
| I-580 Westbound Merge | B | 12 | B | 13 | | | | |
| *Sanitary Landfill Rd. / SB U.S. 101* | *LOS* | *Density*[1] | | | | | | |
| U.S. 101 Merge From Median Acceleration Lane | B | 20 | | | | | | |
| *Vasco Road Interchange* | *LOS* | *Density*[1] | | | | | *LOS* | *Density*[1] |
| I-580 Eastbound Diverge | F | 45 | | | | | F | 45 |
| I-580 Westbound Merge | B | 19 | | | | | B | 19 |
| *I-580 / Vasco Road Ramps* | *LOS* | *V/C*[2] | | | | | *LOS* | *V/C*[2] |
| EB Off Ramp After Freeway Diverge | F | 1.13 | | | | | F | **1.18**[5] |
| EB to Northbound Loop Ramp | D | 0.82 | | | | | D | 0.88 |
| SB to Westbound Ramp | B[3] | 0.25 | | | | | B[3] | 0.30 |
| WB On Ramp Before Freeway Merge | F | 1.08 | | | | | F | **1.13**[5] |
| *Vasco Road Weaving Section* | *LOS* | *Speed*[4] | | | | | *LOS* | *Speed*[4] |
| Northbound Weaving Vehicles | F | 23 | | | | | F | 23 |
| Northbound Non-Weaving Vehicles | F | 27 | | | | | F | 27 |

*Notes:* 1. Density is measured in passenger cars per mile per lane.
2. V/C = Volume/Capacity measured in number of vehicles.
3. Level of service is limited by the restricted ramp design speed.
4. Speed is measured in miles per hour.
5. Bold text indicates a significant impact.
6. The Redwood Landfill is not open during the P.M. peak hour, and no hauling would occur during that time period.

*Source:* Dowling Associates 1997

*Project Impacts and Mitigation Measures*

ALTAMONT LANDFILL

If sediment is hauled to the Altamont Landfill, two intersections would be significantly impacted. The 3rd Street/ Adeline Street intersection would operate at LOS E and the Southfront Road intersection with the I-580 eastbound ramps would operate at LOS F during the P.M. peak hour.

There would be no significant impacts during the A.M. peak hour. There would also be no significant impacts on the freeways leading to the Altamont Landfill.

MITIGATION

- At the 3rd Street/ Adeline Street intersection, when necessary, convert the eastbound and westbound combination through-left turning lanes to exclusive left turn lanes and run permitted left turn phasing instead of split phasing. Jurisdictional responsibility for this mitigation measure is with the City of Oakland. An alternative mitigation measure would be to disallow transport of dredged material to the Altamont landfill during the P.M. commute period (3:00 P.M. to 7:00 P.M.).

- To mitigate the impacts of hauling operations at the 3rd Street/ Adeline Street intersection, and at the Southfront Road/ I-580 eastbound ramps intersection, disallow transport of dredged material to the Altamont Landfill during the P.M. commute period (3:00 P.M. to 7:00 P.M.).

REDWOOD LANDFILL

The intersection of Sanitary Landfill Road and U.S. 101 would operate at LOS F during the morning peak hour. This would constitute a significant impact. No material would be hauled to the Redwood Landfill during the P.M. peak hour. Significant impacts would also result on one freeway segment along the haul route to the Redwood Landfill.

- Southbound U.S. 101 south of Redwood Landfill would drop from LOS E to LOS F during the A.M. peak hour.

MITIGATION

No intersection improvements would mitigate the intersection impacts to less than significant levels during the peak commute periods. Likewise, expansion of the freeways to mitigate freeway impacts to less than significant levels would not be feasible.

- Mitigation of the impacts would require limiting hauling operations to the hours between 3 A.M. and 6 A.M. and between 10 A.M. and 3 P.M. as recommended by Marin County in the Redwood Sanitary Landfill Final EIR.

VASCO ROAD LANDFILL

Two intersections would be significantly impacted if sediment is hauled to the Vasco Road Landfill. The 3rd Street/ Adeline Street intersection would operate at LOS E and the Vasco Road/ Northfront Road intersection would operate at LOS F during the P.M. peak hour. There

would be no significant impacts during the A.M. peak hour. There would also be no significant impacts on the freeway mainline segments leading to the Vasco Road Landfill.

Significant impacts would result at two of the I-580/Vasco Road interchange ramps.

- The eastbound off-ramp from I-580 to Vasco Road would operate at LOS F just after the freeway diverge even if no sediment were hauled to the Vasco Road landfill. Hauling operations would cause the V/C ratio to drop from 1.27 to 1.32 during the A.M. peak hour and from 1.13 to 1.18 during the P.M. peak hour — a drop of 0.05 during both peak hours.

- The westbound on-ramp from Vasco Road onto I-580 would also operate at LOS F just before the freeway merge even if no sediment were hauled to the Vasco Road landfill. Hauling operations would cause the V/C ratio to drop from 1.13 to 1.18 during the A.M. peak hour and from 1.08 to 1.13 during the P.M. peak hour — a drop of 0.05 during both peak hours.

MITIGATION

- To mitigate the impacts of hauling operations at the 3rd Street/Adeline Street intersection, Vasco Road/North Front Road intersection, and on the I-580/Vasco Road interchange ramps, disallow transport of dredged material to the Vasco Road landfill during the commute periods (6:00 A.M. to 9:00 A.M. and 3:00 P.M. to 7:00 P.M.).

RAIL TRANSPORT OF HAZARDOUS WASTE TO ECDC FACILITY IN UTAH

About four trains would be required to haul up to 20,000 cy of the dredged material that could be classified as hazardous waste. This conclusion is based on an estimated 50 cy (75 tons) of material per railcar, and 100 railcars per train. The four new trains required to haul all the hazardous waste to Utah would not cause significant impacts for motorists at the highway/railroad crossings. Each train would cause about 3 minutes of delay at the highway crossings affected. The additional train traffic would represent less than a 0.1 percent increase in the likelihood of a motor vehicle being stopped at the affected crossings. This is considered an insignificant impact on ground transportation.

*Port Operations*

This section addresses the impacts of the project in terms of the amount of additional traffic that would be generated after the proposed deepening is completed. Because the project would accommodate larger ships at the Port of Oakland, demand for port services would increase even if no new berths or upland improvement projects were undertaken. Cumulative transportation impacts of the project in combination with other projects are discussed in section 9.2.7.

The Port estimates that the proposed project would increase container throughput at the Port by about 60,000 containers annually in 2003 and by about 123,000 containers annually in 2010. This increased activity would result in the generation of approximately 630 truck trips per day in 2003 and 1,310 truck trips per day in 2010.

Two types of truck trips are required to move containers at the marine terminals. Intermodal truck trips move containers between the marine terminals and the railyards. Local (over-the-road) truck trips move containers between the marine terminals and local destinations. The over-the-

road service area extends about 150 to 200 miles from the Port. Container shipments to areas outside the over-the-road service area would either be transported by rail or would be served by other ports. The Port of Oakland staff estimates that 10 percent of existing containers from the marine terminals are transported by rail and 90 percent are transported over-the-road. This percentage distribution is not expected to change as a result of the proposed project.

The assessment of the proposed project's operational impacts was conducted for the year 2003, when dredging would be completed, and for 2010, the latest year for which an approved transportation model was available.

Additional train traffic would be generated by the additional container traffic that would result from the proposed project. The Port has estimated that one 6,000-foot train per day would be required to serve 63,000 annual lifts at the Port of Oakland. The additional container throughput resulting from the dredging project would generate one additional train every 11 days in 2003. In 2010, one additional train would be generated every 5 days. This additional train traffic would not cause significant impacts for motorists at highway/rail grade crossings. A thorough analysis of train traffic impacts was conducted as part of the FISCO/Vision 2000 EIR (U.S. Navy and Port of Oakland 1997b). The number of trains generated by the various project scenarios is contained in Appendix S.

*Year 2003*

The analysis of year 2003 operational conditions at the Port was performed using the 2000 Alameda Countywide Transportation Model. Using the TRAFFIX™ impact analysis software package, Port traffic was removed from the 2000 Alameda Countywide Transportation Model traffic forecasts to create a baseline set of traffic volumes. Then traffic for the proposed project was assigned back to the transportation network. The analysis of traffic conditions was performed according to the methods previously described for the possible reuse/disposal options (see section titled "Analysis Methodology" above).

The analysis of intersection operations near the Port after completion of dredging operations is summarized in Table 5.7-7. A summary of the analysis of freeway segments is shown in Appendix S. No significant impacts would occur at intersections or on freeway segments for Port operating conditions in the year 2003.

*Year 2010*

The analysis of year 2010 operational conditions at the Port was performed using the 2010 Alameda Countywide Transportation Model. The CMA provided a transportation model for the analysis of year 2010 conditions. This model features a year 2010 transportation network and ABAG Projections '94 2010 land use data. The level of development in the Projections '94 land use data set was higher than for Projections '96. The Projections '94 land use data set was recommended because of the recent growth in Alameda County and other Bay Area counties, not limited to but including Silicon Valley.

**Table 5.7-7. Intersection Analysis Summary for Port Operations — Year 2003**

| Intersection | A.M. Peak Hour | | | | P.M. Peak Hour | | | |
|---|---|---|---|---|---|---|---|---|
| | No Project | | Project | | No Project | | Project | |
| | LOS | Delay[2] | LOS | Delay[2] | LOS | Delay[2] | LOS | Delay[2] |
| 1. Maritime St./W. Grand Ave. | C | 21.8 | C | 21.9 | C | 21.7 | C | 21.8 |
| 2. Maritime St./Burma Rd. | B | 10.3 | | | B | 10.8 | | |
| 3. Maritime St./14th St. | C | 17.8 | B | 18.2 | B | 14.8 | B | 14.9 |
| 4. Maritime St./7th St. Extension | B | 12.8 | B | 12.9 | B | 13.5 | | |
| 5. 7th St./7th St. Extension | D | 29.5 | D | 33.0 | C | 26.2 | D | 26.5 |
| 6. 3rd St./Adeline St. | C | 25.0 | D | 25.6 | D | 33.1 | D | 33.9 |
| 7. 3rd St./Market St. | | | | | | | | |
| NB Left Turn | B | 6.4 | | | B | 6.7 | | |
| NB Through-Right Turn | A | 4.9 | | | A | 4.8 | | |
| SB Left Turn | B | 5.9 | | | B | 6.5 | | |
| SB Through-Right Turn | A | 3.9 | | | A | 3.5 | | |
| EB Left Turn | A | 2.6 | | | A | 2.5 | | |
| WB Left Turn | A | 2.2 | | | A | 2.4 | | |
| 8. W. Grand Ave./I-880 Fr. Rd. | C | 19.9 | | | C | 20.9 | | |
| 9. 7th St./I-880 SB On Ramp | A | 2.3 | | | B | 6.8 | | |
| 10. 7th St./I-880 NB Off Ramp | C | 21.5 | C | 22.5 | C | 16.9 | | |
| 11. 5th/Union/ I-880 N. Ramps | C | 16.6 | | | C | 16.0 | | |
| 12. 5th St./Adeline St. | B | 12.4 | | | C | 19.7 | | |
| 13. I-880 Off Ramp / Market St. | B | 9.8 | | | B | 10.7 | | |

*Notes:* 1. LOS and delay are shown only where the disposal alternative delay is higher than the delay for the no-project alternative.
2. Delay in seconds per vehicle.
3. No significant Impacts were identified.

*Source:* Dowling Associates, Inc. 1997.

Port traffic was removed from the 2010 Alameda Countywide Transportation Model traffic forecasts to create a baseline set of traffic volumes. Then traffic for the proposed project was assigned back to the transportation network. The analysis of traffic conditions was performed according to the methods previously described for the possible reuse/disposal options.

The analysis of intersection operations near the port in 2010 is summarized in Table 5.7-8. A summary of the analysis of freeway segments is shown in Appendix S.

The additional traffic generated by the proposed project in 2010 would not cause significant traffic impacts on Bay Area freeways; however, significant impacts would occur at two intersections. The 7th Street/7th Street Extension intersection would operate at LOS E during the A.M. and P.M. peak hours. The 3rd Street/Adeline Street intersection would operate at LOS E during the P.M. peak hour.

MITIGATION:

- At the 7th Street/7th Street Extension intersection, when necessary, add a southbound left turn lane to serve the movement from the 7th Street Extension to 7th Street.
- At the 3rd Street/Adeline Street intersection, when necessary, convert the eastbound and westbound combination through-left turning lanes to exclusive left turn lanes and run permitted left turn phasing instead of split phasing.

Jurisdictional responsibility for these mitigation measures is with the City of Oakland.

**Table 5.7-8. Intersection Operations – Year 2010**

| Intersection | A.M. Peak Hour | | | | P.M. Peak Hour | | | |
|---|---|---|---|---|---|---|---|---|
| | No Project | | Project | | No Project | | Project | |
| | LOS | Delay[2] | LOS | Delay[2] | LOS | Delay[2] | LOS | Delay[2] |
| 1. Maritime St./W. Grand Ave. | C | 22.2 | C | 22.4 | C | 22.0 | C | 22.1 |
| 2. Maritime St./Burma Rd | B | 10.5 | B | 10.6 | B | 11.0 | B | 11.1 |
| 3. Maritime St./14th St. | C | 18.0 | C | 18.9 | C | 15.1 | C | 15.4 |
| 4. Maritime St./7th St. Extension | B | 13.1 | B | 13.3 | B | 13.7 | | |
| 5. 7th St./7th St. Extension | D | 32.7 | **E[3]** | 41.7 | E | 43.3 | E | 46.0 |
| 6. 3rd St./Adeline St. | D | 25.9 | D | 27.6 | D | 37.9 | **E[3]** | 40.3 |
| 7. 3rd St./Market St. | | | | | | | | |
| NB Left Turn | B | 6.7 | B | 6.8 | B | 7.0 | | |
| NB Through-Right Turn | A | 5.0 | | | A | 4.9 | | |
| SB Left Turn | B | 6.1 | | | B | 6.8 | | |
| SB Through-Right Turn | A | 4.0 | | | A | 3.5 | | |
| EB Left Turn | A | 2.7 | | | A | 2.6 | | |
| WB Left Turn | A | 2.2 | | | A | 2.4 | | |
| 8. W. Grand Ave./I-880 Fr. Rd. | C | 20.0 | C | 20.2 | C | 21.0 | | |
| 9. 7th St./I-880 SB On Ramp | A | 2.2 | | | B | 6.8 | | |
| 10. 7th St./I-880 NB Off Ramp | D | 28.8 | D | 35.9 | C | 16.9 | C | 17.0 |
| 11. 5th/Union/ I-880 N. Ramps | C | 16.6 | C | 16.7 | C | 16.1 | | |
| 12. 5th St./Adeline St. | B | 12.1 | | | C | 20.0 | C | 20.1 |
| 13. I-880 Off Ramp / Market St. | B | 9.9 | | | B | 10.9 | | |

*Notes:* 1. LOS and delay are shown only where the disposal alternative delay is higher than the delay for the no-project alternative.
2. Delay in seconds per vehicle.
3. Bold text indicates a significant impact.

*Source:* Dowling Associates, Inc. 1997.

The levels of service at these intersections after mitigation are shown in Table 5.7-9.

**Table 5.7-9. Intersection Operations with Project Mitigation – Year 2010**

| Intersection | A.M. Peak Hour | | P.M. Peak Hour | |
|---|---|---|---|---|
| | LOS | Delay[1] | LOS | Delay[1] |
| 5. 7th St./7th St. Extension | C | 24.9 | D | 27.0 |
| 6. 3rd St./Adeline St. | C | 18.6 | C | 19.3 |

*Note:* Delay in seconds per vehicle.
*Source:* Dowling Associates, Inc. 1997.

## 5.8 NOISE

### 5.8.1 Impact Significance Criteria

The primary consideration for most noise impact assessment is the annoying effect of noise. Land use compatibility guidelines from local general plans are the most common source of criteria used to assess the significance for noise impacts. Regulatory thresholds established by state and local codes can also provide some of the criteria used to judge the significance of noise impacts.

A proposed action can have significant noise impacts through two different mechanisms: (1) creating new sources of noise in an area, or (2) establishing noise-sensitive land uses in locations that will be exposed to high noise levels. Both situations must be considered when establishing significance criteria for noise impacts.

Project-related noise changes are identified by comparing future conditions with the project to future conditions without the project. The Port of Oakland has determined that project-generated noise levels would be considered a significant noise impact under the following conditions:

- If a project operations-related increase in CNEL levels of 3 dBA or more would affect noise-sensitive land uses (residential, medical, or educational land uses) and would result in an overall noise level exceeding 65 dBA.
- If a project operations-related increase in CNEL levels of 5 dBA or more would affect noise sensitive land uses, whether or not it would result in an overall noise level exceeding 65 dBA.
- If restrictions specified in the Oakland and Alameda noise ordinances are violated.

Temporary noise sources that are restricted to daytime hours, such as most construction and demolition activities, would be considered a significant impact only if they affect noise-sensitive land uses and result in noise levels that would exceed the limits in the Oakland and Alameda noise ordinances.

### 5.8.2 Proposed Dredging

*Construction Noise*

Noise from dredging activities would be essentially the same under either dredging option B or F, as described below.

*Project Impacts*

Noise increases would result from operation of dredges and associated equipment in the Inner Harbor and Outer Harbor areas. As described in section 2.1.2, dredging could potentially occur 24 hours per day, 7 days per week. While dredging activities would generate noise from a variety of equipment sources (as listed in Appendix T, Table T-2), the primary sources of equipment noise would include the dredges (with their associated pumps and generators) and tugboats used to position the dredges and scows. Other equipment, such as tending boats and survey boats, would not contribute substantially to the noise associated with dredging activities. Although scows

would be associated with the dredging operation, tugboats would be used to move them to the reuse/disposal sites. Therefore, the primary source of noise associated with use of scows would be the tugboats.

In addition to dredging activities, bulkhead construction adjacent to the Inner Harbor turning basin for slope stabilization might involve pile driving. Sheet piles may also have to be installed along the face of the Port berths that will be deepened commensurate with the new channel depth. The pile driving rig would be the primary source of noise for this activity. Noise levels that are typically generated by these equipment sources and the closest sensitive receptors and estimated noise levels at these receptors are listed in Table 5.8-1.

NOISE IMPACTS ON OAKLAND RECEPTORS

Dredging-related noise levels at West Oakland residential receptors located closest to the Inner and Outer harbors are indicated in Table 5.8-1. These noise levels would be less than existing ambient noise levels (see section 4.8), because intervening buildings and the I-880 freeway (and its associated noise barrier) would effectively block the direct line-of-sight between residences and dredging equipment (i.e., the intervening structures between the dredging equipment and residences would serve to attenuate the noise levels). In addition, the large distances between the noise sources and receptors would further reduce dredging-related noise levels at these receptors. Table 5.8-1 indicates that dredging-related noise levels would range between 28 dBA and 34 dBA ($L_{eq}$) at the closest West Oakland residential receptors (receptor location 1, Figure 4.8-2), well below existing ambient noise levels of 52 to 60 ($L_{eq}$) in residential neighborhoods. When compared to the Oakland Noise Ordinance standards for construction noise (occurring for more than 10 days; see Table 4.8-3), dredging-related noise would not exceed daytime standards for weekdays and weekends. For nighttime construction, the applicable noise level standard for residential receptors ($L_{33}$) is 45 dBA, and projected dredging-related noise levels at these residential receptors would not exceed this standard. Therefore, dredging-related noise increases would not have a significant impact on West Oakland residents (receptor location 1, Figure 4.8-2).

Proposed pile driving activities would generate relatively higher noise levels at West Oakland residential receptors. Table 5.8-1 indicates that pile driving along existing berths at the Inner Harbor turning basin would generate noise levels of 47 dBA to 53 dBA ($L_{eq}$) at the closest residential receptors (receptor locations 1 and 2, Figure 4.8-2). Such noise levels would be less than the Oakland Noise Ordinance standards for construction noise (occurring for more than 10 days) and would not occur during nighttime so would not exceed the nighttime standard of 45 dBA. Therefore, noise associated with proposed pile driving would not impact on West Oakland residents.

The Oakland Noise Ordinance also specifies operational noise standards for public open spaces, but the construction noise standards do not specifically apply to open space areas. As indicated in section 4.8, open space areas used for passive recreational uses such as birdwatching or picnicking are considered sensitive receptors, but neighborhood parks are not considered noise-sensitive. Two parks are located near the Oakland shoreline, Middle Harbor Park and Port View Park. The dredging-related noise impacts on these parks are considered a short-term adverse, but not significant impact. Park users could temporarily use other waterfront parks in the Oakland area until proposed dredging in the park vicinity is completed.

**Table 5.8-1. Estimated Dredging-Related Noise Levels at Sensitive Receptors by Project Component**
(page 1 of 4)

| *Project Site* | *Noise Source* | *Reference Noise Levels (dBA)* | *Closest Sensitive Receptor** | *Noise Level Adjustments for Distance and Intervening Structures* | *Total Estimated Exterior Noise Level at Receptor* |
|---|---|---|---|---|---|
| Inner Harbor Turning Basin | Clamshell Dredge | 67 @ 250 ft. | 1. Residential minimum 3,200 ft. to the north of Basin (no direct line of sight) — Oakland | Dredge: 45 dBA from dredge + Tug: 46 dBA = 49 dBA combined - 15 dBA attenuation[1] - 3 dBA distance attenuation[2] | 31 dBA (Leq) |
| | Tugboat | 82 @ 50 ft. (Leq) | | Pile Driving at Berths: 65 dBA w/o & 59 dBA w/ controls - 15 dBA[1] - 3 dBA[2] | 47 dBA w/o & 41 dBA w/ controls (Lmax) |
| | Loaders/Excavators & Trucks at Navy Warehouse | 80 & 91 @ 50 ft. (Leq) | 2. Residential minimum 2,100 ft. to the northeast of Basin (no direct line of sight) — Oakland | Dredge: 49 dBA + Tug: 50 dBA = 53 dBA combined - 15 dBA[1] - 1 dBA[2] | 37 dBA (Leq) |
| | Pile Driving Rig at Berths 67 and 68 | 101 w/o controls and 95 w/ controls @ 50 ft. (Lmax) | | Pile Driving at Berths: 69 dBA w/o & 63 dBA w/ controls - 15 dBA[1] - 1 dBA[2] | 53 dBA w/o & 47 dBA w/ controls (Lmax) |
| | Pile Driving Rig at Beery | 101 w/o controls and 95 w/ controls @ 50 ft. (Lmax) | 3. Residential (North Housing on Mosely) 500 ft. to the south of Inner Harbor southern shoreline - Alameda | Dredge: 61 dBA + Tug: 62 dBA | 65 dBA (Leq) |
| | | | | Pile Driving at Beery: 81 dBA w/o and 75 dBA w/controls | 81 dBA w/o & 75 dBA w/ controls (Lmax) |
| | | | 4. Residential (On-Base Officers Housing on Barbers Point Rd. & south-ward) 600 feet southwest of Basin southern shoreline - Alameda | Dredge: 59 dBA + Tug: 60 dBA | 63 dBA (Leq) |
| | | | | Pile Driving at Beery: 79 dBA w/o and 73 dBA w/controls | 79 dBA w/o & 73 dBA w/ controls (Lmax) |
| | | | 5. Residential (Marina Village Housing) 1,200 ft. South of Inner Harbor shoreline - Alameda | Dredge: 53 dBA + Tug: 54 dBA = 57 dBA - 10 dBA[1] | 47 dBA (Leq) |
| | | | | Pile Driving at Beery: 73 dBA w/o & 68 dBA w/controls - 10 dBA[1] | 63 dBA w/o & 57 dBA w/ controls (Lmax) |

**Table 5.8-1. Estimated Dredging-Related Noise Levels at Sensitive Receptors by Project Component**
(page 2 of 4)

| *Project Site* | *Noise Source* | *Reference Noise Levels (dBA)* | *Closest Sensitive Receptor** | *Noise Level Adjustments for Distance and Intervening Structures* | *Total Estimated Exterior Noise Level at Receptor* |
|---|---|---|---|---|---|
| Vision 2000 Upland and Rehandling Facility | Bulldozer/ Backhoe | 80 @ 50 ft. | 1. Residential 3,200 ft. (minimum) to the northeast - Oakland | Bulldozer/Backhoe: 44 dBA (Leq) - 15 dBA[1] - 3 dBA[2] | 26 dBA (Leq) |
| | Clamshell | 67 @ 250 ft. | | Dredge: 45 dBA + Tug: 46 dBA = 49 dBA/-15dBA[1] - 3dBA[2] | 31 dBA (Leq) |
| | Tugboat | 82 @ 50 ft. | | | |
| | | | 6. Residential 2,200 ft. (minimum) to the south (On-Base Bachelors Housing south of W. Redline Ave.)- Alameda | Bulldozer/Backhoe: 47 dBA (Leq) - 1 dBA[2] | 46 dBA (Leq) |
| | | | | Dredge: 48 dBA - Tug: 49 dBA = 52 dBA - 1 dBA[2] | 51 dBA (Leq) |
| Former NAS Alameda | Bulldozer/ Backhoe | 80 @ 50 ft. (Leq) | 6. Residential 1,000 ft. to the south (On-Base Bachelor's Housing south of W. Redline Ave.) - Alameda | Bulldozer/Backhoe: 54 dBA (Leq) | **54 dBA (Leq)** |
| | | | 4. Residential 2,500 ft. to the southeast (On-Base Officers Housing) - Alameda | Bulldozer/Backhoe: 46 dBA (Leq) - 2 dBA[2] | **44 dBA (Leq)** |
| | | | 3. Residential 5,300 ft. to the southeast (North Housing on Mosely) - Alameda | Bulldozer/Backhoe: 40 dBA (Leq) - 8 dBA[2] | 32 dBA (Leq) |
| Inner Harbor | Cutterhead Dredge | 79 @ 160 ft. (Leq) | 1. Residential 3,500 ft. to the northeast - Oakland | Dredge: 52 dBA + Tug: 45 dBA = 53 dBA - 15 dBA[1] - 4 dBA[2] | 34 dBA (Leq) |
| | Tugboat | 82 @ 50 ft. (Leq) | | Pile Driving at Berths: 64 dBA w/o and 58 w/controls - 15 dBA[1] - 4 dBA[2] | 45 w/o and 37 w/controls (Lmax) |

**Table 5.8-1. Estimated Dredging-Related Noise Levels at Sensitive Receptors by Project Component**
(page 3 of 4)

| *Project Site* | *Noise Source* | *Reference Noise Levels (dBA)* | *Closest Sensitive Receptor** | *Noise Level Adjustments for Distance and Intervening Structures* | *Total Estimated Exterior Noise Level at Receptor* |
|---|---|---|---|---|---|
| Inner Harbor (cont'd) | Pile Driving Rig at Berths 60-63 | 101 w/o controls and 95 w/controls @ 50 ft. (Lmax) | 4. Residential (On-Base Officers housing) 500 ft. southwest of Inner Harbor Channel and 1,300 ft. from Berths 60-63 - Alameda | Dredge: 69 dBA + Tug: 62 dBA | **70 dBA (Leq)** |
| | | | | Pile Driving at Berths: 73 dBA w/o and 67 dBA w/controls | 73 dBA w/o and 67 dBA w/controls (Lmax) |
| | | | 6. Residential (On-Base Bachelors Housing) 1,100 ft. southwest of Inner Harbor Channel - Alameda | Dredge: 62 dBA + Tug: 55 dBA | **63 dBA (Leq)** |
| Middle Harbor Enhancement Area (MHEA) | Tugboat | 82 @ 50 ft. (Leq) | 1. Onshore areas: Residential 4,800 ft. (minimum) to the east - Oakland | Tug: 42 dBA - 15 dBA[1] - 11 dBA[2] | 16 dBA (Leq) |
| Outer Harbor | Cutterhead Dredge<br>Tugboat<br>Bulldozer/ Backhoe<br>Pile Driving Rig at Berths 22-26, 30, 32, 33, and 35 | 79 @ 160 ft. (Leq)<br>82 @ 50 ft. (Leq)<br>80 @ 50 ft. (Leq)<br>101 w/o controls and 95 w/controls @ 50 ft. (Lmax) | 1. Residential 5,000 ft. to the southeast - Oakland | Cutterhead Dredge: 49 dBA +<br>Tug: 42 dBA = 50 dBA - 15 dBA[1] - 7 dBA[2] | 28 dBA (Leq) |
| | | | | Bulldozer/Backhoe: 40 dBA - 15 dBA[1] - 7 dBA[2] | 18 dBA (Leq) |
| | | | | Pile Driving at Berths: 61 dBA w/o and 55 dBA w/controls - 15 dBA[1] and - 7 dBA[2] | 39 dBA w/o and 33 dBA w/controls (Lmax) |
| New Berth 21 | Bulldozer/ Backhoe<br>Clamshell Dredge<br>Tugboat | 80 @ 50 ft. (Leq)<br>67 @ 250 ft. (Leq)<br>82 @ 50 ft. (Leq) | 1. Residential 4,000 ft. to the south - Oakland | Bulldozer/Backhoe: 42 dBA - 15 dBA[1] - 5 dBA[2]<br>Dredge 43 dBA + Tug: 44 dBA = 47 dBA - 15 dBA[1] - 5 dBA[2] | 22 dBA (Leq)<br>27 dBA (Leq) |

**Table 5.8-1. Estimated Dredging-Related Noise Levels at Sensitive Receptors by Project Component**
(page 4 of 4)

| *Project Site* | *Noise Source* | *Reference Noise Levels (dBA)* | *Closest Sensitive Receptor** | *Noise Level Adjustments for Distance and Intervening Structures* | *Total Estimated Exterior Noise Level at Receptor* |
|---|---|---|---|---|---|
| Oakland Entrance Channel and Approach | Cutterhead Dredge | 79 @ 160 ft. (Leq) | 7. Residential on Yerba Buena Island 3,000 ft. northwest of west end of Bar Channel - U.S. Coast Guard lands | Cutterhead Dredge: 54 dBA + Tug: 46 dBA = 55 dBA - 3 dBA[2] | 52 dBA (Leq) |
| | Tugboat | 82 @ 50 ft. (Leq) | | | |

*Notes:* Sources for Reference Noise Levels:
*Cutterhead Dredge:* Measurements taken by Geier & Geier Consulting, Inc. on December 18, 1997 of a diesel-powered cutterhead dredge similar to one that would be used for the project.
*Clamshell Dredge:* Measurements taken by Geier & Geier Consulting, Inc. on September 23, 1997 at Inner Harbor.
*Tugboat:* Tugboats are assumed to operate under full power for approximately 20 minutes during any one-hour period, resulting in an hourly Leq of 5 dBA less than the full power reference noise level of 87 dBA at 50 feet (COE, 1995).
*All Other Equipment:* U.S. Environmental Protection Agency (1971).
* Locations indicated on Figure 4.8-2.
1. For residential receptors to the north of the channel, a 15 dBA attenuation rate is applied due to the noise barrier provided by the I-880 freeway and associated noise walls and/or intervening buildings. None of these receptors have a direct line-of-sight to the channel. For the Marina Village residences, a 10 dBA attenuation rate is applied to shoreline activities due to partial noise attenuation provided by the Gateway Center building.
2. A supplemental distance attenuation factor is added to account for the increased atmospheric absorption effects with distances over 1,000 feet.

Bolded numbers indicate significant impacts identified in text. Some are unavoidable, while some are mitigable to insignificance.

*Source:* Geier & Geier Consulting, Inc. 1997.

MITIGATION MEASURES FOR OAKLAND RECEPTORS

No mitigation measures are required.

NOISE IMPACTS ON FUTURE ALAMEDA RECEPTORS

At present, existing on- and off-base housing associated with the former NAS Alameda (Figure 4.8-2) is mostly unoccupied, and will soon be completely vacated by Navy personnel and their families. However, the Alameda Reuse and Redevelopment Authority anticipates that during the next 2 to 5 years, the off-base housing (North Housing and Marina Village) will be occupied by Coast Guard personnel, while on-base officers housing in the northeast portion of the base will be leased out by the City. It is also possible that the former on-base bachelors housing (located in the northwest portion of the base) could be used as campus housing and classrooms (personal communication, E. Johnson 1997). Therefore, North Housing, Marina Village, on-base officers housing, and on-base bachelors housing (receptor locations 3, 4, 5, and 6, Figure 4.8-2), although unoccupied, are considered sensitive receptors.

Table 5.8-1 indicates that construction of the Inner Harbor turning basin would result in dredging-related noise levels of 65 dBA (Leq) and pile driving noise levels of 81 dBA ($L_{max}$) without controls (75 dBA with controls) at North Housing on Mosely Avenue. Noise levels at the more distant on-base officers housing (the first row of homes on Barbers Point Road) would be 2 dBA lower, while noise levels at the more distant Marina Village Family Housing would be 18 dBA lower. Dredging of the Inner Harbor turning basin would occur over 125 days, while pile driving would occur over 100 days.

Dredging-related noise along the Inner Harbor channel would generate noise levels of 70 dBA (Leq) at the on-base officers housing and 63 dBA (Leq) at the on-base bachelors housing (Table 5.8-1). Although dredging of the Inner Harbor would occur over 165 days, these maximum noise levels would only occur for a much shorter period when the dredge is operating on the Alameda side of the channel and in the vicinity of each of these residential receptors.

The Alameda Noise Ordinance does not specify construction noise standards, but does limit construction activities to specific daytime hours, Monday through Saturday. Proposed hours of dredging would not be consistent with the Ordinance time restrictions.

Since there are no construction noise level standards in the Alameda Noise Ordinance, comparison of these noise levels to the City of Oakland construction noise level standards would provide some indication of the degree of impact. The Oakland construction noise standards (longer than 10 days) for residential uses are 65 dBA (Leq) on weekdays (7 A.M. to 7 P.M.), 55 dBA (Leq) on weekends (9 A.M. to 8 P.M.), and 45 dBA (Leq) during the night (all other times). However, both the Oakland and Alameda noise ordinances state that, where measured ambient noise levels exceed the standard, the standard shall be adjusted to the ambient noise level. Measurement of ambient noise levels at Estuary Park indicates that the nighttime hourly noise level (7 P.M. to 7 A.M.) averaged 53 dBA (Leq). Since this measurement location is adjacent to the existing occupied North Housing and commercial/industrial uses, it is indicative of typical noise environments associated with occupied or developed waterfront areas in Alameda. Therefore, this would be the applicable nighttime noise standard.

The Oakland Noise Ordinance standards ensure that acceptable interior noise levels can be maintained (with an adequate margin of safety) so as to avoid speech and sleep interference

effects. Noise studies by the U.S. Environmental Protection Agency (EPA) suggest that the maximum interior noise level that will permit relaxed conversation with 100 percent intelligibility is 45 dBA. Sleep interference can occur when interior noise levels exceed 32 dBA. Since most residential buildings provide 20 to 25 dBA attenuation with the windows closed, acceptable interior noise levels can be maintained during the day with an exterior noise level of 65 to 70 dBA ($L_{eq}$) or less and during the night with an exterior noise level of 52 to 57 dBA ($L_{eq}$) or less.

A comparison of projected Inner Harbor dredging-related noise levels to the City of Oakland construction noise level standards indicates that projected dredging-related noise levels in the Inner Harbor would exceed the daytime weekday standard at on-base housing located near the Inner Harbor channel (those located in the first three or four rows with a direct line-of-sight to the channel) by as much as 5 dBA due to operation of a diesel-powered cutterhead dredge. Daytime weekend noise standards would be exceeded by as much as 15 dBA and the adjusted nighttime standard would be exceeded by 17 dBA at the on-base officers housing. Dredging-related noise levels at the on-base bachelors housing would not exceed the daytime weekday standard. However, the daytime weekend standard would be exceeded by 8 dBA and the nighttime standard would be exceeded by 10 dBA. If Oakland standards are applied to Alameda, these exceedances would be considered a significant noise impact on Alameda receptors.

When turning basin-related dredging noise is compared to the Oakland construction noise level standards, noise levels would not exceed the daytime weekday standard at North Housing on Mosely or on-base housing receptors. However, the daytime weekend noise standard would be exceeded by 10 dBA at North Housing and 8 dBA at on-base officers housing; this standard would not be exceeded at Marina Village. The nighttime standard would be exceeded by 12 dBA at North Housing and 10 dBA at on-base officers housing, but this standard would not be exceeded at Marina Village.

A comparison of pile driving noise levels to the City of Oakland construction noise level standards indicates that proposed pile driving would result in noise peaks that exceed the daytime weekday standard by 16 dBA at the closest residences in North Housing (those located on Mosely Avenue directly facing the Inner Harbor channel). Those North Housing units with no direct line-of-sight to the channel would be subject to pile driving noise levels of at least 10 dBA lower, and the Oakland noise standard would likely be approached or met. Noise peaks at the on-base officers housing would exceed the daytime weekday standard by 14 dBA, and noise peaks at Marina Village residences would not exceed this standard. If Oakland standards are applied to Alameda, these exceedances would be considered a significant noise impact on Alameda receptors.

Project construction-related dredging and pile driving noise would be considered a significant impact on Alameda receptors due to the conflict between Alameda Noise Ordinance hourly restrictions and proposed hours of dredging, as well as projected exceedance of the Oakland noise standards. Since the proposed hours of dredging (7 days per week, 24 hours per day) would not be consistent with the Alameda Noise Ordinance, this conflict would be an unavoidable significant impact. This conflict would not occur with pile driving noise since daytime hourly restrictions on pile driving are proposed as part of the project (in accordance with the Alameda Noise Ordinance along the Alameda shoreline and Oakland Noise Ordinance along the Oakland shoreline). All other identified significant impacts could be mitigated to a less than significant level with implementation of the mitigation measures outlined below.

The George P. Miller Elementary School and the NAS Alameda Child Development Center are located on Singleton Avenue as close as 1,300 feet from the Inner Harbor turning basin area.

Neither of these uses have a direct line-of-sight to the Inner Harbor since North Housing residences are located in between these two locations. At this distance, they would be subject to dredging-related noise levels of 47 dBA ($L_{eq}$) and pile driving noise levels of 63 dBA ($L_{max}$) without controls (57 dBA with controls). A comparison of these noise levels to Oakland construction noise level standards indicates that dredging and pile driving noise would not exceed the daytime weekday standard (when these facilities would be operating). Therefore, speech interference effects would not be anticipated. Although the nature of pile driving noise may be disturbing to some children, projected interior noise levels of 38 to 43 dBA ($L_{max}$) should be acceptable to allow napping during the afternoon at the NAS Alameda Child Development Center.

The Oakland and Alameda noise ordinances do not specify noise limits for neighborhood parks. Recreational facilities along the Alameda shoreline include Estuary Park (east of Mosely Avenue, adjacent to North Housing), a tot lot (east of Barbers Point Road, adjacent to former on-base officers housing), as well as tennis courts, a gym, and a volleyball court/picnic area. Noise impacts on these parks and playgrounds due to dredging-related noise would be similar to those identified above for the adjacent North Housing and on-base officers housing. Since the Ordinance does not specify a construction noise standard for park uses, dredging-related noise impacts on these parks are considered adverse, but less than significant impacts. State land use compatibility noise guidelines indicate that playgrounds and parks are generally less sensitive than residential uses. Park users would be subject to noise levels of 65 dBA ($L_{eq}$) and 75 dBA ($L_{max}$). While such noise levels would periodically cause speech interference, such noise levels would not result in hearing damage or loss. Also, there are other nearby climbing structures located farther from the Inner Harbor channel in the neighborhood (on Mosely Avenue at Monterey Circle, Drum, and Mulvany as well as at George P. Miller Elementary School on Singleton Avenue) that could be used during this period.

MITIGATION MEASURES FOR ALAMEDA RECEPTORS

The conflict between the proposed hours of dredging and hourly time restrictions of the Alameda Noise Ordinance would be an unavoidable significant impact. This conflict would not occur with pile driving noise since daytime hourly restrictions on pile driving is proposed as part of the project. However, other significant impacts relating to the dredging and pile driving noise level exceedances of the Oakland noise standards could be reduced to a less than significant level with implementation of the following measures except at one location as noted under Measure #2 below:

1. For pile driving, noise controls shall be used wherever feasible and such controls shall include:

    - Engine and pneumatic exhaust controls on pile drivers shall be used as necessary to ensure that exhaust noise from pile driver engines is minimized to the extent feasible. Such controls would provide 6 dBA attenuation as identified in the impact discussion.

    - Use of sonic or vibratory pile drivers instead of impact pile drivers (sonic pile drivers are only effective in some soils). Vibratory pile drivers could further reduce noise levels by as much as 16 dBA, which would be adequate to meet Oakland noise standards at Alameda receptors.

- Where use of vibratory pile drivers is not feasible, an acoustical enclosure around the pile driver to minimize noise peaks when the driver strikes the pile shall be used. The enclosure shall be constructed with noise insulating materials and shall be as high as the maximum height of pile when struck by the driver. Such a barrier could further reduce pile driving noise by as much as 20 dBA if the pile driver is fully enclosed, and 10 or 15 dBA if it is enclosed on the three sides facing the receptor. A reduction of 16 dBA would be adequate to meet Oakland noise standards at Alameda receptors.

2. Use of an electric-powered cutterhead dredge would reduce projected dredging-related noise levels by as much as 18 dBA. In the Inner Harbor turning basin, use of an electric-powered clamshell dredge shall be used, reducing dredging noise by 10 dBA. Such reductions in dredging-related noise would meet Oakland noise standards at Alameda receptors except at four to eight of the closest residential units fronting on Mosely Avenue in North Housing. Although reduced noise levels would still be 2 dBA higher than the adjusted nighttime standard, this exceedance would only occur within 625 feet of the Inner Harbor shoreline, which would affect four to eight residential units (occupying one or two of the northwesternmost buildings which front on Mosely Avenue opposite Estuary Park). In addition, the duration of time when dredging would actually occur within 625 feet of these units would be short and the degree of the exceedance (2 dBA) during this short duration would be small.

NOISE IMPACTS ON YERBA BUENA RECEPTORS

Housing associated with the U.S. Coast Guard is located on the southern end of Yerba Buena Island. These residential receptors are located as close as about 3,000 feet from the location of cutterhead dredging in the Oakland Entrance Channel and Approach (receptor location 7, Figure 4.8-2). Table 5.8-1 indicates that dredging-related noise levels at Yerba Buena residential receptors could reach 52 dBA (Leq). The projected high noise levels can be attributed to the fact that the receptors facing the Port of Oakland have a direct line-of-sight between them and the dredging equipment, with no structures or topography to help block noise. While no specific federal noise standards exist, noise studies by the EPA suggest that the maximum interior noise level that will permit relaxed conversation with 100 percent intelligibility is 45 dBA (EPA 1974). Since most residential buildings provide 20 dBA to 25 dBA attenuation with the windows closed, acceptable interior noise levels can be maintained during the day with an exterior noise level of 65 dBA (Leq) or less. Noise levels in excess of 32 dBA (Leq) during the night can interfere with sleep, and nighttime dredging would result in maximum interior noise levels of approximately 27 dBA to 32 dBA (Leq). Dredging-related noise increases at these residential receptors would be short term and not significant.

MITIGATION MEASURES FOR YERBA BUENA RECEPTORS

No mitigation measures are required.

***Operational Noise***

*Project Impacts*

VESSEL-RELATED NOISE INCREASES

Completion of the proposed dredging is expected to accommodate larger vessels, and projected 2010 vessel calls overall are expected to increase. Both the small and large vessels do not enter the

Inner or Outer Harbor channels under their own power and, therefore, the primary sources of noise associated with vessel traffic are the tugboats that are used to steer/position the vessels. The primary change in noise associated with changes in vessel traffic would be the increased frequency of tugboat use that would be associated with the 18 percent increase in overall vessel traffic. This 18 percent increase would increase the daily average number of ships from four to five. Such an increase in ship traffic would generate a 1 dBA increase in tugboat-related noise along the Inner and Outer Harbor channels. Therefore, an 18 percent increase in tugboat traffic along the Inner and Outer Harbor channels would result in noise level increases that are well below 3 dBA. Noise levels along the Inner Harbor waterfront (away from existing berths) are generally below 62 dBA ($L_{eq}$ or CNEL), and a noise increase of 1 dBA along the Inner Harbor Channel would be an unnoticeable effect.

Under dredging option F, noise impacts would be nearly identical to those identified for dredging option B. However, there would be no two-way vessel traffic in the Outer Harbor channel since the channel would be 250 feet narrower. This would slightly reduce operational noise levels by less than 1 dBA in comparison to dredging option B, because fewer vessels would be in the channel at the same time. This configuration change in noise sources along the Channel would not significantly alter existing or future vessel-related noise levels that are identified for dredging option B.

MITIGATION MEASURES FOR VESSEL-RELATED NOISE INCREASES

No mitigation measures are required.

RAILROAD-RELATED NOISE INCREASES

The proposed increase in container throughput as a result of the project would represent a 25 to 40 percent increase in rail traffic, which would result in a 1 dBA to 2 dBA increase in noise levels, assuming the operational day-night split would remain proportionately the same. Based on the significance criteria outlined above, such an increase would be insignificant.

MITIGATION MEASURES FOR RAILROAD-RELATED NOISE INCREASES

No mitigation measures are required.

TRUCK-RELATED NOISE INCREASES

The traffic analysis (section 5.7.2) indicates that completion of the proposed dredging would result in total daily truck trips increasing from 8,772 in 1996, to 9,405 in 2003, and 10,083 in 2010. Such increases would represent increases of 7 and 15 percent in 2003 and 2010, respectively. Most of these truck trips would occur on local roadways within Port facilities and roadways providing access to the freeway interchanges, such as Middle Harbor Road, 7th Street, the Cypress Freeway frontage road, and the Adeline Street-Union Street vicinity. Since this small increase in truck traffic would not occur on local roadways that pass near sensitive receptors, such an increase would be considered insignificant.

### 5.8.3 Possible Reuse/Disposal Options

Placement of dredged material at reuse/disposal sites is analyzed below. Once placement is completed, there would be no operational noise impacts. Therefore, no mitigation of the operational effects of sediment placement is required.

*Vision 2000 Upland*

This section includes disposal at Vision 2000 Upland and the rehandling facility that would be located at this site.

*Project Impacts*

The proposed placement of dredged material at Vision 2000 Upland to rehandle and use as construction material on site, or rehandle and transport to a landfill would be accomplished by clamshell. Once this material has been placed onshore, earth-moving equipment such as bulldozers and backhoes would move material within the drying cells. The primary sources of noise associated with this disposal option would be clamshell dredge, tugboats, and earth-moving equipment. Noise levels typically generated by these equipment sources are listed in Table 5.8-1 (columns 2 and 3). In addition, the closest sensitive receptors (receptor locations 1 and 6, Figure 4.8-2) and estimated noise levels at these receptors are listed in this table.

Disposal-related noise levels at West Oakland residential receptors (location 1, Figure 4.8-2) closest to Vision 2000 Upland also are indicated in Table 5.8-1. These noise levels would be less than existing ambient noise levels, because the I-880 freeway (and its noise barrier) would effectively block the direct line-of-sight between residences and disposal-related equipment. In addition, the large distances between the noise sources and receptors would further reduce disposal-related noise levels at these receptors. Table 5.8-1 indicates that disposal-related noise levels would range between 26 dBA and 31 dBA ($L_{eq}$) at the closest West Oakland residential receptors (receptor location 1, Figure 4.8-2), well below existing ambient noise levels of 52 dBA to 60 dBA ($L_{eq}$) in residential neighborhoods. When compared to the Oakland Noise Ordinance standards for construction noise (more than 10 days, Table 4.8-3), disposal-related noise would not exceed daytime standards for weekdays and weekends. For nighttime construction, the applicable noise level standard for residential receptors ($L_{33}$) is 45 dBA, and projected disposal-related noise levels at these residential receptors would not exceed this standard. Therefore, disposal-related noise increases would have a short-term adverse, but not significant impact on West Oakland residents.

With respect to existing parks, Middle Harbor Park would be closed since this area would be used for the rehandling facility and, therefore, no park users would be affected by construction noise. Port View Park would be located as close as about 2,400 feet from the rehandling facility cells at the closest point. Since park uses are not considered noise-sensitive, this disposal-related noise impact is considered a short-term adverse, but not significant impact. Park users could temporarily use other waterfront parks in the Oakland area until proposed dredging in the park vicinity is completed.

As indicated in Table 5.8-1, disposal-related noise levels at the closest Alameda residential receptor, the former on-base bachelors housing south of W. Redline Avenue (receptor location 6, Figure 4.8-2), could reach 46 dBA to 51 dBA ($L_{eq}$) when equipment is operated near the Oakland shoreline. Such short-term noise increases would be adverse but not significant, because disposal activities would occur within the City of Oakland and would not be subject to time restrictions of the Alameda Noise Ordinance.

*Mitigation Measures*

Because noise impacts from Vision 2000 Upland would be less than significant, no mitigation measures are required.

***New Berth 21***

*Project Impacts*

The primary sources of noise associated with this disposal option would be a clamshell dredge, tugboat, and earth-moving equipment. Table 5.8-1 provides disposal-related noise levels at West Oakland residential receptors located closest to the new Berth 21 (receptor location 1, Figure 4.8-2). These levels would be less than existing ambient noise levels, because the I-880 freeway (and its associated noise barrier) would effectively block the direct line-of-sight between residences and disposal-related equipment. In addition, the large distances between the noise sources and receptors would further reduce disposal-related noise levels at these receptors. Table 5.8-1 indicates that disposal-related noise levels would range between 22 dBA ($L_{eq}$) and 27 dBA ($L_{eq}$) at the closest West Oakland residential receptors, well below existing ambient noise levels of 52 dBA to 60 dBA ($L_{eq}$) in this residential neighborhood. When compared to the Oakland Noise Ordinance standards for construction noise (more than 10 days; Table 4.8-3), disposal-related noise would not exceed daytime standards for weekdays and weekends. For nighttime construction, the applicable noise level standard for residential receptors ($L_{33}$) is 45 dBA, and projected disposal-related noise levels at these residential receptors would not exceed this standard. Therefore, disposal-related noise increases would have a short-term adverse, but not significant impact on West Oakland residents (receptor location 1, Figure 4.8-2).

*Mitigation Measures*

Because noise impacts at New Berth 21 would be less than significant, no mitigation measures are required.

***Middle Harbor Enhancement Area***

*Project Impacts*

The primary sources of noise associated with this disposal option would be tugboats transporting bottom dump scows. Table 5.8-1 indicates disposal-related noise levels at West Oakland residential receptors located closest to the Middle Harbor Enhancement Area (MHEA) (receptor location 1, Figure 4.8-2). These would be less than existing ambient noise levels, because the I-880 freeway (and its associated noise barrier) would effectively block the direct line-of-sight between residences and disposal-related equipment. In addition, the large distances between the noise sources and receptors would further reduce disposal-related noise levels at these receptors. Table 5.8-1 indicates that disposal-related noise levels would reach 16 dBA ($L_{eq}$) at the closest West Oakland residential receptors, well below existing ambient noise levels of 52 dBA to 60 dBA ($L_{eq}$) in this residential neighborhood. When compared to the Oakland Noise Ordinance standards for construction noise (more than 10 days; Table 4.8-3), disposal-related noise would not exceed daytime standards for weekdays and weekends. For nighttime construction, the applicable noise level standard for residential receptors ($L_{33}$) is 45 dBA, and projected disposal-related noise levels at these residential receptors would not exceed this standard. Therefore, disposal-related noise increases would have a short-term adverse, but not significant impact on West Oakland residents (receptor location 1, Figure 4.8-2).

With respect to existing parks, as mentioned above, Middle Harbor Park would be closed since this area would be used for the Berth 55 rehandling facility, therefore no park users would be affected by construction noise. Port View Park would be located immediately adjacent to the

MHEA and equipment could be operated as close as 100 feet from the park. Since park uses are not considered noise-sensitive, this disposal-related noise impact is considered a short-term, adverse, but not significant impact. Park users could temporarily use other waterfront parks in the Oakland area until proposed dredging in the park vicinity is completed.

*Mitigation Measures*

Because impacts at the MHEA would be less than significant, no mitigation measures are required.

***Former NAS Alameda Construction Fill***

*Project Impacts*

The primary sources of noise associated with this disposal option would be earth-moving equipment. Table 5.8-1 provides disposal-related noise levels at future Alameda residential receptors located closest to the rehandling facility. Table 5.8-1 indicates that disposal-related noise levels would reach 54 dBA (Leq) at the closest potential future Alameda residential receptors (the former on-base bachelors housing that is expected to be used for campus housing). The Alameda Noise Ordinance does not specify construction noise standards, but does limit construction activities to specific daytime hours, Monday through Saturday. Proposed limiting of equipment operation to the daytime hours would mitigate this impact to insignificance.

*Mitigation Measures*

Delivery of material to the proposed NAS Alameda dewatering cell would occur 24 hours a day, but use of earthmoving equipment to transfer the material to the stockpile site would occur only during daytime hours, as specified in the Alameda Noise Ordinance (7:00 A.M. to 7:00 P.M. Monday through Friday, and 8:00 A.M. to 5 P.M. Saturday). This would mitigate noise impacts to insignificance.

***San Francisco Deep Ocean Disposal Site (SF-DODS)***

*Project Impacts*

Noise associated with the SF-DODS disposal option would result primarily from tugs hauling dredged material to the disposal site. No noise impacts would result from disposing of dredged material at this site since it is well removed from any sensitive receptors.

*Mitigation Measures*

Because no noise impacts would result from the use of SF-DODS as a disposal site, no mitigation measures are required.

***Hamilton Wetlands Restoration***

This analysis focuses on noise impacts associated with transport and disposal of dredged material at the Hamilton restoration site, as well as operations associated with the wetlands restoration project. However, only impacts associated with the transport of material to the site are attributable to the Oakland project.

*Construction Impacts and Mitigation Measures*

Construction activities prior to offloading dredged sediment from the Port of Oakland would include constructing offloading facilities, internal levees, and a sediment distribution pipeline. Noise would be generated by grading equipment and trucks hauling materials to the site. This portion of project construction would be short in duration.

Since construction activity would occur more than 1,600 feet away from homes in the Bel Marin Keys Unit 1 to 4 development, no significant noise impacts are expected. The Department of Defense residential development located to the west of the airfield has been historically maintained as housing for active duty military and USCG personnel and their families. These residences are as close as 1,000 feet from the airfield. If residential development is to continue at this site, or additional residential development is constructed to the west of the project in the future, the construction and operation noise of the wetland project could reach adjacent residences. Necessary precautions during construction and operation and for construction workers would be required.

Diesel-powered grading equipment and trucks could generate noise to sensitive land uses up to 50 dBA for brief periods. This value falls within the normally acceptable range for residential and sensitive land uses. This noise impact therefore would be insignificant and no mitigation measures are required.

Equipment, vehicles, and activities during grading and construction would increase noise levels temporarily in the eastern and southern portions of Bel Marin Keys development and upon construction workers. These impacts can be mitigated to less than significant with the following measures: muffle and shield all intake and exhaust ports on power construction equipment, and shroud or shield all impact tools; where such equipment is available and feasible, use electric, rather than gas or diesel construction equipment; and provide construction workers with state-approved ear protection.

*Operations Impacts and Mitigation Measures*

Barges would bring dredged material to unloading facilities at Hamilton, and the dredged material would be pumped through a pipeline to the designated placement area. Pumps would be the noisiest pieces of equipment used at Hamilton. A 2,000-hp unloading pump would be used on the offloading barge, and one or two 1,500-hp booster pumps would be located along the pipeline. The offloading barge would be located at the 16-foot mean lower low water contour line in San Pablo Bay, approximately 5 miles offshore and would not contribute significantly to ambient noise levels onshore. Potential locations for the booster pumps are not known at this time though at least one would possibly be located at the shoreline. Pumps may be in operation 24 hours a day during times when dredged material is offloaded at the site.

Typical diesel engines of the size proposed and equipped with standard mufflers generate noise levels of about 90 dBA at a distance of 50 feet (Corps and Port of Oakland 1994). Since the booster pumps would be located 1 mile from the nearest sensitive receptors, noise levels with two diesel booster pumps operating simultaneously could reach 52 dBA at some of the closer sensitive receptor locations. This value falls within the normally acceptable range for residential and sensitive land uses. Alternatively, were electric booster pumps to be used, noise levels would be greatly reduced. This noise impact therefore would be insignificant and no mitigation measures are required.

Equipment, vehicles, and activities during operation would increase noise levels for area residents, recreationists and employees of the project. These impacts can be mitigated to less than significant with the following measures: install "critical" grade silencers and enclose each pump; provide project employees with state-approved ear protection.

Noise generated from the off-loading platform and booster pump would need to be controlled. Pumps should be fitted with mufflers and surrounded by an insulated enclosure that reduces noise to no more than 65 dBA at a distance of 50 feet from the pump and reduces this impact to a less than significant level.

*Montezuma Wetlands*

*Project Impacts*

This analysis focuses on noise impacts associated with transport and disposal of dredged sediments at the Montezuma Wetlands site. Potential noise impacts associated with site preparation have been addressed in previous documentation (COE and Solano County 1994). Only impacts associated with the transport of material to the site are the responsibility of the Oakland Project.

Barges would bring dredged material to unloading facilities at the Montezuma Wetlands site, and the dredged material would be pumped through a pipeline to the designated disposal area. Diesel-powered pumps would be the noisiest pieces of equipment used at this location. A 2,000-hp unloading pump would be used on the off-loading barge, and two 1,500-hp booster pumps would be located along the pipeline. The first pump would be about 6,000 feet from Collinsville Resort. Typical diesel engines of the size proposed for this project and equipped with standard mufflers generate noise levels of about 90 dBA at a distance of 50 feet (COE and Solano County 1993; EPA 1971). Since two or three pumps could be operating near the river, and since the first booster pump would also be about 6,000 feet away from the resort, noise levels at Collinsville with all these pumps operating simultaneously could reach 63 to 65 dBA (COE and Solano County 1994).

The pumps could be in operation 24 hours a day. A significant impact could be expected on the residents of the Collinsville Resort. An outdoor noise level of 63 dBA to 65 dBA would significantly interfere with the ability to carry on a conversation at a speaker-to-listener distance greater than about 5 feet, and would interfere with the ability to converse in a normal tone of voice indoors with the windows open. Some people might also find it difficult to sleep even with the windows closed. The EPA recommends that to protect against sleep disturbance, noise levels should not exceed an average level of 35 dBA in sleeping areas (EPA 1974, as cited in COE and Solano County 1994). Since a building with the windows open typically reduces outdoor noise levels by about 15 dBA (closed windows typically reduce outdoor noise levels by 25 dBA), indoor noise levels could be as high as 50 dBA with the windows open. With the windows closed, noise levels would be reduced by an additional 10 dBA, typically to a level of about 37 dBA to 40 dBA.

The Collinsville-Montezuma Hills Area Plan adopted by Solano County requires that uses in the industrial reserve area (where the pumps would be located) generate noise levels no greater than 60 dBA as measured at the boundary of the nearby Collinsville commercial recreation area. Even at a level of 60 dBA, noise levels would significantly exceed the existing background noise level in the area, would interfere with outdoor conversation at speaker-listener distances of greater than 10 feet, and could interfere with sleep. Since the background noise level in the area is typically about

40 dBA during the daytime, it was suggested in the environmental analysis of the Montezuma Wetlands Project (COE and Solano County 1994) that the noise of the pumps be controlled to a level that does not exceed 45 dBA at the resort area. Even at this level, the sound of the pumps would be audible, but would not significantly exceed the background level. This recommended noise level would not interfere with outdoor or indoor activity, or with sleep even with the windows open.

*Mitigation Measures*

"Critical" grade silencers shall be installed on the diesel pumps and each pump shall be either completely or partially enclosed so that noise levels at the town of Collinsville do not exceed 45 dBA.

***Various Landfills***

*Project Impacts*

Disposal at the three possible landfills would generate 600 truck trips per day. These truck trips would originate at the Berth 55 rehandling facility and trucks would travel via Middle Harbor Road to I-880. Depending on which direction traveled on the freeway, haul trucks would either use the interchanges off 7th Street, Adeline Street, or Market Street. Southbound trucks going to and from Altamont or Vasco Road landfills would access interchanges via Middle Harbor Road, Adeline Street (to the I-880 southbound on-ramp), and Market Street (I-880 northbound off-ramp). Northbound trucks going to/from Redwood Landfill would access the I-80 eastbound on-ramp and westbound off-ramp via 7th Street and the Cypress Freeway frontage road. Such direct access to these interchanges would avoid travel on local roadways located near sensitive receptors.

To access eastbound I-80, trucks would use 7th Street to the Cypress Freeway frontage road that parallels the freeway on the east side. This road connects 7th Street with West Grand Avenue, and is sub-grade south of 10th Street (which provides a noise barrier for nearby residential receptors), at grade between 10th and 17th (where no sensitive receptors are adjacent), and above grade north of approximately 17th Street (with adjacent neighborhood park and industrial uses). By year 2000, the Cypress Freeway frontage road is estimated to carry approximately 5,225 vehicles per day north of 7th Street and 3,200 vehicles per day south of West Grand Avenue. Assuming it carries approximately 23 percent trucks (as measured for Maritime Street north of Burma Road in 1996 and 1997), noise levels along this road segment would generate noise levels of approximately 70 dBA (CNEL) north of 7th Street (which is partially protected by a noise barrier) and 68 dBA (CNEL) south of West Grand Avenue (where it is elevated). An increase of 600 truck trips per day on this road segment (between 7 A.M. and 5 P.M.) would result in a 1 dBA noise increase. Such an increase would be a short-term adverse, but not significant impact. The closest residential receptors are located east of Wood Street, at least 1,500 feet from the centerline of this frontage road. At this distance, noise levels due to traffic on this frontage road would remain below the FHWA noise criteria of 67 dBA.

Once on the freeways, noise increases associated with these 600 additional truck trips would be a short-term, adverse, but not significant impact. With daily freeway volumes ranging from 131,000 vehicles per day on I-580 to 282,000 vehicles per day on I-80, an increase of 600 truck trips would not significantly increase noise levels. Noise increases due to disposal-related truck traffic would be less than 1 dBA.

Trucks would access Redwood Landfill directly from U.S. Highway 101 via Sanitary Landfill Road, a private landfill access road. No sensitive receptors are located along this access road and, therefore, no impacts on sensitive receptors would occur from disposal-related truck traffic increases along the landfill access road.

Trucks would access Altamont Landfill via Greenville, Altamont Pass, and Northfront roads. No sensitive receptors are located along these roads and, therefore, no impacts on sensitive receptors would occur from increases in disposal-related truck traffic along these landfill access roads.

Vasco Road landfill would be accessed via Vasco Road. Residential receptors are located nearby along this roadway. At present, existing traffic generates noise levels of approximately 71 dBA (CNEL) within 50 feet of this roadway centerline. An increase of 600 trucks per day along this roadway would result in an increase of less than 1 dBA. Based on the significance criteria outlined above, this increase would be a short-term adverse, but not significant impact.

*Mitigation Measures*

Because impacts on noise resulting from the various landfills option would be less than significant, no mitigation measures are required.

## 5.9 HUMAN HEALTH AND RISK

Human health is a concern when human beings may be exposed to chemically contaminated sediment or soil. As discussed in section 4.9, the potential for human exposure to contaminated sediment or soil presently occurs only during maintenance dredging of the existing channel. As noted in Chapter 3, however, sediments containing the highest levels of chemical contaminants are found outside the existing channel footprint.

### 5.9.1 Impact Significance Criteria

Exceedance of any one of the following criteria would be considered a significant impact:

- Exceedance of the EPA target risk range ($1 \times 10^{-6}$ to $1 \times 10^{-4}$) for developing cancer over one's lifetime from chemical exposure (EPA 1990);
- Exceedance of the Cal-EPA target risk for carcinogens ($1 \times 10^{-6}$);
- Exceedance of the EPA (1989) and Cal-EPA (1992a) allowable non-cancer hazard index of 1.0;
- Exceedance of the California Safe Drinking Water and Toxic Enforcement Act's No Significant Risk Levels (SNRLs are based on a carcinogenic risk of $1 \times 10^{-5}$) (Proposition 65; HWA 1988); or
- Exceedance of the Cal-EPA (1992b) and EPA (1991) target blood lead level of 10 micrograms per deciliter.

Proposition 65 levels are designed to address all receptors, including sensitive subgroups such as the elderly, ill, or young children. These sensitive subgroups, however, are not expected to be exposed to dredged materials. Proposition 65 levels do not apply to workplace exposures.

### 5.9.2 Human Health Impact Assessment Methodology

The following sequence of analytical steps was used to evaluate the potential for impacts on human health that could result from the proposed dredging and reuse/disposal options:

1. Identify potential receptors (i.e., people who may have direct or indirect contact with the dredged material).
2. Identify potential exposure pathways for each type of receptor.
3. Define appropriate exposure assumptions associated with each type of receptor. Each type of receptor has expected variations in extent, duration, and frequency of exposure.
4. Identify sediment classes that are not expected to pose an unacceptable risk to human health under any exposure scenario identified for this project.

5. Calculate/select appropriate screening values for each contaminant to evaluate potential impacts on each type of receptor. Separate screening values were defined for each type of receptor to allow for expected variations in extent, duration, and frequency of exposure.

6. Compare likely maximum exposure point concentrations for each type of receptor to the screening values to assess whether any concentrations exceed the screening values.

7. Calculate an estimated cumulative exposure to evaluate whether cumulative (additive) effects of chemical contaminants could result in impacts above the significance criteria.

8. If a significant impact is identified, recommend mitigation measures to prevent or reduce potential exposures.

A summary of each of the eight steps is provided below. The detailed evaluation conducted for each receptor is provided in Appendix Q. The methodology used to select/calculate the appropriate screening values is also described in Appendix Q.

*Step 1: Identify Potential Receptors.* Receptors who may come into direct or indirect contact with dredged material include the following: the dredge crew, the off-loading crew (on-shore and off-shore), workers at the rehandling facility, construction workers using dredged material as fill, nearby construction or terminal workers, truck drivers hauling dredged material to landfills, and passers-by at an accidental spill from a truck or rail car. Thus, only adult workers are expected to have potential routine exposures to dredged material.

*Step 2: Identify Potential Exposure Pathways.* Potential receptors may come into contact with dredged material in one of three ways: by inhaling dust from dried sediment, by direct skin contact when working with the material, or through incidental ingestion (e.g., if workers do not wash their hands after coming in contact with the material, and then ingest small amounts of dredged sediment while eating, drinking, or smoking). Nearby construction and terminal workers who are not working directly with dredged material could only be exposed through inhalation. If a potential exposure pathway is incomplete, no impact on human health can result.

*Step 3: Define Exposure Assumptions.* The frequency of exposure (number of days per year), the duration of exposure (hours per day, and total number of years), and the extent of exposure (specifically, the amount of skin surface expected to be exposed to the material) were defined for each type of receptor. The maximum exposure duration for any receptor is expected to be no more than 4 years (i.e., the duration of the dredging). Workers at the rehandling facility are expected to have the greatest potential exposure because they will be working with the sediment most directly and are likely to be exposed to the sediment containing the highest levels of contaminants.

*Step 4: Identify Classes of Sediments Not Expected to Pose a Concern.* Dredged material was divided into four categories based on its chemical content (see Chapter 3). Three of the categories (suitable for ocean disposal, wetland cover, and wetland non-cover) contain such low levels of contaminants that they are not expected to pose a risk to human health. As result, reuse/disposal sites receiving only these materials would not pose a potential impact on human health.

*Step 5: Identify/Calculate Screening Levels.* The exposure assumptions identified in Step 3 were used to select or calculate appropriate health screening levels for each type of receptor and exposure scenario. Legally enforceable standards, such as OSHA Permissible Exposure Limits (PELs), were given preference over non-promulgated screening levels.

*Step 6: Compare Maximum Chemical Concentrations to Screening Levels.* Individual chemical concentrations were evaluated to determine whether one or more specific contaminants in the dredged materials may result in potential impacts on human health under the defined exposure scenarios.

*Step 7: Assess Cumulative Impacts.* Once the potential impact of individual contaminant concentrations was evaluated, the combined potential impact of all contaminants in a given sample was evaluated to ensure that potential impacts from lower levels of multiple contaminants would also be considered.

*Step 8: Identify Mitigation Measures.* Numerous mitigation measures can be implemented to reduce potential exposures to chemical contaminants in sediment. These mitigation measures include treating contaminated sediment on the barge to avoid future exposures, treating the soil to reduce the potential for dust, reducing the exposure duration by moving sediment with high levels of contamination through the rehandling facility more quickly, using trained workers with the appropriate personal protective equipment to handle contaminated sediment, and requiring truck drivers to remain in their vehicles during loading and unloading.

### 5.9.3 Proposed Dredging

Impacts would be the same for dredging options B and F. Based on the exposure pathway analysis conducted (see Appendix Q), the dredge crew would not have any complete exposure pathway. All dredged material would be handled mechanically, with no need for direct human contact with the dredged material. Because the sediment would also be wet at this stage, dust would not be generated. Since all potential exposure pathways are incomplete, no impacts on human health would occur as a result of dredging operations.

*Mitigation Measures*

Because no potential impacts on human health would result, no mitigation measures are required.

### 5.9.4 Possible Reuse/Disposal Options

As stated above, three classes of sediment (suitable for ocean disposal, wetland cover, and wetland non-cover) are not expected to pose a potential human health concern under any of the exposure scenarios associated with the proposed dredging. This means that no human health impacts are anticipated for those sites that can only accept wetland non-cover or better quality material. Thus, the following reuse/disposal sites did not require evaluation for human health risks (dredged material classifications accepted at each site are identified in parentheses):

- Middle Harbor Enhancement Area (can accept: suitable for ocean disposal, wetland cover, and wetland non-cover material);
- Former Alameda NAS (can accept only suitable for ocean disposal material);
- SF-DODS (can accept only suitable for ocean disposal material);
- Hamilton Wetlands Restoration (currently anticipated to accept only suitable for ocean disposal and wetland cover material); and

- Montezuma Wetlands Restoration (planning to accept: suitable for ocean disposal, wetland cover, and wetland non-cover material).

No impacts are anticipated for these areas, therefore no mitigation for human health risks is required. The remaining three potential reuse/disposal options require a more detailed evaluation, which is presented below.

*Vision 2000 Upland Area*

The Vision 2000 Upland area may include the dredged material rehandling facility and may also be used as a dredged material reuse location. Thus, potential exposures at the Vision 2000 Upland site may include a full range of contaminated sediment. Because the rehandling facility that would contain the most contaminated waste is located at the Vision 2000 Upland site, the most significant potential exposures are expected to occur during use of this site. The following receptors have been identified at this reuse/disposal option:

- Off-loading crew (on-shore and off-shore);
- Workers at the rehandling facility;
- Construction workers using the dredge material as fill; and
- Nearby construction and terminal workers.

*Project Impacts*

Evaluation of potential concentrations of chemical contaminants in dust showed that nearby construction and terminal workers would not be exposed to contaminants in excess of the PELs, even when the most contaminated sediment is being handled. Exposure of the off-loading crew and construction workers using dredged material as fill would be limited in duration (i.e., days or weeks, not months, of handling heavily contaminated material), so impacts would remain below the significance thresholds.

Impacts on rehandling facility workers could occur during handling of the most contaminated material (from the turning basin wings and the Inner Harbor widening). However, the duration of potential exposure is limited, therefore, potential risks are reduced. Currently, the rehandling facility is anticipated to dry a given batch of dredged material within 30 to 90 days. If the most contaminated soils are cycled through the rehandling facility within this time period, potential risks to rehandling facility workers are expected to be less than $1x10^{-6}$. Potential impacts are associated only with the most contaminated material from the Inner Harbor turning basin; the total quantity of this material is approximately 20,000 cy, i.e., approximately 20 percent of the capacity of the rehandling facility. Thus, this material could easily be dried in one cycle.

*Mitigation Measures*

As long as drying of the most contaminated material is accomplished within the proposed 30 to 90 day period, no mitigation is required. Alternatively, implementation of the following mitigation measure would reduce the impact to a less than significant level for workers handling dredged material from the turning basin wings and Inner Harbor channel widening:

- Trained workers shall be employed and shall use appropriate personal protective equipment (PPE) at the rehandling facility, thus preventing exposures. When exposures are prevented, potential risks drop to zero.

OPTIONAL MITIGATION MEASURE. Managing the rehandling facility as proposed or using PPE as described above would be effective in reducing impacts to less than significant levels. Thus, the following mitigation measure is optional:

- Heavily contaminated material shall be treated in the barges and off-loaded directly to trucks, reducing exposure duration and potential carcinogenic risks, and reducing the hazard index to below the significance threshold.

***New Berth 21***

New Berth 21 may receive all types of sediment, including construction fill. The only workers required to place dredged material at New Berth 21 are the off-loading crew. Therefore, potential receptors are limited to the following:

- Off-loading crew (on-shore and off-shore); and
- Nearby construction and terminal workers.

*Project Impacts*

As stated above, the evaluation of potential concentrations of contaminants in dust showed that nearby construction and terminal workers would not be exposed in excess of the PELs even when the most contaminated material is being handled. Again, exposure of the off-loading crew is limited in duration (i.e., days or weeks, not months, of handling heavily contaminated material), and thus will remain below significance thresholds. Most likely, the bulk of the material placed here would be relatively wet when placed, further reducing potential impacts.

*Mitigation Measures*

Because impacts on human health are less than significant, no mitigation measures are required.

***Various Landfills***

The Various Landfills disposal option consists of trucking up to 100,000 cy of contaminated material and debris to local landfills. This disposal option may also include transporting by train up to 20,000 cy of the most contaminated material to a Class I facility in Utah. Potential exposures to on-site workers handling dredged material and nearby construction and terminal workers have already been discussed in the context of the Vision 2000 Upland Area. The other two types of receptors that are associated with this proposed reuse/disposal option are:

- Truck drivers hauling dredged material to landfills; and
- Passers-by at an accidental spill from a truck or rail car.

*Project Impacts*

Passers-by at a potential accident site are not expected to experience any significant impacts. The potential duration of exposure for this type of receptor is extremely limited (minutes or hours, not days), and the resulting potential risks are therefore extremely low. Evaluation of potential contaminant concentrations in dust showed that truck drivers are not expected to be exposed to contaminants in excess of the PELs, even when the most contaminated sediment is being transported.

*Mitigation Measures*

Because impacts on human health are less than significant, no mitigation measures are required.

## 5.10 HAZARDOUS MATERIALS AND CONTAMINATED WASTES

This section addresses hazardous materials and non-hazardous contaminated wastes. Extensive testing has determined that sediments that would be classified as hazardous waste (as defined in 22 CCR Chapter 6.5) are not expected to be found in the areas proposed for dredging.

Hazardous materials include cargo and other items transported into the Port of Oakland onboard ship. Because more cargo will enter the Port after completion of this project, a proportionally higher volume of hazardous materials also could enter the Port.

Contaminated wastes are non-hazardous wastes with elevated levels of potentially toxic chemical constituents. Dredged materials that exceed the chemical criteria for wetland non-cover material are considered to be contaminated wastes. Reuse and disposal of these wastes is regulated under the Porter-Cologne Water Quality Act and 23 CCR Chapter 3, Subchapter 15 by the SF-RWQCB. In this analysis, waste is not confined to the strict definition under Title 23, but refers to dredged materials that can be disposed of in a landfill or reused. Dredged materials addressed in this section have the potential to exceed water quality objectives or to adversely affect beneficial uses in the project area. In Chapter 3 and Table 3.3-1, these materials are classified as construction fill. Debris that may be entrained in dredged material also is addressed in this section.

Other sediments that would be dredged in the project area have been designated as suitable for ocean disposal, wetland cover, and wetland non-cover (refer to Chapter 3 and Appendix H). The impacts of these less contaminated sediments are addressed in section 5.3.

### 5.10.1 Impact Significance Criteria

Impacts associated with non-hazardous contaminated wastes are considered significant if project activities could result in any of the following conditions:

- Exceedance of federal and/or California state non-hazardous contaminated waste standards (23 CCR Chapter 3, Subchapter 15); or
- A substantial reduction in remaining capacity of landfills or treatment facilities, thus impairing the availability of disposal or treatment capacity for other projects.

These criteria will ensure that reuse/disposal of contaminated waste does not adversely affect beneficial uses or cause degradation of groundwater. In addition, since landfill capacity is very limited, large volumes of disposed material could limit Class II or III landfill capacity for other non-Port projects. Limited use of disposal as a dredged material management option is generally preferred. Reuse of sediments, where it meets all appropriate regulatory requirements, is environmentally beneficial.

### 5.10.2 Hazardous Materials

Hazardous materials transported into the Port are required to comply with all federal and state regulations and Port of Oakland rules and regulations for hazardous materials specified in Tariff No. 2-A (Port of Oakland 1996). No significant impacts are expected from the increased volume of hazardous materials cargo that would result from construction of this project.

### 5.10.3 Contaminated Wastes

The remainder of section 5.10 addresses the dredged material that is considered contaminated waste.

### 5.10.4 Proposed Dredging

The dredging options referenced below are described in Table 2.1-1.

*Dredging Option B*

*Project Impacts*

Dredging Option B would widen and deepen the Inner and Outer Harbor channels and turning basins. Dredging would remove sediments that contain potentially high levels of contaminants. Debris, such as creosote wood pilings, most likely would be entrained in dredged material as the dredge excavates sediment. Removal of contaminated sediment would be a beneficial impact. Sediment would be dredged in a manner that minimizes dispersion of contamination. Dredging practices for more highly contaminated sediments would include use of an environmental bucket or hydraulic cutterhead dredge and would impose limits on filling of barges to prevent overflow of contaminated dredged material, as described in section 2.1.2. Dredged sediments would be offloaded directly from barges to the dredged material rehandling facility, which would reduce the potential for spillage.

Dredging Option B would generate approximately 300,000 cy of contaminated sediment and debris. Dredged sediments were evaluated using the modified Waste Evaluation Test (mWET) and the Toxicity Characteristic Leaching Procedure (TCLP). The mWET test determines if contaminants such as heavy metals could become soluble, and therefore more available if used at an upland reuse site. The TCLP test essentially makes the same determination for organic contaminants. These tests determined that contamination in these sediments would not be soluble or have the potential to become soluble or mobile over time at levels that would exceed hazardous waste standards. However, up to 20,000 cy of sediment have constituents that, although they would not be soluble at hazardous waste levels, may be soluble at levels that exceed water quality standards and could potentially impact beneficial uses. These sediments have elevated levels of soluble PAHs that could exceed water quality standards (refer to Chapter 3 and Appendix H).

Some sediments have slightly elevated levels of metals and/or organics that exceed the wetland non-cover material criteria (Chapter 3). This dredged material can be used for a variety of reuse options, such as construction fill (Chapter 3). For the proposed project, this material could be used as construction fill for the Vision 2000 Upland (Chapter 3 and Appendix H) or the upland portion of New Berth 21. As an alternative, the material could be disposed at a Class II landfill or a Class III landfill with specially engineered waste management units. The material would meet waste acceptance criteria at Redwood, Altamont, and Vasco Road landfills.

Portions of old creosote pilings, wharves, or piers would likely be entrained in the dredged material, generating about 30,000 cy of debris that would require disposal. Most of the debris would be non-hazardous and most of it would be recycled (e.g., concrete would be crushed and used in construction, and creosote pilings would be burned as a fuel at a co-generation facility). Any contaminated debris that cannot be reused would be disposed at an appropriate landfill.

*Mitigation Measures*

No mitigation measures are required.

***Dredging Option F***

*Project Impacts*

Dredging Option F is similar to Dredging Option B except that the Outer Harbor Channel would be widened to 750 feet instead of 1,000 feet. Since the more highly contaminated sediment is located in the Inner Harbor turning basin and along the berths, which are part of both dredging options, impacts would be similar to those described for Dredging Option B.

*Mitigation Measures*

No mitigation measures are required.

### 5.10.5 Possible Reuse/Disposal Options

Sediments not classified as hazardous waste, but having elevated levels of contaminants, are proposed for reuse/disposal at three possible sites: Vision 2000 Upland area, New Berth 21, and Various Landfills. Use of the dredged material rehandling facility at Vision 2000 Upland area would be required for each of these alternatives.

***Vision 2000 Upland***

This section first discusses sediment placement activities at Vision 2000 Upland area, then discusses use of the dredged material rehandling facility for contaminated sediments.

*Sediment Placement Activities*

PROJECT IMPACTS

The Vision 2000 Upland area is approximately 818 acres located in the area of the existing FISCO site (see Figure 2.2-2). Fill would be used at this site to raise the grade of the yard areas. Approximately 0.5 to 2.5 mcy of material would be used to raise grades.

Dredged material suitable for wetland non-cover or construction fill would be used at this site. Only materials that meet wetland or non-cover criteria or construction fill that would not leach constituents at levels exceeding water quality standards would be used. These materials would not significantly impact surface water or groundwater. In addition, the materials would not be in direct contact with surface water or groundwater.

The remaining construction fill material (up to 20,000 cy) would come from contaminated sediments in which either metals or organic constituents were shown to be soluble or mobile at a level that potentially could exceed water quality standards. This material would not have a significant impact on surrounding soil, groundwater, and surface water, because it would not be in direct contact with surface or groundwater and would be surrounded on all sides by cleaner fill. This material could be solidified and/or rendered permanently inert, if necessary to ensure that it could not contaminate soil, groundwater, or surface water.

MITIGATION MEASURES

No mitigation measures are required.

*Dredged Material Rehandling Facility*

Design and management of the dredged material rehandling facility is described in section 2.2.4 under the Vision 2000 Upland reuse/disposal option. The rehandling facility would require a waste discharge permit from the SF-RWQCB.

Dredged materials would be offloaded from a barge or scow directly to the rehandling facility. Excess water would be decanted to a separate cell, tested, and discharged in accordance with the SF-RWQCB waste discharge permit. After drying, material would be transported to a reuse site, a landfill, or an on-site or off-site treatment facility. Material that would be disposed at a landfill must be dried in the rehandling facility to a moisture content of 50 percent or less. The transporter must comply with all state and federal requirements for hazardous waste transport.

PROJECT IMPACTS

Impacts could occur during the following operations of the rehandling facility:

- Spillage during placement of contaminated sediment in the rehandling facility;
- Temporary placement of contaminated sediment in the rehandling facility if the facility were to fail or not perform to engineering and regulatory specifications;
- Short-term drying of contaminated sediment; and/or
- Subsequent removal of contaminated sediment for reuse or disposal.

Impacts and mitigations associated with rehandling contaminated sediments in general are discussed first, followed by impacts and mitigations associated with rehandling different levels of contaminated sediments.

Contaminated waste has the potential to adversely impact soil and groundwater. However, appropriate handling of this material, as proposed, would ensure that impacts remain at a less than significant level. Significant but mitigable impacts could occur during placement of dredged material into the rehandling facility if the clamshell bucket spilled dredged material in areas other than the rehandling facility. Some sediments tested for contaminant solubility exceeded the drinking water standards. Infiltration of contaminated water draining from dredged sediment that contains leachable constituents would be avoided, however, through use of an impermeable liner in that drying cell. It is noted that at FISCO, the Navy has evaluated the beneficial uses of groundwater (Revised Draft Technical Memorandum - Examination of Beneficial Uses of Groundwater at FISCO, dated October 1997). The Navy concludes due to various factors (high TDS, low yield, state and county well construction standards, etc.) that drinking water is not a beneficial use of groundwater at FISCO. The Navy also concludes that the only beneficial use of groundwater is recharge to San Francisco Bay. The potential for release of stormwater or water entrained in dredged sediments from the rehandling facility would not have a significant impact on surrounding surface water, because the facility would be designed to avoid this occurrence. The site would be designed to drain any runoff from the dredged material or stormwater to a

second cell where it would be tested prior to disposal as liquid waste or discharge to a storm drain if it meets all SF-RWQCB water quality standards.

The potential for other impacts to occur during the drying period due to breaching of the berm surrounding the rehandling facility by runoff water is not expected. The berm would be constructed to avoid the possibility of breaching during operation of the facility. It also would be covered with geotextile fabric and surrounded by hay bales, which would act as a filter for water that may seep through the berm. Only very small quantities of water, if any, would be able to seep through the berm. Dust would not be a problem, because the moisture content of the sediment would be carefully controlled.

When the dredged material is moved to a reuse or disposal site, fugitive dust, spillage, and odor impacts would be avoided by covering truck beds and limited wetting of soils for dust control.

On-site treatment for this material would be restricted to solidification by adding Portland cement, fly ash, or some other appropriate inert material. During solidification, all appropriate health and safety protective requirements would be followed.

After drying or treatment, material to be disposed of would be moved by truck or rail to an appropriate landfill. The material would be transported in accordance with all federal and state hazardous waste transport regulations. The cell would be cleaned to a sufficient level to remove any residual contaminated waste after the material is removed to the landfill. No significant impact impacts would result from this phase of the operation.

MITIGATION MEASURES

To reduce the impact from possible spills from the clamshell bucket to a less than significant level, procedures for loading and unloading contaminated sediments at the rehandling facility shall be developed. Procedures for clean-up of any spilled material outside the bermed area also shall be established.

Significant localized impacts from the leaching of soluble constituents to groundwater can be mitigated to the level of insignificance. The rehandling facility shall be designed to prevent any migration of contaminants into the environment. An impermeable liner or some other mechanism shall be temporarily placed in those cells with dry sediments, which have the potential to exceed drinking water standards.

***Various Landfills***

*Project Impacts*

Dredged materials would be required to be dried to at least 50 percent moisture content prior to disposal at a landfill. After drying, the material would be transported to a landfill for disposal. The transporter would comply with all state and federal transportation requirements for transport of contaminated wastes. A maximum of 100,000 cy of contaminated sediment and debris would be disposed at Altamont, Vasco Road, and/or Redwood landfill, over a 4-year period. This volume would not have a significant impact on the capacity at any of the three landfills (available landfill capacity is discussed in section 4.12).

Sediments with elevated levels of soluble contaminants that, without treatment, would not be acceptable at Altamont, Vasco Road, or Redwood landfills, would be disposed at ECDC located in Utah. Up to 20,000 cy of contaminated waste may be disposed at ECDC, which would have an insignificant impact on available capacity at this landfill.

*Mitigation Measures*

No mitigation measures are required.

## 5.11 PUBLIC SERVICES

### 5.11.1 Impact Significance Criteria

An impact to public services is considered to be significant if one or more of the following occur as a result of dredging activities:

- There is a potential for damage to services or utilities within the channel areas,
- There is a need to possibly relocate or otherwise protect the services or utilities,
- There is a potential for disruption in these services or utilities.

### 5.11.2 Proposed Dredging

*Dredging Option B*

*Project Impacts*

The power cable identified in Figure 4.11-1 as Utility 1 and the electric line shown as Utility 4 are abandoned and no longer provide service. The lines would likely be removed during the 50-foot project. This would not be a significant impact.

An analysis of as-built drawings of the BART tube (Figure 4.11-1, Utility 2) and protective stone blanket by the Port of Oakland and BART engineers shows that the portion of the system that is in the immediate dredge area is below the deepening limits of the 50-foot project (personal communication, P. Todd; D. Duey; R. Andrews 1997). Because the protective blanket would be near the sediment surface on the eastern side of the Outer Harbor channel at the wharf, the Bar Pilots may implement special shipping control procedures in the area as a precaution (personal communication, R. Andrews 1997). Precautionary dredging procedures may be implemented in the area as well, but impacts to the BART tube and protective blanket would not be significant.

At least three anode platforms and cables associated with the BART cathodic protection system (Figure 4.11-1, Utility 2) would, however, be seriously damaged by dredging the channel to -50 feet and require replacement (Port of Oakland 1997e). This impact would be significant but mitigable.

The 20-inch sanitary sewer force main (Figure 4.11-1, Utility 3) will be replaced by a force main of the same size during the 42-foot deepening project (personal communication, R. Andrews 1997). However, because the new main would be installed at a depth of only -49 feet MLLW, it would require relocation as a result of the 50-foot project, which is considered a significant impact.

*Mitigation Measures*

BART is aware of the potential impact to the cathodic protection system, and the Port is taking financial responsibility for the replacement of the cables and anode platforms that would be impacted by the project (personal communications, P. Todd; R. Andrews 1997). Replacement procedures would be similar to those followed during BART's periodic scheduled maintenance of the system:

- New anode platforms would be driven outside of the new channel margin.
- Cables that carry the current from the BART tube would be placed in trenches 5 feet beneath the surface of the channel bottom.

The impact to the 16-inch sanitary sewer main shall be mitigated to a less than significant level by replacing the force main. Construction of the sewer main will require only a very short (approximately 1 hour) disruption of service, while the new main is being connected to the existing sewer facilities on each side of the channel. This disruption will be scheduled for off peak demand time (personal communication, R. Andrews 1997).

***Dredging Option F***

*Project Impacts*

Under dredging Option F, the impacts on public services would be the same as described above, with one exception. A smaller portion of the cables associated with the BART cathodic protection system would be impacted due to the reduced extent of channel widening in the Outer Harbor that would occur under this option. The impact would remain significant but mitigable.

*Mitigation Measures*

Mitigation measures would be as described for Option B.

### 5.11.3 Possible Reuse/Disposal Options

***Vision 2000 Upland Area***

No impacts are expected at the project site. The demolition of structures and removal of utilities prior to the disposal of dredged materials from this project will be completed as a part of the Berth 55-58 and JIT projects. The site will be prepared for the acceptance of dredged materials before the 50-foot project begins.

***New Berth 21***

Because no utilities are present, no impacts are anticipated at the New Berth 21 site.

***Middle Harbor Enhancement Area***

Because no utilities are present, no impacts are anticipated at the Middle Harbor Enhancement Area site.

***NAS Alameda***

The airfield will not be utilized during the course of the project. Therefore, no impacts are expected at the project site.

***SF-DODS***

Because no utilities are present, no impacts are anticipated at the SF-DODS site.

***Hamilton Wetlands Restoration***

*Novato Sanitary District Facilities*

The State is working with NSD to develop a strategy to accommodate the Districts wastewater treatment and discharge needs while accommodating wetland restoration on the Hamilton Air Field and the Antennae Field. The proposed Hamilton project has the potential to affect continued access to the wastewater system unless design steps are incorporated to alleviate potential conflicts. Three specific design approaches are currently being pursued by the State.

First, the easement location could become a drainage divide for the tidal wetlands in order to provide access to the force main within the existing easement. With such an approach, dredged sediment would be placed atop the pipeline within the easement. Tidal action would be restored to either side of this drainage divide through at least one levee breach to the north in the Antennae Field and at least one levee breach to the south in the Hamilton Air Field. The large size of the Hamilton project suggests that subdividing wetland restoration into a few large blocks would have no effect on the ecological outcome of the restored wetlands and such an approach may be required logistically in any event. This design approach is not expected to have adverse impacts and no additional mitigation measures are proposed.

Second, the dechlorination plant could be addressed in one of two ways. It could be relocated upgradient to the west toward U.S. Highway 101 or its function could be incorporated into the existing wastewater treatment plants located to the west and north of the restoration project site. The latter option offers two benefits to NSD: it eliminates the need to provide electricity to the existing dechlorination plant when the Army closes the base and it improves the NSD's wastewater treatment capabilities by allowing it to upgrade its treatment plant to state-of-the-art ultraviolet radiation treatment and provide easier access to the dechlorination facility . The State is currently working with NSD to identify the most suitable option. These solutions are not expected to have adverse impacts and no additional mitigation measures are proposed.

Lastly, it may be possible to relocate the wastewater discharge point from a shallow water discharge in San Pablo Bay to a shallow water discharge within the restored wetlands. This approach would reuse the discharge to the benefit of ecological objectives of the restored wetlands by providing an additional water source and by generating a greater range of salinities. Discussions with the resource agencies (personal communication, C. Wilcox 1997; personal communication, J. Browning 1997; personal communication, M. Monroe 1997) indicate that seasonal wetlands could benefit from freshwater inputs but that tidal wetlands would benefit from being as saline as possible within the context of ambient surface water salinities in western San Pablo Bay. The resource agencies have indicated that saline tidal wetlands in this portion of San Pablo Bay would particularly benefit the endangered salt marsh harvest mouse and California clapper rail. This latter direction would suggest that beneficial reuse of wastewater discharges should be focused largely on enhancing the seasonal wetland components of the project during winter season. The acceptability of using treated wastewater as a source of freshwater will be analyzed as a part of a separate CEQA/NEPA process for the Hamilton restoration project. In the event that no wastewater is reused beneficially, the District could continue its shallow water discharge to San Pablo Bay via its existing discharge pipe. Access to the pipe would remain unchanged by the project for those reaches of the pipe offshore the eastern Hamilton levee. Access to those reaches of the pipe west of the levee would be via the proposed drainage divide, which would be more difficult than under existing conditions. The State is currently working with the

District to identify the most suitable option. These solutions are not expected to have significant adverse impacts and no additional mitigation measures are proposed.

*Power Supply*

No impacts are anticipated.

***Montezuma Wetlands Restoration***

*Power Supply*

Demand for electrical power would increase as a result of the Montezuma Wetlands Project, but not significantly. At the start-up of this project, approximately 4,300 feet of electrical transmission and telephone lines would be relocated along McDougal Cut. In 1995, approximately 17,000 feet of transmission line were relocated from Phases II and IV to Fire Truck Road.

Other modifications could include changing conductors. Relocations and modifications would take place according to the State of California Public Utility Commission and General Order 95, which are the construction guidelines to all overhead electrical service.

The contractor's work areas would be located adjacent to the proposed electrical power supply. Construction trailers can be powered by the existing 12-kV lines. Electrical supply to the offshore pumpout stations would require bringing power from the existing 12-kV line along the southern portion of the site to the unloading station. When relocating utility poles or extending service farther into the Montezuma project boundaries, PG&E requires that poles of this type be placed every 225 feet, depending on topography.

Diesel power for sediment transfer pumps and fuel storage for the pumps, grading and ditching equipment would be required. Approximately 4,500-horsepower (hp) would be necessary for pumping dredged materials. This power would be supplied by diesel-fueled pumps. A 2,000-hp pump would be located at each offshore pumpout station. A 5,000- to 10,000-gallon above-ground diesel storage tank would be located in the work area adjacent to the offshore stations, accessible to diesel fuel truck delivery. The tank would be installed according to all local and state regulations. Two additional 1,500-hp transfer pumps would be located along the dredged sediment pipeline.

New electric distribution and telephone lines are proposed to be placed above ground, contrary to Solano County and BCDC policy. This would be a potential adverse effect on wildlife habitat.

The Solano County Resource, Conservation, and Open Space Element contains policies that generally discourage the extension of electric and telephone distribution lines. However, they do permit extension of such facilities if they support water-related industrial development. The element states that distribution lines should be placed underground, where feasible, to avoid potential impacts on wildlife habitat and biological resources. In general BCDC policies also discourage the placement of overhead utility lines.

MITIGATION MEASURES

Mitigation measures incorporated in the Montezuma EIR/S would be required to mitigate this impact to a less than significant level.

*Water Supply*

Because no potable water service is available to the Montezuma project area, potable water would be supplied by truck as needed by Project personnel to the construction trailer and work areas. All water used at the site must meet requirements of the County and State health departments. No permanent water facilities are planned as part of this Project.

The sediment handling procedures for the Project would require water supply to mix with dredged materials for slurry. This water supply would be non-potable and would come from on-site shallow groundwater supply wells. Groundwater would be pumped from screened intervals in the upper 60 feet of water supply wells located in the southern part of the Project area, near the Sacramento River. The wells would tap into the sand aquifer underlying the southern portion of the site. Peak water demand could exceed 2,000 gallons per minute. Two holding ponds are proposed to maximize water reuse and to minimize peak flow demand.

*Wastewater*

There is no wastewater service in the Project area, and portable toilets would be needed at the construction trailer and work areas. Since the Project has an anticipated life span of approximately 10 years and would employ about 18 workers per day, portable toilets would need to be replaced or emptied relatively frequently. All wastewater removal would be in accordance with the Solano County Department of Environmental Health requirements.

***Various Landfills***

No impacts are anticipated. For impacts at the rehandling facility, please refer to the discussion of the Vision 2000 Upland Area, above.

## 5.12 LAND USE

### 5.12.1 Impact Significance Criteria

Impacts would be considered significant if the project:

- Fundamentally conflicted with established residential, recreational, educational, or scientific uses of the site.
- Disrupted or divided established land use configurations; or
- Resulted in substantial alteration of present or planned land uses.

### 5.12.2 Proposed Dredging

***Dredging Options B and F***

*Project Impacts*

Impacts would be comparable under dredging options B and F. Dredging impacts on land uses, including recreation, would be concentrated in the Inner Harbor. Approximately 1.2 acres of "dry" land at the FISC Annex property and 0.3 acre of land owned by the City of Alameda (which it leases to Alameda Gateway) would have to be excavated to construct the proposed turning basin. (The Navy may, but is not required to, convey FISC Annex property to the City of Alameda. The Port could acquire the FISC Annex property required for the project from the Navy. If such property has been conveyed to the City of Alameda, either the Port or the Corps could acquire it from the City.) These 1.5 acres are not subject to the navigational servitude. (The federal navigational servitude applies to all areas within the navigable waters, including pile-supported structures, such as wharves and piers, adjacent to the turning basin that would have to be removed to construct the turning basin.) Approximately 2.4 acres of pile supported marine structures (e.g., wharves and piers) on the FISC property, 0.2 acre of marine structures on City of Alameda owned property, and 0.8 acre on property owned by Alameda Gateway also would have to be removed. These lands are subject to the navigational servitude. In addition, approximately 3.3 acres of uncovered submerged lands (i.e., not covered by marine structures) on FISC Annex property, 8.2 acres on property owned by Alameda Gateway, and 3 acres of property owned by the City of Alameda would be deepened. These lands also are subject to the navigational servitude. Temporary work areas, including access to the site, would be necessary. The Port (or the Corps) would have to acquire access to use these temporary sites and would compensate the owners as required by law. The long-term loss of this land would not significantly affect existing or current proposed land uses in the area.

Any lands used for construction staging or access would be returned to the condition that they were in when the contractor began using them. The actual (reasonable) cost to compensate the property owners for their providing both temporary access as well as permanent property rights would be based on fair market value. Relocation benefits would be provided to any business displaced by acquisition of property for the project pursuant to Public Law 91-646 (the Uniform Relocation Assistance and Real Properties Acquisition Act) as amended by Public Law 100-27. Appendix C to the Feasibility Study states that the Port of Oakland would prepare a detailed

Relocation Plan. Displaced persons would receive fair and reasonable relocation payments, as provided in the federal Act.

The proposed project may affect the existing operations of Bay Ship & Yacht, a business leasing pier, wharf, and landside space at the Beery/Alameda Gateway site. However, the project's effect on the business operation of a lessee does not constitute a significant land use impact requiring mitigation pursuant to CEQA and NEPA. Pursuant to law, if a portion of the business is taken, it will be relocated and/or compensation will be provided in accordance with principles of eminent domain. Regardless of the project's effects on this particular business, the land use at the remainder of the site will be unaffected; it will continue to be designated business-industrial by the City of Alameda's General Plan and that designated use will not be inconsistent with the location and construction of the project. Thus, the project will not result in a substantial alteration of the present land use of the Beery/Alameda Gateway site.

The proposed Inner Harbor turning basin site extends into the proposed reuse area for the Alameda FISC Annex. The "Main Street Neighborhoods" subarea designated in the Reuse Plan lies just south of the site. Construction of the turning basin would not impinge on this area, and would not adversely impact the proposed residential and related uses. Construction of the turning basin as proposed would, however, require the removal of a small portion of land (about 1.2 acres) that is included in the "North Waterfront" subarea. Uses proposed for this area include office park, research and development, and residential. Water-oriented commercial uses are proposed for the shoreline area, as well, and the Reuse Plan indicates that existing pier space may be leased for larger vessels and recreational uses.

Expanding the Inner Harbor turning basin would slightly reduce the amount of land available for uses proposed at the FISC Annex under the Reuse Plan. The amount of land that would be needed is small in comparison to the overall amount of land available in the area. The removal of a portion of a wharf included in the Reuse Plan area for construction of the turning basin would not specifically be consistent with the concept of leasing existing pier space for larger vessels and recreational uses, but wharf space will remain in the Reuse Plan area after construction of the turning basin so the project would generally be consistent with this concept. The removal of the land and a small portion of a wharf in this area for the turning basin would not affect other adjacent uses proposed as part of the Reuse Plan. Therefore, reduction of land available for future planning at the FISC Annex does not constitute a significant land use impact.

Turning movements in the Inner Harbor turning basin would interfere with the movement of recreational boats and recreational fishing within the Inner Harbor area only minimally. The site is already used as a turning basin and it currently is being widened to 1,200 feet as part of the 42-foot project. Access to the turning basin area by small vessels would still be possible at most times even when vessels were turning because they would be able to use the shallow waters along the side slopes. As indicated in section 5.7, Transportation, under the worst-case scenario, vessel access could be restricted a maximum of 30 minutes a week, and this waiting period can be reduced by detailed coordination through bridge-to-bridge communications. All vessels would be required to comply with U.S. Coast Guard Rule 9 of the International – Inland Navigation Rules, which describes procedures to be followed in narrow channels and would further ensure safe transit. Construction of the proposed new turning basin would not result in additional impacts on recreational boating or fishing.

*Mitigation Measures*

No significant impacts requiring mitigation were identified.

### 5.12.3 Possible Reuse/Disposal Options

***Vision 2000 Upland Area***

*Project Impacts*

Use of the dredged material to create upland fill at this site would not cause a significant land use impact, since it would be consistent with proposed uses of the area, nor would use of this area as a rehandling facility, since the area already contains industrial uses.

*Mitigation Measures*

No mitigation measures would be required, since no significant impact would occur.

***New Berth 21***

*Project Impacts*

Using the dredged material as aquatic fill at this site would have no significant land use impacts, since it is consistent with proposed uses of the area.

*Mitigation Measures*

No mitigation measures would be required, since no significant impact would occur.

***Middle Harbor Enhancement Area***

*Project Impacts*

Use of dredged material placed into the deep water of Oakland Middle Harbor in order to raise the bottom to a shallower depth to create a more biologically productive habitat would be consistent with long-range plans for the area and would not adversely affect any land uses in the area. Creation of the public waterfront access and marine habitat enhancement area in the Middle Harbor would be a change from its current use as a harbor, docking and storage, and warehouse area. This would have the beneficial impact of providing additional land for public access, habitat mitigation, and open space.

*Mitigation Measures*

No mitigation measures would be required, since no significant impact would occur.

***Former NAS Alameda***

*Project Impacts*

The disposal area is included as the "Northwest Territories" subarea in the reuse plan for NAS Alameda. Once the material were adequately dried, proposed redevelopment could occur as planned. No land use conflicts would occur. During dredging and disposal operations, impacts

on adjacent land uses would be minimized by the proposed waterborne transport of the dredged materials to the site and their subsequent pumping to the site via slurry pipelines. Stockpiling of the dredged materials would require the periodic use of earthworking equipment onsite. Impacts on adjacent land uses during the sediment drying process would be intermittent and would not conflict with existing uses in the vicinity.

*Mitigation Measures*

No mitigation measures would be required, since no significant impact would occur.

***San Francisco Deep Ocean Disposal Site (SF-DODS)***

*Project Impacts*

Limited commercial and recreational fishing occurs in the vicinity of SF-DODS. Impacts on commercial and recreational fishing activities previously have been determined to be adverse but not significant as a result of disposal of dredged sediments at this site (EPA 1993a).

*Mitigation Measures*

No mitigation measures would be required, since no significant impact would occur.

***Hamilton Wetlands Restoration***

*Project Impacts*

Military operations on the airfield and antenna field have already ceased, and there is no current use of much of the airfield parcel. Use of the airfield and antenna field for wetland restoration would not result in any land use conflicts or policy inconsistencies and would return the airfield to a similar previous condition, prior to diking. Wetland restoration on the site would also be a complementary land use to the proposed New Hamilton Partners development immediately to the west (the Army/GSA Sale Parcel). Development of the Hamilton wetlands restoration project would remove the airfield and antenna site from further use as an airport and communications facility and would preclude any potential urban development on the site.

No recreational areas would be affected by wetlands restoration on the site. The San Francisco Bay Plan Policies requiring public access to bayfront development would apply to this site as well. An access trail consistent with wildlife use of the site would be provided along the levees to a point access area, and the proposed San Francisco Bay Trail would be located along the inland perimeter of the restored wetland areas. The Navy recently declined to renew the lease to the City of Novato for the Navy Ball fields located in the southeast corner of the site; therefore, no impacts on the ball fields would occur.

*Mitigation Measures*

No mitigation measures would be required, since no significant impact would occur.

***Montezuma Wetlands Restoration***

*Project Impacts*

Potential land use impacts are described in detail in the Montezuma Wetlands Project (MWP) Draft EIR/S (COE and Solano County 1994). However, if this disposal site is selected for the proposed project, it is assumed that the land use impacts will be mitigated to the extent feasible through the environmental review and permit process prior to this site's use for Oakland Harbor channel sediments. If dredged material from the proposed project were to be disposed at this facility, it would be consistent with the facility's permitted use. Potential land use impacts would result from conversion of the site to a disposal site, an action that is separate from the proposed Port of Oakland 50-foot project. Therefore, land use impacts at the Montezuma Wetlands site would be addressed fully in the EIR/S for the MWP, not this EIS/R/FS.

The only impacts from use of the Montezuma Wetlands site that would be attributable to the Port of Oakland project would thus be those related to transporting dredged sediment to the site. None of these impacts is considered significant. Operation of the rehandling facility and activities associated with rehandling dredged materials near McDougal Cut and the off-loading of dredged materials at the Sacramento River would increase airborne dust and noise levels generated from barges, traffic, earthmoving equipment, and tugs. The off-loading and rehandling facility would be lighted for safety and security purposes and would operate 24 hours a day.

Many of the impacts on recreation would occur either during construction of the MWP or from use of phases of the MWP other than Phase I, so such impacts would not be attributable to the Port of Oakland project. The Collinsville Marina is located approximately 0.5 mile east of the MWP's proposed off-loading facilities. The Collinsville area is also designated for commercial recreation use in the Solano County and BCDC plans. The maneuvering of tugs and associated activity could interfere with existing and proposed recreational boat use. However, the county and state plans provide for water-related industrial uses at the Montezuma Wetlands site. The MWP would thus be no more disruptive than industrial/port uses, so these impacts are not considered significant.

*Mitigation Measures*

No mitigation measures would be required, since no significant impact would occur.

***Various Landfills***

*Project Impacts*

Each of the landfills is permitted to accept dredged material such as that proposed and each has the capacity to do so. No land use impacts would occur.

*Mitigation Measures*

No mitigation measures would be required, since no significant impact would occur.

## 5.13 VISUAL IMPACTS

### 5.13.1 Impact Significance Criteria

Visual resources are qualitatively evaluated by assessing the nature and extent of change in existing landscape character. The analysis addresses landscape modifications as seen from viewpoints within the region of influence. An impact is considered significant if any one of the following occurs:

- The project would noticeably increase visual contrast and substantially reduce scenic quality, as seen from any high sensitivity foreground or middleground viewpoint;
- The project would block or disrupt existing views or reduce public opportunities to view scenic resources; or
- Visual resource conditions under the project would conflict with policies and regulations governing aesthetics.

Impacts can be either adverse (if they degrade scenic qualities) or beneficial (if they enhance scenic qualities).

### 5.13.2 Proposed Dredging

***Dredging Options B and F***

*Project Impacts*

Impacts of dredging options B and F would be comparable. All impacts associated with day-to-day dredging activities would be less than significant. Dredges, tugboats, barges, and other associated equipment would be visible for the approximately 4-year dredging period from varying points along the shoreline of the Inner and Outer Harbor channels, including from such sensitive viewpoints as Port View Park and Jack London Square. The Port already sustains considerable industrial activity, which includes the use of tugboats, barges, and large vessels. Maintenance dredging is also a routine occurrence. The dredging equipment would appear as an extension of existing Port activity and would thus be considered visually compatible with existing uses. The amount of lighting required to illuminate dredging activities would be negligible in comparison with that which currently exists and would not create a significant impact.

No operational impacts would occur. Larger vessels would be accommodated as a result of the proposed project, but large vessels are characteristic of a working port and would be visually consistent with current uses.

*Mitigation Measures*

No mitigation measures are required.

### 5.13.3 Possible Reuse/Disposal Options

***Vision 2000 Upland Area***

*Project Impact*

Use of the dredged material to create upland fill at this site would not cause a significant visual impact, nor would use of this area as a rehandling facility, since the area already contains industrial uses.

*Mitigation Measures*

No mitigation measures are required.

***New Berth 21***

*Project Impacts*

Using the dredged material as aquatic fill at this site would have no significant visual impacts.

*Mitigation Measures*

No mitigation measures are required.

***Middle Harbor Enhancement Area***

*Project Impacts*

Placement of dredged material in the Middle Harbor to create shallow-water habitat would have no long-term visual impacts. Use of this material to create salt marsh or a beach would be a beneficial impact to this industrial area.

*Mitigation Measures*

No mitigation measures are required.

***Former NAS Alameda***

*Project Impacts*

Dewatering dredged material at this site would not cause a significant visual impact.

*Mitigation Measures*

No mitigation measures are required.

***San Francisco Deep Ocean Disposal Site (SF-DODS)***

*Project Impacts*

No significant impacts would be associated with disposing dredged material at this already permitted ocean disposal site.

*Mitigation Measures*

No mitigation measures are required.

***Hamilton Wetlands Restoration***

*Project Impacts*

The off-loading and pumping facilities in the Bay would have a minor visual impact on views from the shoreline and from the Bay. The off-loading facility would be located approximately 5 miles offshore in San Pablo Bay. These facilities would not figure prominently in views from the shore; however, they would be obvious to users of this part of the Bay, including watersports recreationists, fishermen, and sightseers. The continual lighting of the off-loading facility for safety and security would create a negative visual focus during the night. These facilities would be obvious to users of this part of the Bay, and to local residences. However, these impacts would be temporary and not significant and would cease with completion of the project.

Current occupants of the base do not have direct views of the site. Based on project proposals for development, future occupants could have direct views of the project site; however, this is not anticipated to be a significant visual impact.

Wetland restoration would provide new and improved views from public access trails to the shoreline, consistent with BCDC's San Francisco Bay Plan policies on public access and views.

*Mitigation Measures*

No mitigation measures are required.

***Montezuma Wetlands Restoration***

*Project Impacts*

No visual impacts would occur at this site that would be specifically attributable to the Oakland Harbor Project.

*Mitigation Measures*

No mitigation measures are required.

***Various Landfills***

*Project Impacts*

The three landfills under consideration (Altamont, Redwood, and Vasco Road) are existing, permitted facilities. Disposal of dredged material at these sites would be consistent with their permitted use and would not cause a significant impact.

*Mitigation Measures*

No mitigation measures are required.

# 6.0 CONSISTENCY WITH ADOPTED PLANS AND POLICIES

This chapter addresses the project and project alternative's consistency with adopted plans and policies. Pertinent plans and policies that apply to the Bay Area are described first (section 6.1), followed by a discussion of local plans and policies (section 6.2). A discussion of policies from key plans that have not yet been adopted is provided in section 6.3 for informational purposes only, since these plans are still subject to revision. Federal, state, and local agencies also have laws and regulations that would apply to the project; these are discussed in Appendix G.

## 6.1 REGIONALLY APPLICABLE PLANS AND POLICIES

### 6.1.1 BCDC San Francisco Bay Plan

The San Francisco Bay Conservation and Development Commission (BCDC) has jurisdiction over all tidal areas of San Francisco Bay, including projects within 100 feet of the shoreline. The BCDC thus exercises regulatory authority over all filling and dredging in the Bay and over all development within 100 feet of the shoreline. As a coastal zone agency, BCDC jurisdiction may extend beyond the 100-foot shoreline band into adjacent lands identified in area plans. BCDC also has jurisdiction over the Suisun Marsh and other managed wetlands adjacent to the Bay, salt ponds, and certain waterways. BCDC has two fundamental objectives: (1) to protect the Bay as a natural resource for the benefit of present and future generations, and (2) to develop the Bay and its shoreline to their highest potential with a minimum of Bay filling.

Under the state McAteer-Petris Act, the BCDC has authority to issue or deny permit applications for placing fill, extracting materials, or changing the use of any land, water, or structure within the area of its jurisdiction. Since the BCDC has regulatory authority over activities within or adjacent to San Francisco Bay, it would thus be a responsible agency with regard to the proposed dredging and any of the potential disposal sites except SF-DODS and the landfills. Consistency review would be necessary from the BCDC for the proposed dredging, any disposal or reuse activities in the Bay and shoreline lands, and transportation of dredged material through the Bay.

In response to the mandate of the McAteer-Petris Act, BCDC developed the *San Francisco Bay Plan (Bay Plan)* (BCDC 1969). The *Bay Plan* is the primary plan governing development in San Francisco Bay; it is a comprehensive and enforceable plan for conservation of the water of the Bay and the development of its shoreline. Permits and consistency concurrences/certifications for dredging and disposal activities are issued by the BCDC if it finds the activities to be consistent with the McAteer-Petris Act and the *Bay Plan*. In addition to any needed permits, federal activities that affect the Commission's jurisdiction are subject to consistency review by the Commission, pursuant to the federal Coastal Zone Management Act (CZMA), for their consistency with the Commission's federally approved coastal management program, including the McAteer-Petris Act and the policies and findings of the *Bay Plan*.

The BCDC *Bay Plan* specifies findings and policies for the management of Bay resources and developments of San Francisco Bay and its shoreline, including dredging and water-related industry. The Dredging Findings and Policies of the *Bay Plan* state that regular dredging of the Bay is essential to the economic and social welfare of the San Francisco Bay region. The latest amendments to the Plan were completed in 1997; the amended *Bay Plan* policies that are related to dredging and disposal and pertinent to the proposed project are listed below.

*Fish and Wildlife*

Policy 1. *The benefits of fish and wildlife in the Bay should be insured for present and future generations of Californians. Therefore, to the greatest extent feasible, the remaining marshes and mudflats around the Bay, the remaining water volume and surface area of the Bay, and adequate fresh water inflow into the Bay should be maintained.*

The proposed dredging would increase the overall volume of the Bay, since between 12.8 and 14.5 mcy of material would be removed from the Oakland Harbor channels. Certain project elements would reduce the water volume and surface area of the Bay, however. Fill would be required for the New Berth 21 and MHEA disposal options, which would not be specifically consistent with this policy. New Berth 21 would not be consistent with the goal of preserving the benefits of fish and wildlife in the Bay, but the MHEA would establish an area of valuable habitat including 3.5 acres of salt marsh, and would be consistent with the overall intent of this policy. Freshwater inflow into the Bay would be unaffected by the project. Use of dredged material for habitat restoration at the Hamilton and Montezuma sites would be consistent with this policy.

Policy 2. *Specific habitats that are needed to prevent the extinction of any species, or to maintain or increase any species that would provide substantial public benefit, should be protected, whether in the Bay or on the shoreline behind dikes....*

Dredging and disposal activities would affect several sensitive habitats. Widening the Inner Harbor channel would likely remove a portion or all of the eelgrass bed at the western margin of the Union Pacific Mole, and any remaining portions of the eelgrass bed may be impacted by increased turbidity, sedimentation, and resuspended contaminants from the dredging. The proposed Middle Harbor Enhancement would tend to improve foraging habitat for the California least tern (see section 5.4.3). Filling of New Berth 21 would eliminate 27 acres of deepwater and wharf piling habitat. Additionally, construction of the dewatering cell at NAS Alameda could eliminate burrowing owl nests, if present. Implementation of the mitigation measures identified in this EIS/R/FS would make the project consistent with this policy.

*Water Quality*

Policy 1. *To the greatest extent feasible, the Bay marshes, mudflats, and water surface area and volume should be maintained and, whenever possible, increased. Fresh water inflow into the Bay should be maintained at a level adequate to protect Bay resources and beneficial uses. Bay water pollution should be avoided.*

Use of Hamilton and Montezuma wetlands sites for reuse of dredged material would be consistent with this policy, for wetlands would be restored. No pollution of the Bay waters would occur as a result of the project, and the overall impact would be beneficial, since contaminated sediments would be removed. The dredging project would increase the volume of the Bay, although the MHEA and New Berth 21 option would require filling of the Bay, which would not specifically be consistent with this policy. The placement of the jetty as part of the MHEA would decrease the surface area of the Bay slightly at low tide, however, it would provide roosting habitat for birds. The MHEA would result in an increase in Bay marshes and mudflats.

Policy 2. *Water quality in all parts of the Bay should be maintained at a level that will support and promote the beneficial uses of the Bay as identified in the Regional Water Quality Control Board's Basin Plan . . .*

The overall impact would be beneficial, since contaminated sediments would be removed from the Bay. Therefore, the project is consistent with this policy.

Policy 3. *Shoreline Projects should be designed and constructed in a manner that reduces soil erosion and protects the Bay from increased sedimentation through the use of appropriate erosion control practices.*

Dredged material that would be disposed of on land would be properly confined so as to avoid increased sedimentation of the Bay. Therefore, the project is consistent with this policy.

Policy 4. *Polluted runoff from projects should be controlled by the use of best management practices in order to protect the water quality and beneficial uses of the Bay, especially where water dispersion is poor and near shellfish beds and other significant biotic resources. Whenever possible, runoff discharge points should be located where the discharge will have the least impact. Approval of projects involving shoreline areas polluted with hazardous substances should be conditioned so that they will not cause harm to the public or the beneficial uses of the Bay.*

The project would remove contaminated sediments from the Bay, which would be a beneficial impact. Runoff from dredged material disposed of on land would be controlled by the use of appropriate management practices to protect water quality, and procedures would be established to clean up any accidental spills. The project would be consistent with this policy.

***Water Surface and Volume***

Policy 1. *The surface area of the Bay and the total volume of water should be kept as large as possible in order to maximize active oxygen interchange, vigorous circulation, and effective tidal action. Filling and diking that reduce surface area and water volume should therefore be allowed only for purposes providing substantial public benefits and only if there is no reasonable alternative.*

Filling of the Bay would be required under the MHEA and New Berth 21 disposal/reuse alternatives. The MHEA would have a substantial benefit in that it would provide valuable shallow-water habitat and would be designed to enhance tidal circulation in Middle Harbor. The New Berth 21 would facilitate the economic growth of the Port, which would have wide-spread benefits to the Oakland area. The berth will also meet the demand for Bay Area shipping facilities as designated in BCDC's Seaport Plan. Thus, the project is consistent with this policy, as long as there is no reasonable alternative.

Policy 2. *Water circulation in the Bay should be maintained and improved as much as possible. Any proposed fills, dikes, or piers should be thoroughly evaluated to determine their effects upon water circulation and then modified as necessary to improve circulation or at least to minimize any harmful effects.*

Impacts to circulation from filling New Berth 21 and the MHEA were evaluated in this EIS/R/FS and found to be less than significant. Therefore, the project is consistent with this policy.

Policy 3. *To offset possible additional losses of marshes due to necessary filling and to augment the present marshes: (a) former marshes should be restored when possible through removal of existing dikes; (b) in areas selected on the basis of competent ecological study, some new marshes should be created through carefully placed lifts of dredged spoils; and (c) the quality of existing marshes should be improved by appropriate measures whenever possible.*

Use of the Hamilton and Montezuma wetlands restoration sites for the disposal of dredged material would be consistent with this policy, as would the new marsh to be created as part of the MHEA.

***Safety of Fills***

Policy 2. *Even if the Bay Plan indicates that a fill may be permissible, no fill or building should be constructed if hazards cannot be overcome adequately for the intended use in accordance with the criteria prescribed by the Engineering Criteria Review Board.*

No unavoidable hazards were identified with the placement of fill. The proposed federal placement of fill in the Bay for Middle Harbor will be evaluated through Coastal Zone Consistency Review.

***Dredging***

Policy 1. *Dredging should be authorized when the Commission can find that (a) the applicant has demonstrated that the dredging is needed to serve a water-oriented use or other important public purpose, (b) the materials to be dredged meet the water quality requirements of the San Francisco Bay Regional Water Quality Control Board, (c) important fisheries and Bay natural resources would be protected, and (d) the materials would be disposed of in accordance with Policy 2.*

The project would be consistent with this policy for the following reasons:

- The dredging is needed to allow access by the new deep-draft vessels and ensure the viability of the Port of Oakland.
- The materials to be dredged would be disposed of in accordance with the water quality requirements of the San Francisco Regional Water Quality Control Board.
- Fisheries and Bay natural resources would be protected through the implementation of mitigation measures identified in this EIS/R/FS.
- The dredged material would be disposed of in accordance with Policy 2 (see the discussion below), with one exception. Use of the MHEA would require an amendment to the *Bay Plan*, which has not yet been obtained. Unless the *Bay Plan* is amended to allow the MHEA, dredged material reuse at this site may be inconsistent.

Policy 2. *Disposal of dredged materials should be encouraged in non-tidal areas where the materials can be used beneficially, or in the ocean. Disposal in tidal areas of the Bay should be authorized when th BCDC can find that (a) the applicant has demonstrated that non-tidal and ocean disposal is infeasible; because there are no alternate sites available or likely to be available for use in a reasonable period, or the cost of disposal at alternate sites is prohibitively expensive; (b) disposal would be at a site designated by the BCDC; (c) the quality and volume of the material to be*

*disposed is consistent with the advice of the San Francisco Bay RWQCB; and (d) the period of disposal is consistent with the advice of the CDFG and the NMFS.*

All dredged material would be disposed of in a manner that is consistent with SF-RWQCB criteria. Disposing of the dredged material at SF-DODS, NAS Alameda, New Berth 21, Vision 2000 Upland Area, Hamilton Wetlands Restoration site, and the Montezuma Wetlands Restoration site clearly would be consistent with this policy. The Hamilton restoration project will include a public access component to be developed as part of the Hamilton Restoration Project effort, that is consistent with wildlife use of the area. The upland landfills would be used only for material that is not suitable for other disposal methods, and their use also would be consistent. New Berth 21 and the MHEA would require filling the tidal area within the Bay. New Berth 21 is already designated as a marine terminal in the *Seaport Plan* and therefore is considered a site already designated by BCDC. BCDC is initiating an amendment to the *Bay Plan* to establish policies for fill in wildlife refuges such as the proposed MHEA, but the amendment has not yet occurred (see section 6.3.2).

Policy 4. *To ensure adequate capacity for necessary Bay dredging projects and to protect Bay natural resources, acceptable non-tidal disposal sites should be secured and ocean disposal sites designated. Further, disposal projects should maximize use of dredged materials as a resource, such as creating, enhancing, or restoring tidal and managed wetlands, creating and maintaining levees and dikes, providing cover and sealing material for sanitary landfills, and filling at approved construction projects.*

With the exception of the material that would be disposed at SF-DODS, dredged sediment would be used for beneficial purposes. If feasible, the material requiring disposal at the landfills would be used as cover; disposal at the Montezuma and Hamilton restoration sites would facilitate wetlands restoration; material disposed at New Berth 21, the Vision 2000 Upland Area, and NAS Alameda would be used for construction projects; and the material disposed at the MHEA would create valuable habitat, including salt marsh. The alternatives that exclude SF-DODS would be considered to "maximize the use of dredged material as a resource" and would be the most consistent with this policy.

Policy 5. *Once non-tidal or ocean disposal sites have been secured or designated, and prior to completion of the LTMS, the maximum feasible amount of dredged material should be disposed of at non-tidal sites or in the ocean. Until non-tidal upland disposal sites are secured and ocean disposal sites designated, aquatic disposal in the Bay should be authorized at sites designated by the Corps and the BCDC. Dredged materials disposed of aquatically in the Bay, particularly at the Alcatraz Island disposal site, should be carefully managed to ensure that the amount and timing of disposal does not create navigational hazards, adversely affect Bay currents or natural resources of the Bay, or foreclose the use of the site by projects critical to the economy of the Bay Area.*

The only sites that would involve aquatic disposal in the Bay are New Berth 21 and the MHEA. New Berth 21 is already designated for this purpose in the *Seaport Plan* and therefore is considered a site already designated by BCDC. Its use would be consistent with this policy, as would use of the sites other than MHEA. BCDC is initiating an amendment to the *Bay Plan* to establish policies for fill in wildlife refuges such as the proposed MHEA, but the amendment has not yet occurred (see section 6.3.2).

Policy 6. *All proposed channels should be carefully designed so as not to undermine the stability of any adjacent dikes, fills, or fish and wildlife habitats.*

Implementation of mitigation measures included in this EIS/R/FS would avoid the impacts described above. The project would be consistent with this policy.

Policy 8. *To protect underground fresh water reservoirs (aquifers), (a) all proposals for dredging or construction of work that could penetrate the mud "cover" should be reviewed by the RWQCB and the State Department of Water Resources, and (b) dredging or construction work should not be permitted that might reasonably be expected to damage an underground water reservoir. Applicants for permission to dredge should be required to provide additional data on groundwater conditions in the area of construction to the extent necessary and reasonable in relation to the proposed project.*

The SF-RWQCB and state Department of Water Resources would review this project. No impacts to underground reservoirs will occur, as indicated in section 5.3. Thus, the project is consistent with this policy.

***Water-Related Industry***

Policy 1. *Sites designated for both water-related industry and port uses in the Bay Plan should be reserved for those industries and port uses that require navigable, deep water for receiving materials or shipping products by water in order to gain a significant transportation cost advantage.*

The MHEA would result in a loss of deep-water access to the Middle Harbor. This area is designated as port use, and the implementation of the MHEA may require an amendment to the *Bay Plan*. The project as a whole is consistent with Policy 1 because the project furthers port use of sites designated for port priority use.

***Ports***

Policy 1. *Port planning and development should be governed by the policies of the Seaport Plan and other applicable policies of the Bay Plan. The Seaport Plan provides for:*

*(a) Expansion and/or redevelopment of port facilities at ... Oakland...*

*(b) Further deepening of ship channels needed to accommodate expected growth in ship size and improved terminal productivity;*

*(c) The maintenance of up-to-date cargo forecasts and existing cargo handling capability estimates to guide the permitting of port terminals; and*

*(d) Development of port facilities with the least potential adverse environmental impacts while still providing for reasonable terminal development.*

The proposed project would be consistent with these listed objectives of the *Seaport Plan* (refer to chapters 1 and 2, and section 5.7.1 for additional detail).

Policy 2. *Some filling and dredging will be required to provide for necessary port expansion, but any permitted fill or dredging should be in accord with the Seaport Plan.*

The project would be consistent with this policy. The Seaport Plan allows for the placement of up to 50 acres of fill in the Port, which would occur either at Berth 21 or the former Navy piers area under the Berths 55-58 project.

Policy 3. *Port priority use areas should be protected for marine terminals and directly related ancillary activities such as container freight stations, transit sheds, and other temporary storage, ship repairing, support transportation uses, including trucking and railroad yards, freight forwarders, government offices related to the port activity, chandlers, and marine services. Other uses, especially public access and public and commercial recreational development, should also be permissible uses provided they do not significantly impair the efficient utilization of the port area.*

The project would be consistent with this policy. The New Berth 21 and Vision 2000 Upland Area reuse options would expand marine terminal facilities within the Port. The MHEA would create recreational uses in the Middle Harbor. Development of this area has been coordinated with the overall Vision 2000 Program and would not impair the efficient utilization of the Port area.

***Recreation***

Policy 1. *As the population of the Bay region increases, more people will use their leisure time in water-oriented recreation activities. Water-oriented recreation facilities such as marinas, launch ramps, beaches, and fishing piers should be provided to meet those needs. For parks, there is no practical estimate of the acreage that should be provided on the shoreline of the Bay, but it is assumed that the largest possible portion of the total regional requirement should be provided adjacent to the Bay.*

Development of the MHEA would be consistent with this policy, since it includes recreational non-motorized shallow draft boat access in the Middle Harbor.

Policy 10. *Because of the need to increase the recreational opportunities available to Bay Area residents, small amounts of Bay filling may be allowed for shoreline parks and recreation areas that provide substantial public benefits and that cannot be developed without some filling.*

Detailed public access planning is ongoing as part of the Berths 55-58 project, so that both habitat needs and public boating access needs are accommodated in a manner that will work from an engineering perspective, but still satisfy the BCDC's standard that the fill be the minimum necessary to meet the project purposes.

***Public Access***

Policy 2. *Public access to some natural areas should be provided to permit study and enjoyment of these areas (e.g., by boardwalks to piers in or adjacent to some sloughs or marshes). However, some wildlife may be sensitive to human intrusion. For this reason, projects in such areas should be carefully evaluated in consultation with appropriate agencies to determine the appropriate location and type of access to be provided.*

Development of the MHEA is expected to increase the number of shorebirds and waterfowl in the area, which could be viewed by those using the new recreational facilities associated with the proposed Berths 55-58 project. The biological impact analysis (section 9.2.4) includes design constraints to avoid conflicts between public access and wildlife. The project would be consistent with this policy.

### 6.1.2 San Francisco Bay Area Seaport Plan

The *San Francisco Bay Area Seaport Plan* (BCDC and MTC 1996, as amended) is the product of a cooperative planning effort of the Metropolitan Transportation Commission (MTC) and the BCDC. The *Seaport Plan* constitutes the maritime element of MTC's *Regional Transportation Plan* and is incorporated into BCDC's *San Francisco Bay Plan*, where it is the basis of the *Bay Plan* port policies. The MTC uses the *Seaport Plan* to assist in making project funding decisions and managing the metropolitan transportation system, and BCDC uses the *Plan* to help guide its regulatory decisions on permit applications, consistency determinations, and related matters.

The *Seaport Plan* promotes the following five goals:

- Ensure the continuation of the San Francisco Bay port system as a major world port and contributor to the economic vitality of the San Francisco Bay region;
- Maintain or improve the environmental quality of San Francisco Bay and its environs;
- Provide for the efficient use of finite physical and fiscal resources consumed in developing and operating marine terminals through the year 2020;
- Provide for integrated and improved surface transportation facilities between San Francisco Bay ports and terminals and other regional transportation systems; and
- Reserve sufficient shoreline areas to accommodate future growth in maritime cargo, thereby minimizing the need for new Bay fill for port development.

The following policies are intended to achieve the goals set forth for the *Seaport Plan* and to reflect MTC's and BCDC's shared purpose to enhance economic activity while protecting the environment, making efficient use of all resources, and coordinating development.

Policy 1. *In order to foster economic activity, improvements should be made to the Bay Area port system to handle the forecast growth in waterborne cargo.*

The dredging project would be consistent with this policy.

Policy 2. *Proposed marine terminal development should be closely linked to projected regional need for new facilities based upon reasonable forecasts of waterborne cargo.*

The project would be essential to the Port's continued viability and would accommodate projected increases in the numbers and sizes of vessels expected to call. The project is consistent with this policy.

*Port Priority Use Areas*

Policy 2. *Within port priority use areas, non-port uses such as public access and commercial recreation development may be allowed provided that the use would not impair existing or future use of the area for port purposes.*

The project would be consistent with this policy. Under the proposed Berths 55-58 project, current military maritime uses along the shoreline of the FISCO property would be replaced by recreational uses. Development of this area has been coordinated with the

overall Vision 2000 Program and would not impair the efficient utilization of the Port area.

*Marine Terminals*

Policy 1. *Bay fill authorized for development of any marine terminal must be the minimum necessary to achieve a functional terminal at the site. Marine terminal development projects must meet the criteria for Bay fill projects specified in Section 66605(c) of the McAteer-Petris Act, which are (1) that public benefits of fill must exceed the public detriment from the loss of water area; (2) that there is no alternative upland location; (3) that the proposed fill is the minimum necessary to achieve the purpose of the fill; (4) that the nature, location, and extent of any fill must minimize harmful effects to the Bay Area, such as reduction or impairment of the volume surface area or circulation of water, water quality, fertility of marshes or fish and wildlife resources; (5) that the fill be constructed in accordance with sound safety standards; (6) that fill should establish a permanent shoreline; and (7) that the project applicant has valid title to the properties in question.*

The fill that would be required for New Berth 21 already has been accounted for in the *Seaport Plan;* the Port, however, currently does not have title to this entire site, which is partially owned by the Army.

Policy 2. *Future marine terminals should be developed for the type of cargo specified in Part II of this Plan at each port and port priority use area . . .*

The development of a container terminal at Berth 21 would be consistent with Part II of the Plan.

Policy 4. *New marine terminals requiring large volumes of Bay fill should only be developed when all existing terminals are operating at maximum feasible capacity and should involve the least possible amount of Bay fill.*

The new terminal at Berth 21 would be required in order to meet the projected increase in vessel calls, and is specifically designated by the *Seaport Plan* as a future marine terminal site that will need fill. The least possible amount of Bay fill would be used to bring the new terminal into alignment with the Outer Harbor channel; therefore, the project is consistent with this policy.

*Dredging and Navigation*

Policy 1. *Deepening or widening of San Francisco Bay channels, including the San Francisco Bar Channel, should proceed only if economically justified or if needed for national defense, and if such deepening or widening accomplishes the objectives of the Seaport Plan and conforms to state and national environmental law and policies. The interior channels of San Francisco Bay should not be deeper than the San Francisco Bar Channel.*

The project would be essential to the Port's continued viability and would accommodate projected increases in the numbers and sizes of vessels expected to call. It would accomplish the objectives of the *Seaport Plan,* which include ensuring the continuation of the San Francisco Bay port system as a major world port and contributor to the economic vitality of the San Francisco Bay region. The project would conform with state and national environmental laws and policies. Thus, the project would be consistent with this policy.

Policy 2. *Ship channels should be deepened and widened to accommodate larger ships with greater cargo capacity that will call on Bay Area container terminals if economically justified or if needed for national defense, and if such deepening or widening conforms to state and national environmental laws and policies.*

The project would be essential to the Port's continued viability and would accommodate projected increases in the numbers and sizes of vessels expected to call. The project would conform with state and national environmental laws and policies. Thus, the project would be consistent with this policy.

Policy 3. *Ship channels, turning basins, and berths should be maintained to the depths and widths necessary to safely accommodate the kinds of ships docking at the Bay Area marine terminals if economically justified or if needed for national defense, and if such deepening or widening conforms to state and national environmental laws and policies.*

The project would be essential to the Port's continued viability and would safely accommodate projected increases in the numbers and sizes of vessels expected to call. The project would conform with State and national environmental laws and policies. Thus, the project would be consistent with this policy.

*Port of Oakland*

Policy 1. *By the year 2020, the Port of Oakland should have the following annual cargo throughput capabilities:* (Note: Table 13 of the Seaport Plan, as amended September 18, 1997, indicates that the Port of Oakland is expected to have a total throughput of 22,260,000 metric tons; total container cargo throughput would be further increased approximately 1,765,000 metric tons by locating port and related industrial uses on approximately 100 acres at the Oakland Army Base east of Maritime Street.)

The proposed dredging project would be essential to meeting this goal. Thus, the project is consistent with this policy.

### 6.1.3 The San Francisco Bay Trail Plan

This plan was approved in 1990. It proposes development of a regional hiking and bicycling trail around the perimeter of San Francisco and San Pablo bays. The Plan was prepared by the Association of Bay Area Governments pursuant to Senate Bill 100, which mandated that the Bay Trail:

- Provide connections to existing park and recreation facilities,
- Create links to existing and proposed transportation facilities, and
- Be planned in such a way as to avoid adverse effects on environmentally sensitive areas.

Existing Bay Trail paths are located on 7th Street and Middle Harbor Road near Port View Park and Middle Harbor Park, respectively. Proposed Bay Trail alignments in the Port area are on Maritime Street, Burma Road, and 7th Street Extension. The proposed project would not interfere with existing trails or the development of future trails in the project area.

## 6.2 LOCAL PLANS AND POLICIES

### 6.2.1 Oakland Comprehensive Policy Plan

The City of Oakland Comprehensive Plan serves as the City's General Plan. This plan consists of the Oakland Policy Plan and several supporting documents that identify goals, policies, and actions the City of Oakland should adopt to enhance the physical, social, and economic stature of the city. Each supporting report addresses an "Element," or specific subject matter. The Policy Plan was adopted in 1972 and most recently amended in 1991; the Open Space, Conservation and Recreation Element (OSCAR) was adopted in 1997 (City of Oakland 1996c); and an Updated Land Use and Transportation Element was adopted in March 1998. The MHEA project shares the planning goals of the Oakland General Plan, including specific references and language in the Elements.

***Land Use***

*Land Use and Transportation Element of the Oakland General Plan (March 1998)*

The new Land Use and Transportation Element of the Oakland General Plan is intended to be the blueprint for growth and development in the City of Oakland to the year 2015. The policies identified below include revisions recommended by the General Plan Congress, the Oakland Planning Commission, and the Oakland City Council. The Land Use Diagram of the Plan designates the area along the Inner and Outer Harbor channels as General Industrial/ Transportation, with the exception of the area that borders the Middle Harbor in the area of the FISCO berths and immediately to the west, which is designated as Park and Urban Open Space. The project is consistent with these policies.

***Industry and Commerce Policies***

*Policy I/C.1.2 Retaining Existing Business*

*Existing businesses and jobs within Oakland which are consistent with the long-range objectives of this Plan should, whenever possible, be retained.*

The proposed dredging project would allow the new deep-draft vessels to enter the Port. If dredging is implemented, existing jobs would be retained, and new jobs would be created (see Table 5.6-1). Thus, the project would be consistent with this policy.

*Policy I/C1.10 Coordinating City and Port Economic Development Plans*

*The City and Port should mutually develop and implement a coordinated plan-of-action to support all airport and port related activities which expand the local or regional employment or revenue base.*

The Port has coordinated the proposed project and related projects with the City, consistent with this policy.

*Policy I/C5.2 Planning for the Fleet Industrial Supply Center*

*The reuse of the waterfront portions of the Fleet Industrial Supply Center should emphasize maritime, rail, and open space related activities.*

Development of the MHEA and use of dredged material at the Vision 2000 Upland site, which would occur under all alternatives, would be consistent with this policy.

***Waterfront Policies***

*Seaport and Airport Policies*

*Policy W6.1 Maintaining a Competitive Edge*

*In order to maintain international stature and competitiveness, the Port should continue to develop, expand, or otherwise modernize facilities and/or support infrastructure to enhance its overall efficiency and capabilities to handle increasing amounts of cargo and passengers. Examples include:*

- *Outer harbor terminals expansion and modernization*
- *Channel deepening as necessary...*

The proposed project is consistent with and would implement this policy.

***Parks and Recreation***

*Project Location*

Policy 3. *Public and commercial recreational uses should be located at many different places along Oakland's waterfront, although these locations should be compatible with the reasonable needs of shipping, navigation, commerce, and industry.*

The Vision 2000 EIS/EIR (U.S. Navy and Port of Oakland 1997b) provides a programmatic overview of planned uses in the Middle Harbor area. The design will include community input.

***Open Space and Natural Resources***

*Water Resources*

Policy 5. *Bay fill should be undertaken only upon clear and convincing evidence that its benefits will outweigh its resulting environmental and other costs.*

Filling of the Bay would be required under the MHEA and New Berth 21 disposal/reuse alternatives. The MHEA would have a substantial benefit in that it would provide valuable shallow-water habitat. The New Berth 21 would facilitate the economic growth of the Port, which would have wide-spread benefits to the Oakland area. Thus, the project is consistent with this policy.

Policy 9. *Harbor and ship channel dredging should be conducted so that spoils are removed in a manner and to an area in conformance with Federal and State requirements.*

The project would be consistent with this policy. Dredged material would be removed and disposed of in a manner that conforms with federal and state requirements.

*Plant and Animal Resources*

Policy 1. *Efforts should be made to perpetuate the full range of plant types and plant communities, and therefore also wildlife variety, found in Oakland.*

The project would have short-term adverse impacts on biological resources, but these could be mitigated to less than significant levels. The MHEA would have a long-term beneficial impact on biological resources; therefore, the project is consistent with this policy.

Policy 2. *Special attention should be given to the protection of rare and endangered species.*

Impacts to special-status species have been considered in this document. Dredging could impact eelgrass, but these impacts would be mitigable to a less than significant level. Disposal at NAS Alameda also could eliminate burrowing owl nests, if they were present at the time, but this impact, too, could be mitigated. The project would be consistent with this policy.

### 6.2.2 Open Space, Conservation, and Recreation Element

This element was adopted in 1996.

*Policy OS-3.2 Military Base Open Space*

*Support provisions for park and open space areas in plans for military base reuse.*

*Policy OS-7.1 Promotion of Beneficial Waterfront Uses*

*Require land uses along the shoreline which promote the beneficial uses of the Estuary and Bay waters, including a balanced mix of commercial shipping facilities; water-dependent industry, commerce, and transportation; recreation; water-oriented services and housing; and resource conservation.*

*Policy OS-7.2 Dedication of Shoreline Public Access*

*Support the BCDC requirements which mandate that all new shoreline development designate the water's edge as publicly accessible open space where safety and security are not compromised, and where access can be achieved without interfering with waterfront industrial and maritime uses. Where such conflicts or hazards would result, support the provision of off-site access improvements in lieu of on-site improvements. In such cases, the extent of off-site improvements should be related to the scale of the development being proposed.*

*Policy OS-7.3 Waterfront Appreciation*

*Promote a greater appreciation of the Oakland waterfront by preserving and enhancing waterfront views, promoting its educational value, and exploring new and creative ways to provide public access to the shoreline without interfering with transportation and shipping operations or endangering public safety.*

*Policy OS-7.4 Waterfront Park Enhancement*

> *Expand and enhance the City's waterfront park areas. Signage and access provisions to existing waterfront parks should be improved. Opportunities for new shoreline parks as depicted in Figure 7 (Shoreline Access) should be pursued as redevelopment along the waterfront occurs. A variety of park environments should be created, including active recreation areas, fishing piers and boating facilities, natural areas, and small "pocket parks" with landscaping and benches, all linked by linear parks or pedestrian paths emphasizing shoreline views and access.*

Development of the MHEA, which is common to all alternatives, would be consistent with these policies since it would be consistent with the development of a recreational area along the shoreline at the former FISCO site.

*Policy CO-5.3 Control of Urban Runoff*

> *Employ a broad range of strategies, compatible with the Alameda Countywide Clean Water Program, to (a) reduce water pollution associated with stormwater runoff; (b) reduce water pollution associated with hazardous spills, runoff from hazardous material areas, improper disposal of household hazardous wastes, illicit dumping, and marina "live-aboards;" and (c) improve water quality in Lake Merritt to enhance the lake's aesthetic, recreational, and ecological functions.*

ACTION CO-5.3.5 MITIGATION OF ROAD CONSTRUCTION AND DREDGING IMPACTS

> *Continue to use the environmental review process to ensure that future road construction and dredging projects incorporate measures to protect water quality in potentially impacted lakes, creeks, wetlands, and nearshore waters. Consider developing standard mitigation measures for future road improvement and dredging projects in collaboration with Caltrans and the Port.*

A number of significant impacts associated with surface water quality and stormwater were identified in the EIS/R, including the following: impacts to surface water could result from dredging materials in the Inner Harbor area that exceed water quality criteria; at the Vision 2000 Upland site, potentially contaminated water from the rehandling facility that exceeds water quality standards could be discharged to the Bay; rebuilding a new stormwater system, which would be necessary at the Vision 2000 Upland site, could direct stormwater into the MHEA; contaminated dredged material could be spilled accidentally from the clamshell bucket during transfer to the Vision 2000 Upland site; and TSS concentrations could exceed TSS thresholds during disposal at the New Berth 21 site. All of these impacts would be mitigated to less than significant levels; thus, the proposed project is consistent with the above policy and action.

*Policy CO-6.6 Restriction of Bay Fill*

> *Prohibit bay fill unless there is compelling evidence that its benefits will outweigh the environmental and other costs. In such instances, support compliance with the mitigation requirements of the Bay Conservation and Development Commission and other regulatory agencies.*

Both the MHEA and New Berth 21 disposal options would require Bay fill. The latter site is already designated as a marine terminal in the *Seaport Plan* and the need for fill is acknowledged. Use of this site would be consistent with this policy.

The MHEA option would result in short-term adverse but insignificant effects on fish in the Middle Harbor area. Over the long term, the impact would be beneficial as fish species in the

Middle Harbor would be expected to be more diverse and more abundant. Following disposal activities, approximately 190 acres of shallow-water habitat would be created. The newly created habitat would be a more biologically productive habitat, similar to the shallow intertidal shoal area. As with the shoal, the fish expected to re-establish in the area would be greater in number than currently existing in the Middle Harbor.

Approximately 3 acres of hard-bottom habitat currently exists in the Middle Harbor. Under the proposed MHEA, hard-bottom habitat would be expanded to between 4 and 8 acres, with the principal expansion of this substrate being associated with the construction of the jetty that would protect the site. Additional habitat is associated with scattered fish enhancement structures. These enhancement structures would attract new fish to the area.

If the construction phase of the MHEA occurred in years in which the herring would ordinarily have used the Oakland waterfront for spawning, then the use of Middle Harbor for this purpose would be lost in those years. However, the addition of the breakwater as well as the eelgrass bed offer much improved spawning habitat in the future. Thus if this short-term impact occurred, it will be adequately mitigated in the long run. If it does not occur (i.e., herring do not choose the Oakland waterfront for spawning during the construction years), then all MHEA improvements represent a net potential benefit (positive impact) to this species.

The MHEA would create additional roosting habitat for aquatic birds and foraging habitat for shorebirds and waterfowl, a long-term beneficial impact. Four small roosting islands and a section of the U.P. Mole have been designed to provide continued and improved bird habitat within the Middle Harbor. These areas have been designed to reduce the potential threat of mammalian predators and use avoidance due to human disturbance. The islands would be a maximum of 5,000 square feet each. In addition, the eastern jetty would be designed to have a flat surface crest just below the mean-high-tide elevation with an additional layer of large boulders placed individually and discontinuously along the jetty crest. The string of larger rocks would provide roosting habitat for water birds. The new beach area would also provide storm refuge to Bay waterfowl and shorebirds and low-tide foraging habitat for more tolerant shorebird species. A small marsh totaling 3 to 5 acres would be created in the southeastern corner of the site. The marsh would promote wildlife diversity in the area and provide foraging opportunities for the birds.

Although there would be adverse impacts during disposal activities, the MHEA would eventually result in habitats that are more highly productive than existing habitats. Therefore, through designed enhancements, the MHEA would result in a net increase in habitat values. This net increase in habitat values is expected to offset any habitat losses incurred and to more than offset any potential impacts to foraging success experienced by special-status species during construction of the enhancement area.

Some or all of the eelgrass bed at the western margin of the U.P. Mole is likely to be removed during proposed dredging activities as a result of the proposed widening of the Inner Harbor channel. The removal of some or all of this eelgrass bed is expected to reduce the overall productivity and biodiversity of the aquatic environment that comprises the proposed dredge area; this constitutes a significant long-term mitigable impact. Remaining portions of the bed (if any) may be impacted by increased turbidity, sedimentation, and resuspended contaminants from proposed dredging operations.

The shallow water habitats have been designed to enhance habitat for least tern prey species which may improve foraging opportunities for this endangered species (Entrix 1997b). Tidal flow through the new jetty opening would be similar to tidal flows near the breakwater on the south side of Alameda Island where it has been found that least terns forage frequently and preferentially. Therefore, similar benefits could occur in this area.

The biological benefits are considered to outweigh the environmental impacts of the development, and the Port has coordinated closely with BCDC and other regulatory agencies in developing this alternative. Thus, it is considered consistent with this policy.

Policy CO-12.6 *Control of Dust Emissions*

*Require construction, demolition and grading practices which minimize dust emissions.*

Implementation of the BAAQMD measures to control dust emissions, as identified in section 5.1, would make the proposed project consistent with this policy.

### 6.2.3 City of Alameda General Plan

The *General Plan* supports maintaining the bulk cargo seaport capacity at Alameda Gateway consistent with the *Seaport Plan* (refer to Policy 2.8.b, Guiding Policies: Business Parks and Industrial Areas). However, upon the City of Alameda's request, the *Seaport Plan* has been amended and no longer designates Alameda Gateway for port priority use. Therefore, consistency with this policy is not addressed below.

### 6.2.4 Plans Related to the Montezuma Wetlands Restoration

Consistency of the project with the plans and policies that affect the Montezuma Wetlands site is based on the Draft EIR/S for the Montezuma Wetlands Project (MWP) (COE and Solano County 1994). If this disposal site is selected, it is assumed that appropriate plan and policy amendments will be in place through the environmental review and permit process prior to its use for Oakland Harbor sediment. If dredged material from the Oakland Harbor project were to be disposed at this facility, it would be consistent with the facility's permitted use.

Local land use and policy regulations that apply to the Montezuma site include those found in the Solano County General Plan, the Collinsville-Montezuma Hills Area Plan, the Solano County Zoning Ordinance and, implemented by the BCDC, the Suisun Marsh Protection Plan. The General Plan designates the western part of the site as *marsh* and the eastern portion for *water-dependent industry*. The Solano County General Plan has policies applicable to the site that provide for marsh and wetlands protection, cultural resource protection, wildlife habitat preservation, and provision of public access.

The two zoning designations that apply to the Montezuma site are Water-Dependent Industrial (I-WD) and Marsh Preservation Zone (MP). These County zoning districts correspond with the General Plan designations. The eastern and southern shoreline of the site, as well as inland areas, are zoned I-WD. Use of dredged materials for wetland enhancement is not addressed for this zoning designation. The western portion of the site is zoned MP. Uses allowed include management of wetlands and growing of plants for wildlife habitat. Although the zoning mentions enhancement of wetlands, it does not include the placement of fill or dredged materials to restore wetlands as an allowable or conditional use.

As part of the MWP, amendments have been proposed to land use and policy regulations that apply to the Montezuma site including those found in the Solano County General Plan, the Collinsville-Montezuma Hills Area Plan, the Solano County Zoning Ordinance, the Local Protection Plan, and the BCDC's Suisun Marsh Protection Plan. Generally, these amendments would allow for marsh restoration projects using dredged materials, as long as adverse environmental impacts are not caused by the MWP. Generally, these amendments would allow more flexibility for construction of the MWP, and would allow for the placement of dredged materials on the site as long as activities do not adversely affect wildlife habitats or industrial or port activity.

The proposed off-loading and dredged materials disposal facilities for the MWP are generally in conformance with Solano County and BCDC's plans and policies regarding construction of industrial facilities in water-dependent industrial areas. These facilities would be water-dependent and industrial in use and character. However, the placement of dredged materials to restore wetlands in areas designated as *marsh* and *water-dependent industry* is not provided for in current policies.

### 6.2.5 Plans Related to the Hamilton Wetlands Restoration

The Hamilton restoration site is within the City of Novato, but controlled by the federal and State government. If the site is eventually sold to a private land owner, the property would be subject to regulations established by the City.

*City of Novato General Plan*

The City of Novato recently updated its General Plan. The General Plan Steering Committee and the Planning Commission's recommended land use designations for the airfield parcel are Bayfront Wetlands and Open Space. The proposed use of the airfield for wetland restoration would be consistent with this land use designation.

*City of Novato Zoning Ordinance*

The City of Novato's current zoning classification for the airfield is planned community (PC) district. The PC district allows a variety of land uses including wetland restoration, subject to approval of a master plan and precise development plan.

*County of Marin*

The City of Novato, which includes the Hamilton site, is located within the County of Marin. The County's jurisdictional authority over the site is superseded by the authority of the federal government. If the Hamilton site is eventually purchased by a private individual or group, it would fall under the authority of the City of Novato, with the county having an advisory role in development of the property.

*San Francisco Bay Conservation and Development Commission*

The San Francisco Bay Plan Map Number 12 designates the airfield and antenna field as a wildlife priority use area and notes that a "comprehensive wetlands habitat plan and long-term management program for restoring and enhancing wetlands habitat in diked former tidal wetlands" should be developed for the site. Further, the Map notes: "Dredged materials should be used whenever feasible and environmentally acceptable to facilitate wetlands restoration." Depending upon the design of the restoration project, other policies that could apply include, but

are not limited to, those related to Bay fill activities as well as activities in the 100-foot shoreline band, and those regarding appearance, design, and scenic views.

The Long Term Management Strategy (LTMS) for dredging began in January 1990 as a federal/state partnership between the four primary agencies with regulatory authority over dredging activities in the Bay and with the close coordination of a variety of interested parties from the public and private sectors. The LTMS has indicated that beneficial reuse of dredged material for projects such as wetland restoration will be the major direction and policy in the region.

The San Francisco Estuary Project (SFEP) was developed to "promote effective management of the San Francisco Bay-Delta Estuary and to restore and maintain its water quality and natural resources." The SFEP's efforts focused on dredging management issues and identified specific objectives needing attention, including the reuse of dredged material for projects such as wetland creation. Under the aegis of the SFEP, the Comprehensive Conservation and Management Plan (CCMP) for the Estuary was created which included recommendations for addressing the problems facing the Estuary, including those related to dredging activities. Information and recommendations obtained through the SFEP were used in developing the LTMS and in preparing the LTMS EIS/R. The restoration of the Hamilton site using dredged material would be consistent with the recommendations of the CCMP.

*Regional Airport System Plan*

The Regional Airport System Plan (RASP), a component of the San Francisco Metropolitan Transportation Commission (MTC)'s long-range Regional Transportation Plan (RTP) recommended deletion of the airport facility as a regional general reliever airport and redesignation as a wetlands restoration site. The RTP determined that the Hamilton airport was no longer needed.

*California State Lands Commission*

The California State Lands Commission has jurisdiction over sovereign tidelands and submerged lands, and the beds of navigable lakes and streams that the State owns in a trustee capacity. The State made a claim to approximately 1,200 acres of the Hamilton Air Base, claiming it to be tidelands. In 1981, a settlement granted the State Lands Commission title to approximately 400 acres of shoreline property, which includes the antenna field and tidal lands east of the airfield accounting for approximately 87 acres (Turner, Collie & Braden, Inc. 1984).

### 6.2.6 Navy Installation Restoration Program (IRP) and Remedial Investigation/Feasibility Study Schedule for FISCO

The Navy is implementing a program to restore contaminated sites on FISCO through the IRP. The Remedial Investigation/Feasibility Study (RI/FS) and Record of Decision (ROD) is expected to be completed in December 1998. This will allow the Port to develop many portions of FISCO without restriction, as planned through the Vision 2000 program. Remedial actions on specific contaminated sites may proceed or be expedited through Port construction activities. Currently, remediation is expected to continue through 2006.

## 6.3 CONSISTENCY WITH PLANS THAT HAVE NOT YET BEEN ADOPTED

The following is provided for informational purposes only.

### 6.3.1 Long-Term Management Strategy

BCDC is cooperating with EPA, the San Francisco RWQCB, and the Corps on a long-term management strategy (LTMS) for dredged material disposal options. When completed, the LTMS is expected to provide the basis for uniform federal and state dredged material disposal policies and regulations. The goals of the LTMS are to conduct necessary dredging and dredged material disposal in an environmentally sound and economically prudent manner, to maximize the beneficial reuse of dredged material, and to develop a coordinated permit review process for dredging processes.

Impacts of the dredging project would be mitigated to the extent feasible through the implementation of measures identified in this EIS/R/FS. Dredging would also be conducted in an economically prudent manner. Thus, dredging itself is consistent with the goals of the LTMS. Use of the Vision 2000 Upland Area would be considered a beneficial reuse of the dredged material, and therefore consistent with the LTMS, since it would be used to create new berth areas on top of already deposited fastland. The development of New Berth 21 would reuse dredged material in the creation of a new berth, but since this option would require new filling of the Bay, it may not be considered a beneficial reuse. Development of the MHEA would be a beneficial reuse of dredged material, although it, too, would require filling of the Bay. Deposition of dredged material at NAS Alameda would be considered a beneficial reuse, since the material would be used for construction. Use of SF-DODS is considered a viable option in the LTMS and therefore would be consistent with this plan. Use of the dredged material for wetlands restoration at the Montezuma Wetlands and Hamilton Wetlands sites would be considered a beneficial reuse of this material that would be consistent with the LTMS. Since the landfills would be used only for material that is unsuitable for other methods of disposal, their use would be consistent with the LTMS.

### 6.3.2 Proposed Bay Plan Amendment

The BCDC has initiated a proposal to amend the BCDC San Francisco Bay Plan fish and wildlife findings and policies to provide the policy guidance for permitting Bay fill for a wildlife refuge. If adopted by the Commission, the Plan would be modified to add policies allowing placement of fill, including dredged material, to restore or improve habitat for fish and wildlife. New fish and wildlife policies that will be considered by the Commission in May 1998 and voted upon in June 1998 include:

***Fish and Wildlife***

Policy 3. *Some fill should be approved for a wildlife refuge to restore or improve fish and wildlife habitat if all the following conditions are met:*

*a. The wildlife refuge will be permanently preserved and managed for the benefit of fish and wildlife by an agency or organization with fish and wildlife management expertise;*

The Port of Oakland is willing to dedicate the MHEA in perpetuity for fish and wildlife refuge purposes and to have the site managed on a long-term basis by an organization

with fish and wildlife management expertise. Therefore, the project would be consistent with this policy. The Port has made a similar, although not identical, commitment for a 70-acre wetland mitigation site at the Port's Distribution Center, and has a long-term agreement with the East Bay Regional Park District to manage that land as a permanent wetlands.

b. *No feasible alternative measures or sites that would have less impact on Bay natural resources are available to provide the habitat improvement benefits of the proposed project;*

The MHEA will restore a degraded environment (deep-dredged harbor and berths) to a condition similar to its historic Bay depth and environmental characteristics. By replacing it with a shallow water habitat with salt marsh, eelgrass beds, and other subtidal features, the Port will provide added fish nursery areas to the Bay and enhance bird foraging areas in the East Bay. Therefore, the project would be consistent with this policy. It would not be feasible to provide these habitat benefits by excavating a site elsewhere within the Central Bay. Excavation of 190 acres would represent a land value of at least $41 million (at $5 per square foot) and a construction cost of at least $32 million (at $5 per cubic yard) to excavate filled land down to a similar depth.

The habitat improvement benefits are especially important in light of the U.S. Fish and Wildlife Service's proposed 900-acre National Wildlife Refuge (525 acres of land and 375 acres of open water) at the former Alameda Naval Air Station, which is across the Estuary from the MHEA. The proposed Alameda refuge is home to nesting California least terns in the spring and summer, a large colony of endangered California brown pelicans in the summer and fall, the second largest western gull colony in central and northern California, the largest Caspian tern nesting colony on the Pacific coast, and nesting ducks, geese, shorebirds, and other waterbirds.

The 50-foot project would complement the goals of the Fish and Wildlife Service by providing feeding habitat, both directly and indirectly, for birds at the refuge. The subtidal habitat would provide a greater variety of organisms for the aquatic food chain than a deeper habitat because it would support a more diverse benthic (bottom and sand-dwelling) community. It would provide a spawning substrate for the last San Francisco Bay commercial fishery (Pacific herring), a nursery habitat, more diverse fish assemblage, and bird roosting sites in the salt marsh and mudflat areas of the project.

c. *Either:*

(1) *The project is limited to a small pilot project which will likely be successful, based on competent scientific study, or*

(2) *The success of similar projects has been shown in similar environmental settings;*

Projects similar to the MHEA have proven successful in similar environmental settings including southern California, Puget Sound, the Chesapeake Bay, and other harbors, ports and bays in the western U.S. and Canada. The master response on Habitat Issues (Appendix X) includes a list of such projects, with descriptions, monitoring results and other project characteristics. Therefore, the project would be consistent with this policy. The project sponsors will rigorously examine the restoration objectives and monitoring for previous projects to determine whether they provide sufficient information, or

whether additional monitoring and/or pilot projects are essential. In addition, the hydraulic characteristics of a pilot MHEA project would not be similar to the full-scale project, and construction of a second phase could destroy the previous phase.

d. *The necessity for, location, kind and amount of fill have been determined by competent environmental studies and are consistent with the advice of the California Department of Fish and Game, U.S. Fish and Wildlife Service and the National Marine Fisheries Service;*

The Port of Oakland hired nationally-recognized consultants to scope and evaluate the MHEA proposal, as well as to evaluate the existing habitat. Major reports on the MHEA are: Entrix, Inc. *Habitat Evaluation for Oakland's Harbor Navigation Improvement (-50') Project* (December 17, 1997); Hartman Consulting Corp., *Hydrodynamic Modeling* Report *for Middle Harbor Habitat Creation* (November 12, 1997 Draft); and Merkel & Associates, -*50' Harbor Deepening Project, Middle Harbor Dredged Material Re-use: Conceptual Habitat Design Plan* (October 1997). Each report was prepared in association with the other consultants and with Uribe & Associates and Laurel Marcus & Associates.

To assist in designing the Middle Harbor Enhancement Area, the Port of Oakland invited representatives of local, state, and national resource and regulatory agencies: environmental groups; and the nearby West Oakland community to participate on a Technical Advisory Committee. Invited participants included the state of California Department of Fish and Game, U. S. Fish and Wildlife Service, and the National Marine Fisheries Service, as well as the San Francisco Bay Conservation and Development Commission, East Bay Regional Park District, Golden Gate Audubon Society, San Francisco Regional Water Quality Control Board, Save San Francisco Bay Association, Sierra Club, and a West Oakland community representative. All invitees were kept informed by mail of meetings and issues. The project would be consistent with this policy.

e. *The project has been carefully planned and measurable objectives and controls have been established that will ensure the success and permanence of the project; and*

The Port of Oakland hired nationally-recognized consultants to scope and evaluate the MHEA proposal, as well as to evaluate the existing habitat. Major reports on the MHEA are: Entrix, Inc. *Habitat Evaluation for Oakland's Harbor Navigation Improvement (-50') Project* (December 17, 1997); Hartman Consulting Corp., *Hydrodynamic Modeling Report for Middle Harbor Habitat Creation* (November 12, 1997 Draft); and Merkel & Associates, -*50' Harbor Deepening Project, Middle Harbor Dredged Material Re-use: Conceptual Habitat Design Plan* (October 1997). Each report was prepared in association with the other consultants and with Uribe & Associates and Laurel Marcus & Associates. The monitoring plan will be developed with the advice of the Technical Advisory Committee and resource and regulatory agencies, including BCDC. The project sponsors will examine their existing design effort to determine if alternatives were analyzed in sufficient detail, or whether further work on alternatives or establishing habitat restoration objectives is necessary. Therefore, the project would be consistent with this policy.

f. *The project will not adversely affect water quality, will contain only material that is suitable for aquatic disposal, and will result in no net loss of Bay surface area or volume.*

The MHEA project is designed to ensure optimal water circulation to the diverse shallow water habitats in the MHEA. The policies and advice of the EPA, the state of California Water Resources Control Board, and the San Francisco Bay Regional Water Quality Control Board are guiding the Port of Oakland in determining dredged material quality and placement. The last two are the same agencies whose policies, advice, and authority are the primary basis for BCDC in carrying out its water quality responsibilities, according to Section 66646.1 of the McAteer-Petris Act. The project will remove approximately 12.8 million cubic yards of material from the Bay, and place only about 7 million cubic yards back, so it will increase the volume of the Bay. Only minor amounts of fill extend above the surface of the water, and that fill is included to provide a habitat deemed essential by the U. S. Fish and Wildlife Service. Therefore, the project would be consistent with this policy.

Policy 4. *If after a reasonable period of monitoring, either (a) the fill project has not met its goals and measurable objectives, and attempts at remediation have proven unsuccessful, or (b) the fill is found to have substantial adverse impacts on the natural resources of the Bay, the fill should be removed and the site returned to the conditions existing immediately preceding placement of the fill, unless it is demonstrated by competent environmental studies that removing the fill would have a greater adverse effect on the Bay than allowing it to remain.*

The Port of Oakland is willing to dedicate the MHEA in perpetuity for fish and wildlife refuge purposes and to have the site managed on a long-term basis by an organization with fish and wildlife management expertise. The monitoring plan will be developed with the advice of the Technical Advisory Committee and resource and regulatory agencies, including BCDC.

Policy 5. *In general, fill to restore or improve fish and wildlife habitat should be limited to those parts of the Bay where habitat has been degraded. Fill should not be placed in areas with existing high natural resource values, unless the fill is needed to protect the resource values.*

The MHEA will restore a degraded environment, Middle Harbor, to a condition similar to its historic Bay depth and environmental characteristics. Until World War II, Middle Harbor ranged from about 6 to 12 feet in depth. Since then, however, the harbor was periodically dredged to accommodate Navy vessels, until the recent closure of FISCO. By replacing it with a shallow water habitat with salt marsh, eelgrass beds, and other subtidal features, the Port will provide added fish nursery areas to increase diversity of fish assemblage in the Bay and enhance bird foraging areas in the East Bay. Therefore, the project would be consistent with this policy.

Policy 6. *To maximize the beneficial use of dredged material, projects to restore or improve fish and wildlife habitat should use fill material dredged from the Bay wherever feasible, unless other material would provide better habitat or improve the likelihood that the project will meet its goals and measurable objectives.*

The Port will use dredged material to create the subtidal habitat at the MHEA. Non-dredged material will be used for the partially submerged jetty and for the fish enhancement structures since dredged material is less suitable for those purposes. Therefore, the project would be consistent with this policy.

### 6.3.3 NAS Alameda Community Reuse Plan

The Community Reuse Plan is a legal document necessary to meet the federal requirements for base reuse and transfer of property to the Alameda Reuse & Redevelopment Authority (ARRA), federal agencies, and Public Benefit recipients. The plan outlines the community's intentions for reuse and redevelopment of NAS Alameda. This plan has been adopted by the ARRA, but it is not a City General Plan, nor a zoning map for NAS Alameda and the Fleet Industrial Supply Center (FISC) sites. Land use regulatory authority rests with the City of Alameda, and changes or amendments will be required to the City of Alameda General Plan, Zoning Ordinance, and other plans and regulations to enact the plans and policies documented in this plan.

The plan identifies a number of planning subareas, two of which would be directly affected by the proposed project: the North Waterfront subarea includes a portion of the Inner Harbor turning basin, and the Northwest Territories subarea includes the proposed NAS Alameda reuse/disposal site.

*North Waterfront Area*

This area largely corresponds with the boundary of the FISC Annex. The northern portion of the area, which is adjacent to the waterfront, is planned as a mixed use neighborhood with an office park/research and development and housing emphasis. Shoreline activity may include water-oriented commercial uses such as retail development, restaurants, and other supporting uses, including an Oakland-Alameda water taxi/ferry service. Housing uses would be encouraged. Existing pier space may be leased for larger vessels and recreational uses. Expanding the Inner Harbor turning basin would require removal of the piers that adjoin this area as well as the taking of a small portion of land within the subarea and a portion of a wharf. The amount of land that would be needed is small in comparison to the overall amount of land available in the area. The removal of a portion of a wharf included in the Reuse Plan area for construction of the turning basin would not specifically be consistent with the concept of leasing existing space for larger vessels and recreational uses, but wharf space will remain in the Reuse Plan area after construction of the turning basin so the project would generally be consistent with this concept. The removal of the land and a portion of a wharf in this area for the turning basin would not affect other adjacent uses proposed as part of the Reuse Plan.

*Northwest Territories*

This subarea is located at the northwestern tip of Alameda Island and is proposed for mixed use development. A portion of the northern edge of the existing airfield is designated for development as an international commerce and trade zone, including light industrial/research and development and warehouse uses. This area may include a site for the Alameda Science & Technology Center. The remainder of the Northwest Territories would be devoted to recreation and open space uses. Recreational uses would include the Bay Trail and shoreline park and the Point Alameda regional park at the far northwestern end of the island. This area could be used as a possible reuse/disposal site for a small amount of dredged material. Once the material were dry and leveled, the site could be developed as planned. Use of the NAS Alameda reuse/disposal site would be consistent with the Reuse Plan.

The Reuse Plan also contains policies (City Design Element/Urban Design Framework Regional Transportation Policy 3-5 and 3-6) that refer to expanding ferry service to NAS Alameda and moving the existing ferry terminal (which is directly west of the Inner Harbor turning basin) to the northern end of the Civic Core, which is further west. The proposed project would not preclude this action.

# 7.0 ENVIRONMENTAL JUSTICE

Although the Environmental Justice "movement" began in the 1970s, federal agencies have only recently been mandated to respond to these concerns. The Port of Oakland and U.S. Army Corps of Engineers, along with countless other agencies that receive federal funds, are also endeavoring to fully comprehend and address issues of environmental justice. Environmental Justice has been defined by a variety of organizations interested in the topic. The U.S. EPA's Office of Environmental Justice (1996a) offers the following definition:

> "The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people, including racial, ethnic, or socioeconomic group should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations of the execution of federal, state, local, and tribal programs and policies."

The goal of this 'fair treatment' is not to shift risks among populations, but to identify potential disproportionately high and adverse effects and identify alternatives that may mitigate these impacts. The Port of Oakland began investigating potential environmental justice impacts associated with its expansion plans in its FISCO/Vision 2000 Disposal and Reuse Final EIS/R (U.S. Navy and Port of Oakland 1997b). Dialogue, data gathering, and public involvement regarding environmental justice issues and overall quality of life concerns will be an ongoing and evolutionary process throughout the 50-foot project as well as with other Vision 2000 projects. The Port is committed to working with the surrounding community, regional interests, and regulatory agencies to mitigate environmental impacts whenever feasible.

## 7.1 REGULATORY SETTING

Since the 1970s, there has been growing public concern and evidence that low-income and minority communities often suffer disproportionately from exposure to unhealthy environmental conditions. Excessive exposure to lead, hazardous materials in the workplace, noise and air pollution, and the frequent location of industry and infrastructure developments in these communities are key concerns for the environmental justice movement. In response, President Clinton issued a special Executive Order in 1994 to raise awareness and bring environmental justice issues into public policy debate.

> The President's Executive Order 12898 requires that, "to the greatest extent practicable....each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies and activities on minority populations and low-income populations."

Furthermore, the order reiterates that federal agencies must analyze the environmental effects, including human health, economic, and social effects, of its actions. This includes their effects on minority and low-income communities, when such analysis is required by the National Environmental Policy Act (NEPA). The U.S. Army Corps of Engineers is the federal lead agency

on this project under NEPA and is thus responsible for ensuring that environmental justice issues are addressed.

Application of this Executive Order to NEPA documentation suggests that two questions be examined: (1) is a federal project with significant adverse environmental impacts being proposed in a community comprised largely of minority or low-income persons, and (2) would any significant adverse human health or environmental effects of the project disproportionately affect minority or low-income persons?

The Executive Order does not mandate special mitigation measures for environmental justice impacts, and there are no formal, commonly accepted significance criteria. However, the Presidential Memorandum accompanying the Executive Order does direct federal agencies to include measures to mitigate disproportionately high and adverse environmental effects of proposed federal actions on minority and low-income populations.

Federal agencies also are required to give affected communities opportunities to provide input into the NEPA process, including identification of mitigation measures. In previous scoping and public participation activities surrounding Port of Oakland improvement projects, freeway construction, and other infrastructure projects, West Oakland residents and community activists identified a number of high priority issues. These issues include trucks driving through West Oakland on their way to and from the Port that park illegally on residential streets, air quality, noise, human health impacts, jobs, education and training, economic opportunities, and recreational facilities.

This analysis examines environmental effects of the proposed project and project alternatives that could cause disproportionally high and adverse human health or environmental impacts in West Oakland. The analysis considers the effects of the dredging activities in Oakland Harbor and the transport and placement of dredged material at the following reuse/disposal sites: Vision 2000 Upland Area, New Berth 21, Middle Harbor Enhancement Area, and the Various Landfills. The other reuse/disposal sites (NAS Alameda, SF-DODS, Hamilton, and Montezuma) are not considered here because they are not close to communities where environmental justice concerns are an issue, and dredged material would be transported to these sites by sea, not land.

## 7.2 AFFECTED ENVIRONMENT

### Quality of Life

West Oakland is one of the oldest parts of the City of Oakland. Its neighborhoods grew up around the Transcontinental Railway terminus that opened in 1869, followed by the Bay Bridge, shipping facilities, military bases and related industry. It has hosted each successive wave of arriving populations from the Portuguese, Irish, and Italians of the early 1900s to the African-American community that makes up the largest portion of the West Oakland population today. Figure 7.2-1 shows the location of the West Oakland community.

Many African-Americans came to Oakland from the South and East during the period of western railroad expansion and, especially, during World War II to work in the war-time ship building industry. West Oakland was once the home of a significant African-American middle class population and thriving neighborhoods complete with shopping, cultural, and entertainment districts. However, after World War II, the economy and jobs in West Oakland dropped severely when government shipbuilding and defense contracts decreased. The community has never fully

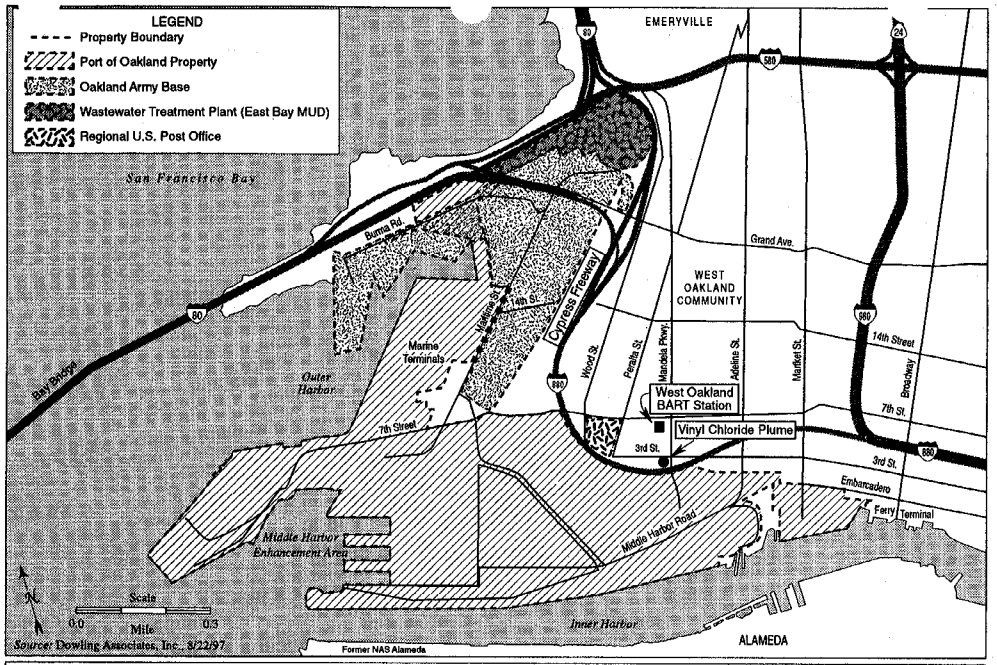



**Figure 7.2-1**

**WEST OAKLAND COMMUNITY**

recovered from this loss of its economic base. Further job losses have resulted from the changing global economy, increased mechanization of Port of Oakland operations, a dramatic decrease in passenger rail traffic, military base closures, and lack of new investment by businesses due to the antiquated and deteriorating condition of the area's commercial and industrial facilities and social change.

West Oakland is now known as an area of economic distress. Over 35 percent of West Oakland's 23,400-plus residents live below the poverty level and unemployment rates average 21.5 percent, compared to a statewide average of 9.1 percent. For the African-American male population, unemployment is over 40 percent. The median household income is $16,692 compared to $27,095 citywide. About 85 percent of the 8,735 housing units in West Oakland are occupied by renters. The diversity of the population has remained about the same for the past 20 years, with African-Americans making up 71.5 percent of the population, Spanish descendants 13.6 percent, Whites 9.7 percent, Asian-Americans 8.7 percent, and other ethnic groups 10.6 percent (U.S. Census 1990; CWOR 1994; OEDE 1994).

However, from within the West Oakland community comes the very real promise of change. Residents, property owners, business owners, and employers have recognized the potential for a revitalized West Oakland and are supporting efforts to turn the area around. Historically, urban economic empowerment and revitalization have been chief concerns of community activists. Organizations such as OCCUR (Oakland Citizen's Council for Urban Renewal), the Black Panther Party, and programs such as the Model Cities Program, which developed the Edith Austin East Bay Skills Center, were propelled by 1960s West Oakland community activism. More recently, the Citizens for West Oakland Revitalization (CWOR) and other groups have formed coalitions to rebuild the economy, clean up the environment, and strengthen the community. Table 7.2-1 lists the current community groups active in West Oakland.

These listed groups reflect the diversity of West Oakland including residents, businesses, churches, nonprofit organizations, and community institutions. CWOR engaged in an 18-month community-based planning process with the support of the City's Office of Economic Development and Employment and produced its *West Oakland Visions and Strategies* report as the basis for the revitalization planning process (CWOR 1994). The report identifies existing conditions, goals, and implementation strategies addressing a broad range of socioeconomic issues. This was followed by the *Visions to Actions* report (CWOR 1995), which outlines specific issues and actions community members will take to work in partnership with government agencies and businesses to rebuild West Oakland.

A top priority for the community was to involve visible, vocal participants in the planning of projects that affect the community. Thus, the West Oakland community is actively involved in the development of the West Oakland Area Plan (City General Plan amendment), Port of Oakland Vision 2000 plan, Oakland Army Base Reuse Plan, and Mandela Parkway Plan. The West Oakland community succeeded in getting Caltrans to realign the Cypress Freeway so that it no longer geographically splits the community. Through these efforts, community members have identified key concerns and priorities and offered input on how agencies and businesses can help reduce the negative impacts of their projects on West Oakland yet still support much needed economic development.

**Table 7.2-1 West Oakland Community Groups (partial list)**

| |
|---|
| ACORN Tenants Association |
| Chester Street Neighborhood Association |
| Churches / Faith Community |
| Citizens Emergency Relief Team (CERT) |
| Coalition for West Oakland Revitalization (CWOR) |
| Jubilee West |
| Mother Wright Foundation |
| National Economic Development Law Center |
| Oak Center Neighborhood Association |
| Oakland Citizens Council for Urban Renewal (OCCUR) |
| Oakland Community Organizations (OCO) |
| Prescott Family and Community Resource Center |
| Prescott Family and Community Support Network |
| Sierra Club |
| South Prescott Neighborhood Association |
| West Oakland Army Base Task Force |
| West Oakland Association of Community Organizations for Reform Now (West Oakland ACORN) |
| West Oakland Commerce Association |
| West Oakland Community Advisory Group (WOCAG) |
| West Oakland Healthy Start |

**Land Use, Mobility, Transportation and Truck Traffic**

West Oakland is surrounded by the Oakland Army Base, Port of Oakland, the EBMUD wastewater treatment plant, industrial facilities, railroads and major freeways (see Figure 7.2-1). Over 60 percent of West Oakland's area consists of industrial/commercial properties. However, the commercial buildings are, by and large, vacant or in very poor condition. Residents are affected by trucks that use residential streets to access industrial and commercial properties.

Truck parking on residential streets has caused disruption and residents have complained. Incompatible land uses, vehicle transport, and truck traffic in neighborhoods are a problem, as many residential lots are located next to industrial facilities or are located on an alternate route to a commercial or industrial facility. There is also an absence of essential residential and business support services like food markets, pharmacies, and banking services.

The surrounding Port facilities, Army Base, and freeways physically isolate residents from access to desirable areas nearby, such as Jack London Square, Emeryville shopping districts, waterfront areas, and downtown Oakland. Many residents in West Oakland do not own cars, and AC Transit bus service is limited or unavailable at night and on weekends. The incompatible land uses, limited transportation options, and poor urban design exacerbate the environmental and social challenges facing the West Oakland community.

**Air Quality and Public Health**

Over the years, West Oakland residents have expressed concern about air pollution coming from the Port, major freeways, truck traffic, and other industrial facilities in the neighborhood. Ozone and particular matter have been of particular concern to local residents. Particulate matter (such as dust and smoke) can be inhaled deeply into human lungs, can exacerbate conditions such as asthma, emphysema, and bronchitis, and can cause serious health problems (American Lung Association 1997). Common sources of particulate matter include windblown dust, wood-burning fireplaces, and diesel bus and truck emissions.

Compared to other urban areas of its size, the San Francisco Bay Area has one of the lowest ozone levels in the nation, and its particulate levels (PM) are also relatively low. Although the Bay Area is currently designated an attainment area for ozone, the U.S. EPA is considering changing the designation because of the number of non-attainment days that have occurred in recent years. At the urging of West Oakland activists, in 1996 the Port of Oakland and Bay Area Air Quality Management District set up two PM monitoring stations in West Oakland; one on Port property and one in the neighborhood. Monitoring data from the first year show that local PM levels did not exceed existing or proposed state and federal PM standards.

Public health studies indicate that West Oakland residents, like other communities along Oakland's industrial belt (around the I-880 freeway), suffer higher than expected rates of hospitalization for asthma; certain diseases such as lung, pancreatic, and prostate cancers; and infant mortality (Children's Hospital of Oakland 1994; CDHS 1993). Public health issues involve a variety of factors. These may include income level, access to health care, education about preventative health care, nutrition, smoking, alcohol consumption, hazards in the home and workplace, and environmental conditions.

Asthma, for example, may be exacerbated by the cumulative effects of air pollution, dust, mold and spores in old houses with poor ventilation, old paint, smoking, pet allergies, diet, and limited

access to health care. Research suggests that the lack of timely and effective outpatient care may lead to high asthma hospitalization rates in low-income areas compared to higher income areas (Children's Hospital of Oakland 1995). While there has been no epidemiological study to show that health conditions in West Oakland are the result of environmental impacts from industrial activities, local activists are concerned that there is an already health-impacted population that will be particularly sensitive to increased pollution (Nadel 1997).

**Noise**

As explained in section 4.8 (noise setting), existing noise levels in West Oakland are generally high. Sources of noise pollution in West Oakland neighborhoods include vehicles on freeways and on local roadways from the Port of Oakland, BART, U.S. Post Office, Oakland Army Base and other industrial activities. Noise levels generally exceed 60 dBA along the I-880 freeway, local streets that serve as truck routes, BART tracks, and UPRR railroad tracks. Local streets where noise levels generally exceed 70 dBA include (but are not limited to) 3rd Street (south of Adeline Street) and 7th Street (see Table 4.8-1, Existing Noise Levels in the West Oakland Area).

For residential uses, schools, childcare, healthcare, nursing home, or public open space noise levels up to 60 dBA are considered normally acceptable in the City of Oakland. For commercial uses, noise levels up to 65 dBA are considered normally acceptable in the City of Oakland. Guidelines from the Oakland Planning Code, Section 7710, provide for these noise levels up to 20 minutes per hour at the receiving location. State guidelines are similar but present an upper limit to noise levels that are considered normally acceptable. "Normally acceptable" is defined as satisfactory for the specified land use, assuming that buildings are built according to normal conventional construction standards and the California Uniform Building Code.

Effects of noise pollution can include interference with sleep, concentration, and communication; physiological and psychological stress; and hearing loss. West Oakland contains noise-sensitive land uses such as schools, child care centers, residences, and nursing homes.

**Environmental Remediation**

The U.S. EPA (1997b) notes that nationwide there is a particularly high concentration of lead problems in low-income and culturally diverse populations who live in the inner city where housing units were built before 1970, when lead house paint was banned. The primary pathway for exposure is from ingestion of paint containing lead. As 63 percent of West Oakland's housing was built before 1959, the Alameda County Lead Poisoning Prevention Program has recently begun working with the West Oakland Health Center on a program to monitor and test children for lead poisoning.

California Department of Health Services (CDHS), Environmental Health Investigations Branch also has been supporting the Alameda County Health Services Agency in addressing environmental health concerns of West Oakland residents. The Department conducted an investigation to identify sites in the neighborhood in which environmental contamination may be present, or in which toxic or hazardous materials or wastes may be used or generated. A health consultation produced December 2, 1997, documents the results of that investigation (U.S. DHHS 1997), which was prompted by concerns about vinyl chloride contamination discovered during construction of the new Cypress Freeway.

The Department of Toxic Substances Control (DTSC) took soil and groundwater samples along the Cypress Freeway Reconstruction Corridor, as well as at additional sites in the neighborhood. The reports names two sites in the neighborhood of particular public health concern: Bobo's Junkyard and DC Metals. At Bobo's, vinyl chloride was found in the shallow groundwater beneath the site, as well as other contaminants such as petroleum hydrocarbons, solvents, and heavy metals. The vinyl chloride contamination is believed to have come from leaking underground storage tanks at the DC Metals site. DTSC and the U.S. EPA are currently investigating the DC Metals site. The U.S. EPA is currently remediating the groundwater in the area.

The Health Consultation report states that "environmental contamination has been found at several locations in the neighborhood [Prescott Neighborhood and Cypress Reconstruction Corridor south of 10th Street, north of Middle Harbor Road, east of Maritime Street, and west of Market Street]. However, these sites are in the process of being remediated. This includes excavation and off-site disposal of contaminated material, on-site treatment of groundwater, and capping of contaminated locations. Access to these sites is currently restricted, and those areas within the Reconstruction Corridor will be covered by either the freeway of by the freeway right-of-way. While exposure to toxic materials may have occurred at some of these sites in the past, CDHS believes that, once the remediation is complete, these sites will not be a source of exposure to hazardous materials for neighborhood residents" (U.S. DHHS 1997).

Neighborhood residents are also concerned about other contaminated sites and toxic materials used in businesses and industrial facilities in the area. The DTSC CALSITES database listed a total of 41 sites within the 94607 zip code that are under their jurisdiction, many of which are undergoing cleanup efforts. Community activists are also working with the City of Oakland Public Works and Community and Economic Development Agencies to encourage cleanup and redevelopment of old industrial "brownfields" sites in West Oakland.

**Jobs and Economic Development**

Over 8,800 maritime industry jobs in the Bay Area are generated by activity at Oakland's seaport (Martin Associates 1996). These jobs are with maritime businesses such as terminal operators, shipping lines, freight forwarders, warehouses, container repair and leasing, government, railroads and trucking, as well as longshore workers. About 12 percent of the regional maritime industry jobs due to Oakland seaport activity are held by Oakland residents. That number is relatively low due to the large number of trucking jobs, which are spread throughout the region, and longshore jobs that require ILWU membership (Port of Oakland 1997f).

West Oakland residents have stated repeatedly that they have long suffered the negative environmental and traffic impacts from the Port without receiving a substantial number of jobs or economic benefits. West Oakland citizen activists are seeking ways to address the current high unemployment levels and anticipated future effects of welfare reform in the community.

## 7.3 PROJECT IMPACTS AND MITIGATION MEASURES

This section analyzes environmental justice impacts and mitigation measures directly related to the 50-foot project. It does not include impacts of other Port of Oakland projects. Cumulative impacts and mitigation measures, those that include all of proposed Port of Oakland development, are discussed in section 7.4.

**Quality of Life**

***Impacts***

The Port of Oakland is the largest neighbor and industry in West Oakland; maritime operations affect residents and businesses greatly. The West Oakland Community is directly adjacent to the Port, and concerns will be heightened as a result of both deepening of the channel and reuse/disposal of dredged material, and the additional goods that arrive at the Port and must be delivered outside the Port area.

***Mitigation Measures***

- The Port is a City of Oakland department and participates in and sponsors many specialized programs to provide opportunities to residents to participate in the economic benefits and growth fueled by maritime operations. Continuing programs that the Port supports for the benefit of West Oakland residents and mitigation of adverse quality of life effects include:

  - Employment Resources Development Program
  - Youth Employment Partnership
  - Student Outreach Programs
  - Surplus Equipment Program
  - Student Internships
  - Port Tours
  - Air Quality Monitoring Stations
  - Port Funding of Truck Enforcement Program
  - Vision 2000 Public Access Workshops/Community Planning Participation
  - Public Access/Parks and Recreation

- The Port will develop an Environmental Justice Program that will address 50-foot project quality of life issues related to environmental justice. The program will expand to encompass all Port development that affects West Oakland, as necessary. This program will continue to implement existing programs, meet with the community to explore community needs related to the project's contribution to environmental justice impacts, and study a broad range of recommendations to determine feasibility and implement those recommendations that are feasible.

  The Environmental Justice Program will be initiated before the start of the construction period (1999-2003). It will be jointly developed through ongoing public workshops hosted by the Port's Executive Director, Community Relations Department, Environmental Planning Department, and Maritime Division. Notices of workshops will be delivered to individuals, organizations, and interested agencies, inviting and encouraging interested community members, organizations, and public agencies to participate. Through the Environmental Justice Program, the Port will participate in and support, to the extent feasible, ongoing, community-based improvements in the quality of life in West Oakland as it relates to Port projects and operations.

**Land Use, Mobility, Transportation and Truck Traffic**

***Impacts***

The Port of Oakland is the major steward of land adjacent to the Bay. Dredging the existing channel and berths to 50 feet will not in itself change land use or mobility for West Oakland residents, but will cause an increase in truck traffic. Section 5.12 discusses impacts to land use as a result of the project and measures to lessen those impacts. Section 5.7 discussion impacts to transportation as a result of the project and measures to mitigate those impacts.

***Mitigation Measures***

Mitigation measures for transportation and land use were presented in previous sections (section 5.7, Transportation; section 5.12, Land Use). The following measure will be undertaken by the Port to mitigate environmental justice impacts related to land use, mobility, transportation and truck traffic:

- The Port will develop an Environmental Justice Program that will address 50-foot project quality of life issues related to environmental justice. The program will expand to encompass all Port development that affects West Oakland, as necessary. This program will continue to implement existing programs, meet with the community to explore community needs related to the project's contribution to environmental justice impacts, and study a broad range of recommendations to determine feasibility and implement those recommendations that are feasible.

  The Environmental Justice Program will be initiated before the start of the construction period (1999-2003). It will be jointly developed through ongoing public workshops hosted by the Port's Executive Director, Community Relations Department, Environmental Planning Department, and Maritime Division. Notices of workshops will be delivered to individuals, organizations, and interested agencies, inviting and encouraging interested community members, organizations, and public agencies to participate. Through the Environmental Justice Program, the Port will participate in and support, to the extent feasible, ongoing, community-based improvements in the quality of life in West Oakland as it relates to Port projects and operations.

In addition to the above, the Port will:

- Continue to participate in and support local and regional planning efforts (e.g., Estuary Plan; Oakland Base Reuse Authority planning process; City of Oakland General Plan Update; Fleet Industrial Supply Center – Oakland reuse process) in order to support West Oakland's work toward fostering land use compatibility and improved accessibility in the community.

- Continue to participate in the West Oakland Truck Parking Enforcement Program.

- Work with the City of Oakland Police Department to monitor and control truck traffic during project construction and after completion to enforce truck speed limits in the Port area and to ensure Port-related trucks are not using residential streets in West Oakland to bypass congested truck routes, freeways, or freeway interchanges.

- Continue working with the West Oakland community and the City of Oakland to address truck traffic and other transportation issues related to Port projects and operations.

**Air Quality and Public Health**

***Impacts***

As noted in section 5.1, operation of the project will generate significant emissions, due to the increase in cargo handling activities within the Port and the transport of cargo within the Bay Area region. Since project operational activities will be focused in the Port, concerns will be heightened in the adjacent West Oakland Community regarding the impact of these emissions. However, the majority of the operational emissions will occur from cargo vessels as they cruise into the Port and these emissions will be dispersed to the point that no ambient air quality will be exceeded in onshore region.....

semuch of the , this area as a result of both deepening of the channel and reuse/disposal of dredged material and the additional goods that arrive at the Port and must be delivered outside the Port area.

***Mitigation Measures***

Mitigation measures for air quality were presented in section 5.1. The following measure will be undertaken by the Port to mitigate environmental justice impacts related to air quality and human health:

- The Port will develop an Environmental Justice Program that will address 50-foot project quality of life issues related to environmental justice. The program will expand to encompass all Port development that affects West Oakland, as necessary. This program will continue to implement existing programs, meet with the community to explore community needs related to the project's contribution to environmental justice impacts, and study a broad range of recommendations to determine feasibility and implement those recommendations that are feasible.

  The Environmental Justice Program will be initiated before the start of the construction period (1999-2003). It will be jointly developed through ongoing public workshops hosted by the Port's Executive Director, Community Relations Department, Environmental Planning Department, and Maritime Division. Notices of workshops will be delivered to individuals, organizations, and interested agencies, inviting and encouraging interested community members, organizations, and public agencies to participate. Through the Environmental Justice Program, the Port will participate in and support, to the extent feasible, ongoing, community-based improvements in the quality of life in West Oakland as it relates to Port projects and operations.

In addition to the above, the Port will:

- Continue air quality monitoring to measure particulate matter in West Oakland.
- Explore a broad range of measures to improve air quality, including measures outside the Port's jurisdictional responsibility.

**Noise**

***Impacts***

Section 5.7 details noise impacts and measures that will be undertaken to mitigate construction noise. Noise from construction and increased Port operations may be of concern to the West Oakland community.

***Mitigation Measures***

Mitigation measures for noise were presented in section 5.8. The following measure will be undertaken by the Port to mitigate environmental justice impacts related to noise:

- The Port will develop an Environmental Justice Program that will address 50-foot project quality of life issues related to environmental justice. The program will expand to encompass all Port development that affects West Oakland, as necessary. This program will continue to implement existing programs, meet with the community to explore community needs related to the project's contribution to environmental justice impacts, and study a broad range of recommendations to determine feasibility and implement those recommendations that are feasible.

  The Environmental Justice Program will be initiated before the start of the construction period (1999-2003). It will be jointly developed through ongoing public workshops hosted by the Port's Executive Director, Community Relations Department, Environmental Planning Department, and Maritime Division. Notices of workshops will be delivered to individuals, organizations, and interested agencies, inviting and encouraging interested community members, organizations, and public agencies to participate. Through the Environmental Justice Program, the Port will participate in and support, to the extent feasible, ongoing, community-based improvements in the quality of life in West Oakland as it relates to Port projects and operations.

In addition, the Port will

- During dredging and construction activities, prohibit pile driving at night.

**Environmental Remediation**

***Impacts***

Sections 5.9 and 5.10 detail impacts and measures that will be undertaken to mitigate human health and risk and hazardous materials. The Port of Oakland is a major industrial facility adjacent to and part of the West Oakland community. The dredging portion of the project proposes to take some contaminated material from the Bay and rehandle the material at a site on FISCO that segregates the material from the environment and then transports the material to a landfill.

***Mitigation Measures***

Mitigation measures for human health and risk and hazardous materials/contaminated wastes were presented in sections 5.9 and 5.10, respectively. The following measure will be undertaken by the Port to mitigate environmental justice impacts related to environmental remediation:

- The Port will develop an Environmental Justice Program that will address 50-foot project quality of life issues relating to environmental justice. The program will expand to encompass all Port development that affects West Oakland, as necessary. This program will continue to implement existing programs, meet with the community to explore community needs related to the project's contribution to environmental justice impacts, and study a broad range of recommendations to determine feasibility and implement those recommendations that are feasible.

  The Environmental Justice Program will be initiated before the start of the construction period (1999-2003). It will be jointly developed through ongoing public workshops hosted by the Port's Executive Director, Community Relations Department, Environmental Planning Department, and Maritime Division. Notices of workshops will be delivered to individuals, organizations, and interested agencies, inviting and encouraging interested community members, organizations, and public agencies to participate. Through the Environmental Justice Program, the Port will participate in and support, to the extent feasible, ongoing, community-based improvements in the quality of life in West Oakland as it relates to Port projects and operations.

In addition, the Port will

- Continue to seek ways to incorporate pollution prevention techniques and technology into Port facilities and practices.
- Investigate a means for the Port to support or participate in "Brownfields" initiatives.

**Jobs and Economic Development**

***Impacts***

Section 5.6 details impacts and measures that will be undertaken to mitigate socioeconomic impacts. West Oakland community members have stated that they suffer disproportionately high adverse effects from the Port without receiving the benefits of additional employment and economic activity. The Port of Oakland should support efforts of West Oakland residents to share in the economic benefits that the project will bring to the region. This is consistent with the *Guidance Manual for Incorporating Environmental Justice Concerns in EPA's NEPA Compliance Analyses* (EPA 1996a).

As the Port of Oakland is a landlord port, leasing facilities for operation by others, the Port itself employs very few people (about 150) in its maritime and support divisions (Port of Oakland 1997f). Most of the new direct jobs created by the project would be hired through Port tenants and contractors. The Port of Oakland already runs an in-house program (Employment Resources Development Program [ERDP]) to assist Oakland residents in getting jobs with Port tenants through job matching and placement.

***Mitigation Measures***

The following measures will be undertaken by the Port to mitigate environmental justice impacts related to jobs and economic development:

- The Port will develop an Environmental Justice Program that will address 50-foot project quality of life issues related to environmental justice. The program will expand to

encompass all Port development that affects West Oakland, as necessary. This program will continue to implement existing programs, meet with the community to explore community needs related to the project's contribution to environmental justice impacts, and study a broad range of recommendations to determine feasibility and implement those recommendations that are feasible.

The Environmental Justice Program will be initiated before the start of the construction period (1999-2003). It will be jointly developed through ongoing public workshops hosted by the Port's Executive Director, Community Relations Department, Environmental Planning Department, and Maritime Division. Notices of workshops will be delivered to individuals, organizations, and interested agencies, inviting and encouraging interested community members, organizations, and public agencies to participate. Through the Environmental Justice Program, the Port will participate in and support, to the extent feasible, ongoing, community-based improvements in the quality of life in West Oakland as it relates to Port projects and operations.

In addition, the Port will

- Expand the Youth Employment Partnership program that trains and employs local youth in building construction and "deconstruction" project at Port facilities.
- Design and implement a year-round Port internship program to coordinate with the School-To-Career program, with emphasis on West Oakland schools.
- Support nonprofits and/or West Oakland residents seeking to develop community leadership skills to fully participate in community development projects.

## 7.4 CUMULATIVE IMPACTS

Cumulative impacts and mitigation measures are discussed in Chapter 9. Eighteen projects were considered in this analysis. They include:

- Port of Oakland Vision 2000 Berths 55-58 Project
- Port of Oakland Vision 2000 Joint Intermodal Terminal
- Port of Oakland Vision 2000 Terminal 59
- Port of Oakland Vision 2000 New Berth 21
- Port of Oakland Site "B"
- Port of Oakland Recreational Boathouse Development
- Port of Oakland Buildout of Jack London Square Master Development Plan-Phase I
- Port of Oakland Jack London Square Marina
- Port of Oakland Berth 22 Replacement
- Oakland Army Base Reuse
- Treasure Island Reuse
- Buildout of the Oakland Comprehensive Plan
- Naval Air Station Alameda

- Redevelopment of Alameda Encinal Terminal
- Buildout of Alameda General Plan
- Chiron Life Sciences Research Center
- South Bay Front
- Pixar Corporation Headquarters

For environmental justice concerns, cumulative impacts are understood by the Port of Oakland to be those issues related to quality of life that are not addressed through the traditional environmental assessment process. The Port proposes to address these environmental justice concerns by implementing a long-term environmental justice program initiated during the project period (1999-2004). The Environmental Justice Program, described previously, will address the Port's role and activities to effect or support the improvement of the quality of life in West Oakland. It is understood that this is a collaborative and cooperative long-term initiative.

# 8.0 PROJECT ALTERNATIVES ANALYSIS

This chapter summarizes and compares the potential environmental impacts of the no-project alternative and the 15 dredging/reuse/disposal alternatives.

## 8.1 DEFINITION OF PROJECT ALTERNATIVES

The dredging/reuse/disposal alternatives are summarized in Table 8.1-1; this table shows the estimated sediment volume that would go to each reuse/disposal site under each alternative. The actual volume of sediment delivered to each reuse/disposal site would be governed by the actual volumes dredged; the actual volumes dredged could change based, in part, on shoaling during construction and the amount of overdepth actually achieved. In the first column of the table, the alternatives labeled as B1 through B6 would include dredging option B, and those labeled as F1 through F9 would include dredging option F; dredging options B and F are described in section 2.1.1.

The sediment volumes destined for each reuse/disposal site in Table 8.1-1 do not necessarily agree with the sediment volume shown for each site in Table 2.2-1. Table 2.2-1 was developed early in the analysis of each site, before the 15 project alternatives shown in Table 8.1-1 were defined. In the absence of more refined sediment volumes early in the analysis, Table 2.2-1 established an upper bound on the amount of sediment that could go to each site for the purposes of the impact assessment in Chapter 5.

The no-project alternative is described in section 2.3.1.

## 8.2 COMPARISON OF IMPACTS BY PROJECT SITE

The dredging/reuse/disposal alternatives are comprised of either dredging option B or F, together with different combinations of reuse/disposal sites. Since there is only a minor difference between dredging option B and F (the amount of the Outer Harbor that would be widened [see Figure 2.1-3]), the impacts of the two dredging options are largely identical for most resource areas. For this reason, the difference in the impacts of the various alternatives is largely a function of the impacts and benefits that would occur at the reuse/disposal sites. These impacts, which have been discussed in detail in Chapter 5, are summarized by site and by resource area in Table 8.2-1. Since the alternatives necessarily include the dredging, Table 8.2-1 includes not only the impacts at the reuse/disposal sites but also the impacts of the dredging (so that these impacts can be factored into the comparison in section 8.3).

Table 8.2-1 indicates the maximum level of impact that would be expected at each site for each resource area. The level of adverse impact in the table for a given resource is noted as: (0) negligible/no impact; (-1) adverse but not significant; (-2) significant but mitigable; or (-3) significant and unavoidable. Beneficial effects are indicated in the table by a "B." The sections below on each resource area explain the impacts shown in Table 8.2-1, and compare the advantages and disadvantages of the various reuse/disposal options.

**Table 8.1-1. Sediment Volume Destined for Reuse/Disposal Sites under Each Project Alternative**

| *Alternative Number* | *Dredging Option* | REUSE/DISPOSAL SITES (VOLUME IN MCY) | | | | | | | | *Total Volume*[6] |
|---|---|---|---|---|---|---|---|---|---|---|
| | | *Vision 2000 Upland*[1] | *New Berth 21*[1] | *MHEA*[2] | *NAS Alameda*[3] | *SF-DODS*[3] | *Hamilton*[4] | *Montezuma*[4] | *Various Landfills*[5] | |
| B1 | B | 0.5 | 2.5 | 5.2/1.8 | 0.75 | 3.65 | | | 0.1 | 14.5 |
| B2 | | 0.5 | 2.5 | 5.2/1.8 | 0.75 | | 3.65 | | 0.1 | 14.5 |
| B3 | | 0.5 | 2.5 | 5.2/1.8 | 0.75 | | | 3.65 | 0.1 | 14.5 |
| B4 | | 0.5 | | 2.7/4.3 | | 6.9 | | | 0.1 | 14.5 |
| B5 | | 0.5 | 2.5 | 5.2/1.8 | | | 4.4 | | 0.1 | 14.5 |
| B6 | | 0.5 | 2.5 | 5.2/1.8 | | 4.4 | | | 0.1 | 14.5 |
| F1 | F | 0.5 | | 5.5/1.5 | | 5.2 | | | 0.1 | 12.8 |
| F2 | | 0.5 | | 5.5/1.5 | | | 5.2 | | 0.1 | 12.8 |
| F3 | | 0.5 | | 5.5/1.5 | | | | 5.2 | 0.1 | 12.8 |
| F4 | | 0.5 | 2.5 | 7.0/0 | | 2.7 | | | 0.1 | 12.8 |
| F5 | | 0.5 | 2.5 | 7.0/0 | | | 2.7 | | 0.1 | 12.8 |
| F6 | | 2.5 | | 7.0/0 | | 3.2 | | | 0.1 | 12.8 |
| F7 | | 2.5 | | 7.0/0 | | | 3.2 | | 0.1 | 12.8 |
| F8 | | | 2.5 | 7.0/0 | 0.75 | 2.45 | | | 0.1 | 12.8 |
| F9 | | 1.0 | 2.5 | 7.0/0 | | 2.2 | | | 0.1 | 12.8 |

*Notes:*
1. Sediment would be in this order: construction fill, non-cover material, or material suitable for unconfined aquatic disposal.
2. Volume of cover material/volume of non-cover material. The total sediment volume going to the MHEA would be 7.0 mcy under each alternative; the split between cover material and non-cover material is as shown.
3. Sediment would all be cover material, Tier I SUAD (SUAD = Suitable for Unconfined Aquatic Disposal).
4. Sediment would be SUAD or wetland cover.
5. Material would be contaminated construction material or debris.
6. Actual volumes depend, in part, on shoaling during construction and the amount of overdepth actually achieved.

**Table 8.2-1. Comparison of Impacts by Project Site[1]**

| *Resource Area* | *Dredge Area* | REUSE/DISPOSAL SITE | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | *Vision 2000 Upland* | *New Berth 21* | *MHEA* | *NAS Alameda* | *SF-DODS* | *Hamilton[2]* | *Montezuma[2]* | *Various Landfills* |
| Air Quality[3] | -1 | -1 | -1 | -1 | -1 | -1 | -1 | -1 | -1 |
| Surface Water Resources | -2 | -2 | -2 | -2 | 0 | 0 | 0 | 0 | 0 |
| Geology and Groundwater | -2 | 0 | 0 | B | 0 | -1 | 0 | 0 | 0 |
| Biological Resources | -2 | 0 | -2 | -1/B | -2 | -1 | 0 | 0 | 0 |
| Cultural Resources[4] | -2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Socioeconomics | B | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Vessel Transportation | -2/B | -1 | -1 | -2 | -1 | -1 | -1 | -1 | 0 |
| Ground Transportation | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -2 |
| Noise | -3 | -1 | -1 | -1 | -2 | 0 | 0 | 0 | -1 |
| Human Health and Risk | 0 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Hazardous Materials and Contaminated Wastes | B | -2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Public Services | -2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Land Use[5] | 0 | 0 | 0 | B | 0 | -1 | 0 | 0 | 0 |
| Visual Resources | 0 | 0 | 0 | B | 0 | 0 | 0 | 0 | 0 |

*Notes:* 1. For adverse impacts: -3 = significant and unavoidable adverse impact
-2 = significant but mitigable adverse impact
-1 = adverse but not significant impact
0 = negligible or no impact
For beneficial effects: B = beneficial

2. Only sediment transport impacts are attributable to the 50-foot deepening project.
3. Impacts associated with the construction phase (dredging, transport, and disposal).
4. If the former Todd Shipyard is determined to be eligible for the National Register of Historic Places, the removal of some of its structures may be a significant impact, but that impact would be mitigated to a level of less than significance.
5. The number in the table refers to compatibility with existing and proposed land uses.

### 8.2.1 Air Quality

As shown in Table 8.2-1, the air quality impact associated with dredging operations, transport, and disposal at the possible reuse/disposal sites would be considered an adverse, but not significant, air quality impact regardless of the reuse/disposal sites selected. The primary reason for this classification is that the BAAQMD has established CEQA guidelines that recognize that, although construction equipment emits CO and ozone precursors (ROG and $NO_x$), these emissions are included in the emission inventory that is the basis for regional air quality plans, and such emissions are not expected to impede attainment or maintenance of ozone and CO standards in the Bay Area (BAAQMD 1996).

$PM_{2.5}$ and $PM_{10}$ emissions that are emitted from construction activities can cause substantial increases in localized concentrations of $PM_{2.5}$ and $PM_{10}$ and lead to adverse health effects, as well as nuisance concerns such as reduced visibility and soiling of exposed surfaces. The BAAQMD has therefore established a set of particulate matter control measures for implementation at construction sites (see section 5.1.1 for a detailed list of these measures). If all of the measures are implemented (as appropriate, depending on the size of the project construction area), then air pollutant emissions from the construction activities are considered to be a less than significant impact. If all of the measures are not implemented, construction impacts would be considered to be significant (unless the Lead Agency provides a detailed explanation as to why a specific measure is unnecessary or not feasible) (BAAQMD 1996).

Although each reuse/disposal site is rated the same in Table 8.2-1, from an air quality perspective it is generally true that the sites that are closer to the dredging areas would be preferred over the more distant sites. For a given amount of dredged material, the overall emissions would be less for those sites with shorter transport distances. However, distance is not the only factor, so is the mode of transport. Hauling dredged material by barge is much more efficient, resulting in less emissions per cubic yard of sediment, than trucking the material. For this reason, the Various Landfills would result in higher emissions per ton of material disposed than any of the other reuse/disposal sites which would all be accessed by barge. Of the sites accessed by barge, the Vision 2000 Upland area, New Berth 21, the MHEA, and NAS Alameda options would be preferred over the SF-DODS, Hamilton, and Montezuma options; the Hamilton site would be preferred over the Montezuma site; and the Montezuma site would be preferred over the SF-DODS site. From an air quality perspective, the Various Landfills would be the least desirable disposal site, and would only be used for dredged material and debris that could not be reused by the project or disposed at SF-DODS.

### 8.2.2 Surface Water Resources

There would be potential impacts on surface waters from the dredging options B and F. There would also be impacts on surface waters at some of the reuse/disposal sites from the release of sediment into the water column and from stormwater runoff.

Dredging Oakland Harbor would cause a short-term, significant impact on surface water quality because releases from high concentrations of chemical constituents from the dredged sediments to the water column could occur; however, mitigation would minimize the impact to a level of insignificance. Short-term and insignificant changes to the level of total suspended solids, dissolved oxygen, and possibly nutrients are likely but conditions would return to ambient conditions relatively quickly.

For the reuse/disposal sites, New Berth 21, MHEA and SF-DODS would have water column effects from released sediments, but the water quality impact would be, short-term, and localized during the disposal episode. New Berth 21 and MHEA would receive sediments that meet the wetland non-cover and wetland cover screening criteria. These materials have been determined by the SF-RWQCB to be suitable for aquatic reuse based on the modified WET (leachability) test and, for wetland cover material, the bioassay test. SF-DODS would have SUAD material disposed at the site. A Tier 1 exclusion and confirmation biological testing of the SUAD dredged material has demonstrated compliance with water quality criteria. Short-term and localized changes to dissolved oxygen levels and possibly nutrients would occur during disposal operations at these sites but these levels would return to ambient conditions relatively quickly. A short-term and localized significant impact from increased TSS levels could occur but mitigation measures will minimize this condition to a point of insignificance.

Impacts on surface water resources from stormwater runoff would be greatest at the sites where fill material would be placed above sea level and adjacent to the existing wharf, where stormwater outfalls are located. The Vision 2000 Upland and New Berth 21 reuse disposal options include long-term significant but mitigable impacts in the form of uncontrolled surface water runoff that has the potential to impact the water quality of the Bay. Construction of a new stormwater system at New Berth 21 would mitigate these impacts. The reconstruction of the stormwater system at the Vision 2000 area could impact the adjacent sensitive MHEA site if outfalls direct stormwater to the site. The impacts would be reduced to a level of insignificance by designing a stormwater system that directs water away from the MHEA. In addition, water contained in the rehandling facility may impact the Bay if uncontrolled potentially contaminated water was discharged into the Bay. This impact would be mitigated to a level of insignificance by appropriately designing the facility to contain the water, and conducting a sampling, analysis, and treatment program under permit with the SF-RWQCB prior to discharge. No impacts are expected at the NAS Alameda because no existing stormwater systems would be affected by dredged material placement. No surface water impacts at Hamilton or Montezuma associated with dredged material offloading or placement would be attributable to the Oakland project. No impacts are expected for the Various Landfills options because surface water runoff is controlled and regulated by the SF-RWQCB at each landfill.

The preferred reuse/disposal options in terms of surface water resources would be the MHEA, NAS Alameda, SF-DODS, Hamilton, Montezuma, and the Various Landfills.

### 8.2.3 Geology and Groundwater

This resource area includes several types of impacts, including impacts affecting geology, soils, sediments, and groundwater, and seismic impacts on the project. Among the reuse/disposal options, geologic and groundwater impacts would range from none (Vision 2000 Upland Area, New Berth 21, NAS Alameda, Hamilton, Montezuma, and Various Landfills), to adverse but not significant (SF-DODS), to significant but mitigable (the dredge area), to potentially beneficial (MHEA).

In the dredge area, dredging would destabilize channel slopes and undermine pilings and crane wall girders. This would be a significant impact that would be mitigated by standard building practices, such as building sheet pile walls at the toe of the shore slopes, building new rail girders to the waterside of existing girders, and replacing piles at the watershed crane rail girders. In widening areas, the removal of Younger Bay Mud material by dredging would improve sediment quality in those areas.

At the MHEA, sediment quality would be improved because the wetland cover material that would make up the new sediment surface would have generally lower concentrations of contaminants than existing sediments at the site. The surface layer of cover material that would be placed over the non-cover material would be a minimum of 3 feet thick and would range up 11 feet thick. Considering the relatively quiescent water conditions that would prevail at this site and other factors, this thickness would be effective in isolating the underlying non-cover material from the biotic environment.

Disposal of dredged material at the SF-DODS would result in accumulation that would be greatest near the center of the site, and minor changes in grain size and organic carbon levels. Effects on sediment contaminant levels and toxicity of site sediments would be insignificant.

There would be no impacts on geology or groundwater at the Vision 2000 Upland, New Berth 21, Hamilton, or Montezuma sites that would be attributable to the proposed project.

For the Various Landfills option, any groundwater issues at the landfills would not be attributable to the proposed project and would be addressed by the permits for these facilities.

In summary, the MHEA reuse/disposal option would be the best in terms of geologic and groundwater impacts because sediment quality would be improved at this site. The next most preferable options would be the Hamilton, Montezuma, or Various Landfills options which would have no impacts attributable to the proposed project. Next would be the Vision 2000 Upland, New Berth 21, or NAS Alameda, for which impacts would be negligible. Finally, minor sediment impacts would occur at the SF-DODS site.

### 8.2.4 Biological Resources

The only potentially significant impact on biological resources associated with the proposed dredging is that turbidity from the dredging could disrupt herring spawning and result in mortality to eggs. This could be mitigated to insignificance by postponing dredging in the vicinity of herring spawning areas.

The biological impacts of the various reuse/disposal options vary from no impact (Various Landfills), to negligible (Vision 2000 Upland), to adverse but not significant (SF-DODS), to significant but mitigable (New Berth 21 and NAS Alameda), to the beneficial impacts of habitat enhancement (MHEA). Habitat enhancement would also occur at the Hamilton and Montezuma sites if they were part of the selected plan although, since these sites would accept dredged material from multiple sources, this benefit would not be strictly attributable to the Oakland project.

The Vision 2000 Upland, which would be transformed from the existing aquatic environment to fastland by filling from the Berth 55-58 project, would provide no biological habitat by the time fill from the 50-foot project is placed there. Therefore, adding more fill to this site under the proposed project would have negligible long-term biological impacts. The construction activity required for placement of the fill would cause very minor short-term disturbance of birds in the area. Any excess water from the site would be contained and discharged to a treatment plant, or treated and discharged to the harbor according to permit requirements, with no adverse biological impacts.

The rehandling facility under this option would be located at one of six possible areas on Port property, none of which supports significant biological habitat. This facility could result in minor

short-term disturbance on birds that forage in nearby areas and use structures at the site of the rehandling facility for roosting and perching. This would be an insignificant impact.

The New Berth 21 option would result in the loss of 27 acres of degraded marine habitat, including the benthic community and foraging habitat for fish and birds. The affected habitat provides insignificant foraging habitat for special status species. While the habitat is degraded, filling this large an area of deep dredged habitat is considered a significant but mitigable impact on the marine biological resources of the Harbor.

The Middle Harbor Enhancement Area would result in long-term benefits to habitats and species that would more than offset the loss of the existing community at the site and the short-term construction impacts. Construction of the MHEA would likely remove a portion or all of the eelgrass bed at the western margin of the U.P. Mole; any remaining portions of the eelgrass bed may be impacted by increased turbidity, sedimentation, and resuspended contaminants from construction. This impact would be mitigated to insignificance by establishment and long-term monitoring of an eelgrass bed of equal or greater area and density in the proposed MHEA. Existing deep-water habitats would be replaced with the more productive habitats of shallow-water channels and basins, eelgrass beds, sand beach, and salt marsh. Hard bottom habitat would be increased, and covered water area would be reduced. These changes would result in significantly increased species diversity and biological productivity in the Middle Harbor in the long term. Multi-function habitat for waterfowl and shorebirds, including the endangered least tern, would be enhanced. Turbidity plumes during material placement would be localized and have short-term, insignificant biological impacts. Special status and other species would forage in the area less during construction, an insignificant impact. Because only material suitable for wetland cover and non-cover uses would be placed at the site, no significant toxicity or bioaccumulation of contaminants would occur.

Placement of sediment at the former NAS Alameda could destroy burrowing owl nests, depending on the presence of this species of special concern and the timing of construction. This would be a significant impact that could be mitigated by avoiding the destruction of active nests and relocating any affected owls found to be present in impact areas. Stockpiling of material on this site might also induce least terns and snowy plovers to nest outside of the protected USFWS refuge to the south, although this impact can be mitigated to less than significance.

Disposal at the SF-DODS would result in burial of benthic organisms near the center of the site. The organisms would burrow up through the deposited material and/or recolonize from adjacent areas. Fish disturbance would be minor and short-term, and foraging habitat impacts would not be significant. Because only material deemed suitable for open-water disposal would be disposed at this site, significant toxicity or bioaccumulation of contaminants would not occur. Impacts on marine mammals, marine birds, and special status species would be short-term and negligible.

Impacts on biological resources from sediment offloading or placement operations at the Hamilton and Montezuma sites would not be attributable to the 50-foot project. The biological impacts of transporting Oakland sediment to either of these sites would be negligible.

In summary, the MHEA option would be the best in terms of biological impacts, because its significant biological benefits would more than offset the loss of existing habitat and adverse impacts during construction. The Various Landfills option would have no impact. The Vision 2000 Upland would be the next most preferable option, because its biological impacts would be negligible. There would be adverse but not significant biological impacts at the SF-DODS. The

New Berth 21 option would result in the loss of 27 acres of marine habitat, albeit degraded. The biological impacts of the NAS Alameda option would be minor, assuming the significant impacts on the burrowing owl are mitigated successfully.

### 8.2.5 Cultural Resources

No significant impacts associated with cultural resources are anticipated from the proposed dredging and reuse/disposal sites. Dredging would not affect the Oakland Inner Harbor Jetties and Federal Channel, an historic property eligible for the National Register of Historic Places. Disposal of the dredged material at the Vision 2000 Upland would be used to fill part of the NSCO Historic District but, with the existing MOA that ensures appropriate treatment of historic properties within this district, there would not be a significant impact on cultural resources. There would be no impact on known cultural resources from use of the following reuse/disposal options for Oakland Harbor sediment: the New Berth 21, MHEA, NAS Alameda, SF-DODS, Montezuma Wetlands, and the Various Landfills.

The potential for exposing currently unknown cultural resources during dredging and disposal at any of the project sites is negligible due to previous land use activities, past dredging, prior channel clearing and other impacts. No unknown cultural resources are expected at SF-DODS due to this site's depth and distance from the coast.

### 8.2.6 Socioeconomics

The economic effects associated with the disposal of dredged materials at the various reuse/disposal sites center on the costs of transporting the dredged material to the site and any corresponding fees for the placement of the material at the site. The transportation costs and fees for the placement of dredged materials would be a temporary, short-term economic effect of the proposed project. The costs of transport are relatively minor when compared to the long-term beneficial economic effects of the Port's dredging project. Consequently, none of the reuse/disposal sites presents a clear long-term economic advantage over the others.

### 8.2.7 Transportation

*Vessel Transportation*

Impacts associated with dredging activities would be comparable regardless of the dredging option selected. Dredging could significantly impact the access of commercial vessels to their berths and could cause structural damage to the berths. These impacts could both be mitigated to less than significant levels. Use of a clamshell dredge in the Inner Harbor could cause a delay in ferry schedules, but this impact is mitigable by avoiding dredging during A.M.and P.M. peak hours. The deepened channels would also result in a beneficial impact by eliminating tidal delays, making vessel transportation into and out of the Port more efficient.

The only potentially significant impact associated with the reuse/disposal sites is that associated with construction of the Middle Harbor Enhancement Area. If the tug service were still at its present location when construction began, tugboat access could be impeded. This impact could be avoided by ensuring that adequate access channels are available until the tug service is relocated, or by relocating tug service before construction of the Middle Harbor Enhancement Area.

*Ground Transportation*

For the dredge area and all the reuse/disposal sites that would be accessible by water, the land impacts of the proposed project would be negligible. Employees involved in the dredging activities would generate 10 trips or less during both A.M. and P.M. peak commute hours. A smaller number of trips could be generated at each of the reuse/disposal areas by landside inspectors.

Disposal of sediment at any of the three landfills under consideration would cause significant impacts. The mitigation measures described in section 5.7 would reduce transportation impacts to less than significant levels.

### 8.2.8 Noise

The dredging would result in a significant and unavoidable impact, as well as significant but mitigable impacts. Operation of the dredge 24 hours a day in the Inner Harbor Channel and turning basin would not comply with hourly restrictions for construction that are specified in the Alameda Noise Ordinance, and this would be an unavoidable significant impact.

Of the reuse/disposal options, two sites would have significant but mitigable impacts. They include the former NAS Alameda site and the Montezuma Wetlands Restoration site. The NAS Alameda site would result in significant but mitigable noise impacts on planned campus housing south of West Redline Avenue and some of the former officers housing (those located closest to the Inner Harbor); but these impacts would only occur if this housing is occupied within the next 4 to 5 years. If these units continue to be unoccupied as they are now, the identified impacts would not occur. If these units are occupied, these impacts could be mitigated to insignificance by not operating earthmoving equipment at this site during the more noise-sensitive nighttime hours. Significant but mitigable noise impacts on sensitive receptors at the nearby town of Collinsville would result from pump operation at the Montezuma site. Reducing pump noise with enclosures or silencers would mitigate these impacts to insignificance. This impact at Montezuma would not be attributable to the proposed 50-foot project.

### 8.2.9 Human Health and Risk

The human health and risk analysis (section 5.9) determined that no significant human health risk would be associated with dredging operations. Potentially significant human health impacts would be limited to one reuse/disposal area: the Vision 2000 Upland site (due to the presence of the rehandling facility). Although disposal of contaminated sediments may occur at New Berth 21, potential adverse impacts are expected to be negligible. The remaining reuse/disposal areas either cannot receive material that would cause human health impacts or, in the case of the Various Landfills option, are not expected to have an adverse impact. No beneficial impacts on human health are anticipated as a result of any reuse/disposal option.

Although potentially significant impacts are associated with the use of the Vision 2000 Upland site, they are not a result of sediment placement activities at the site, but rather the fact that the rehandling facility (which could handle contaminated sediments) is likely to be located within this reuse area. Management of contaminated sediment is required to implement the project, and the Vision 2000 Upland site is appropriate for this task. The rehandling facility can be located close to shore, thereby reducing sediment handling activities, and can also be located far from potential residential receptors. Thus, although the Vision 2000 Upland site ranks lowest of the

reuse/disposal options, it is a necessary part of the project. Also, the impacts associated with this site either are not significant if the rehandling facility is operated as anticipated, or they could be mitigated to insignificance if lengthy handling of the most contaminated sediments is required.

### 8.2.10 Hazardous Materials and Contaminated Wastes

Contaminated waste (which is the focus of this resource area) would be found only in dredged material from Inner Harbor turning basin sediments. Removal of highly contaminated sediments from the Inner Harbor turning basin and reuse or upland disposal of those sediments would result in a long-term benefit to this area of the Inner Harbor.

Only the rehandling facility at the Vision 2000 Upland site and the Various Landfills reuse/disposal options would receive contaminated sediment. The other reuse/disposal sites would receive the cleaner dredged material classified as suitable for ocean disposal, wetland cover, wetland non-cover, and/or construction fill material. Thus, impacts associated with significantly contaminated sediment would not be a concern at the other reuse/disposal sites.

The Vision 2000 Upland site would have two significant, but mitigable, impacts related to contaminated waste. Contaminated dredged material could be spilled accidentally from the clamshell bucket. This impact would be mitigated to a level of insignificance by developing procedures for loading and unloading contaminated sediments that minimize the potential for spillage, and by establishing clean-up procedures. The second impact is the potential for sediments to leach constituents into groundwater that exceed drinking water standards. This impact would be mitigated to insignificance by the placement of an impermeable liner or membrane in the drying cell while these sediments are drying.

The Various Landfills option would not involve quantities of dredged material that would adversely impact available landfill capacity, and the material would meet the landfill acceptance limits. Hence, impacts would be negligible.

### 8.2.11 Public Services

There would be no impacts on public services (including utilities or infrastructure) associated with any of the reuse/disposal options. The only impacts on public services would be due to the dredging. If unmitigated, the dredging would result in significant, long-term impacts from damage to two public services: a 16-inch sanitary sewer force main that services Alameda and part of the cathodic protection system for the BART Transbay Tube. Replacement of the sewer main and the impacted parts of the BART cathodic protection system would mitigate the impacts to insignificance.

### 8.2.12 Land Use

No significant land use impacts would result from dredging activities. At the reuse/disposal sites, impacts on land use would be either insignificant or no impact would occur.

Dredged material reuse at the Vision 2000 Upland, New Berth 21, and the MHEA would be consistent with proposed uses of these areas and would not adversely affect land uses in the vicinity. Beneficial land use impacts would occur at the MHEA with creation of marine habitat enhancement area and open space.

At NAS Alameda, impacts on adjacent land uses during the sediment drying process would be intermittent and would not conflict with existing uses in the area.

At SF-DODS, any impacts on commercial or recreational fishing would be adverse but not significant, because limited fishing occurs in the vicinity.

No impacts on land use at either the Hamilton or Montezuma sites from offloading or placement of dredged material would be attributable to the 50-foot project, and the same would be true of the Various Landfills disposal option.

### 8.2.13 Visual Resources

No significant visual impacts would result from either the dredging-related equipment or any of the reuse/disposal sites.

Visual impacts associated with the dredging, which would be comparable under either dredging option B or F, would be less than significant. Dredges, tugboats, barges, and other associated equipment would be visible for the approximately 4-year dredging period along the shoreline of the Inner and Outer Harbor channels, including from such sensitive viewpoints as Port View Park and Jack London Square. This dredging equipment would appear as an extension of existing Port activity and would thus be considered visually compatible with existing uses.

## 8.3 COMPARISON OF THE PROJECT ALTERNATIVES

Table 8.3-1 indicates the maximum level of impact that would be expected under each project alternative, including the no-project alternative; it follows the same format as Table 8.2-1. The level of adverse impact in the table for a given resource is noted as: (0) negligible/no impact; (-1) adverse but not significant; (-2) significant but mitigable; or (-3) significant and unavoidable. Beneficial effects are indicated in the table by a "B." Since all of the dredging/disposal alternatives are comprised of several reuse/disposal sites, the level of impact assigned to the alternative in Table 8.3-1 is based on the highest impact that could occur, even if that impact would occur at only one site in the alternative. For example, if an alternative involves four reuse/disposal sites, each of which involves a different level of impact, the highest impact of the four sites would be assigned to that alternative. The sections below on each resource area explain the impacts shown in Table 8.3-1, and compare the advantages and disadvantages of the various alternatives. In each resource area section, the impacts are summarized typically for each alternative but, where the impacts are essentially the same for several alternatives, the alternatives with similar impacts are discussed as a group.

### 8.3.1 Air Quality

The impacts of each project alternative are compared in Table 8.3-1. With the exception of the no-project alternative, the air quality impacts would be essentially the same regardless of the dredging/reuse/disposal alternative selected. Impacts would be significant and unavoidable in

**Table 8.3-1. Comparison of Impacts by Project Alternative[1]**

| *Resource Area* | PROJECT ALTERNATIVE | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *No-Project* | *B1* | *B2* | *B3* | *B4* | *B5* | *B6* | *F1* | *F2* | *F3* | *F4* | *F5* | *F6* | *F7* | *F8* | *F9* |
| **Air Quality[2]** | B | -3 | -3 | -3 | -3 | -3 | -3 | -3 | -3 | -3 | -3 | -3 | -3 | -3 | -3 | -3 |
| **Surface Water Resources** | 0 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 |
| **Geology and Groundwater** | 0 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 |
| **Biological Resources** | 0 | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B |
| **Cultural Resources[3]** | 0 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 |
| **Socioeconomics** | 0 | B | B | B | B | B | B | B | B | B | B | B | B | B | B | B |
| **Vessel Transportation** | -3 | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B |
| **Ground Transportation** | 0 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 |
| **Noise** | 0 | -3 | -3 | -3 | -3 | -3 | -3 | -3 | -3 | -3 | -3 | -3 | -3 | -3 | -3 | -3 |
| **Human Health and Risk** | 0 | -1 | -1 | -1 | -1 | -1 | -1 | -1 | -1 | -1 | -1 | -1 | -1 | -1 | -1 | -1 |
| **Hazardous Materials & Contaminated Wastes** | 0 | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B | -2/B |
| **Public Services** | 0 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 |
| **Land Use[4]** | 0 | 0/B | 0/B | 0/B | 0/B | 0/B | 0/B | 0/B | 0/B | 0/B | 0/B | 0/B | 0/B | 0/B | 0/B | 0/B |
| **Visual Resources** | 0 | 0/B | 0/B | 0/B | 0/B | 0/B | 0/B | 0/B | 0/B | 0/B | 0/B | 0/B | 0/B | 0/B | 0/B | 0/B |

*Notes:* 1. For adverse impacts: -3 = significant and unavoidable adverse impact
-2 = significant but mitigable adverse impact
-1 = adverse but not significant impact
0 = negligible or no impact
For beneficial effects: B = beneficial

2. Impacts associated with the operation phase (i.e., after dredging/disposal is complete).

3. If the former Todd Shipyard is determined to be eligible for the National Register of Historic Places, the removal of some of its structures may be a significant impact, but that impact would be mitigated to a level of less than significance.

4. The number in the table refers to compatibility with existing and proposed land uses.

each case because, for each alternative, the emission increases from new operation sources allowed by the deeper channels would be exactly the same as shown previously in Table 5.1-10, i.e., the same increase in vessel calls, cargo handling, cargo transport, and employee commuting would occur regardless of the dredging/disposal alternative selected. As shown in Table 5.1-10, the BAAQMD significance thresholds of 80 pounds per day and 15 tons per year would be exceeded for $NO_x$ and $SO_x$ in 2003 and would be exceeded for ROG, $NO_x$, $SO_x$, and $PM_{10}$ in 2010. These exceedances are considered to cause a significant air quality impact. Mitigation measures would be applied (section 5.1.5), however, this would not reduce emissions to below the significance thresholds. The no-project alternative would result in a beneficial air quality impact, for the reasons described below.

*No-Project Alternative*

Under the no-project alternative, dredging of the Inner Harbor and Outer Harbor would not occur. Since dredging would not occur, no construction activity would take place and no operation emissions associated with an increased number of vessels, cargo transport, or terminal activity would be generated. However, emissions would not remain at 1996 baseline levels. Instead, emissions would be reduced under the no-project scenario because it is anticipated that the continued transportation inefficiencies of the Inner Harbor and Outer Harbor channels (which are currently too shallow to accommodate the newly emerging deep-draft container vessel fleet) would cause the number of vessel calls at the Port to decrease. The Port has indicated that container ship vessel calls are projected to drop from a 1996 baseline of 1,630 to 1,292 by 2003, and down to 1,024 by 2010 (personal communication, G. Joseph, 1997).

Emissions are generated under the no-project alternative by vessel traffic in the form of combustion emissions emitted during vessel cruise, maneuvering, and hoteling modes. In addition, emissions are associated with other source categories, such as the terminal equipment used to load/unload the vessels, the trucks and trains used to haul the cargo, and the employee vehicles used for commuting. The maximum daily and total emissions associated with the no-project alternative are provided in Table 8.3-2. Also included in the vessel emission numbers are emissions from the tugs that would assist the vessels during maneuvering and berthing operations. Detailed calculations of each of these emission source categories are provided in Appendix I.1.

As shown in Table 8.3-2, all pollutant emissions associated with the no-project alternative would be less than emissions in the 1996 baseline year. The no-project alternative would therefore provide a beneficial regional impact on air quality.

*All Project Alternatives*

From an *operational* standpoint there is no air quality distinction that can be made for selecting one dredging/reuse/disposal alternative over another since the magnitude of operational emissions is the same for each. However, a distinction can be made when emissions associated with the *construction* phases of the action are compared. Emissions from construction activities are considered to be short-term/temporary impacts that are not significant. Nonetheless the emissions from some of these activities (dredging, transport of material, and reuse/disposal of material) would vary depending upon the distance to the selected disposal sites and the particular equipment mix and hours of operation required for those sites. Emissions from construction

**Table 8.3-2. Emissions Associated with the No-Project Alternative**

| | Maximum Daily Emissions[a] (lbs/day) | | | | |
|---|---|---|---|---|---|
| *Year/Emission Source* | *ROG* | *CO* | *NOx* | *SO2* | *PM10* |
| **1996 (Baseline)** | | | | | |
| Vessels[b] | 462 | 940 | 9,450 | 6,520 | 954 |
| Trucks | 383 | 2,340 | 3,770 | 100 | 299 |
| Trains | 20 | 64 | 476 | 35 | 10 |
| Terminal Equipment | 233 | 716 | 2,650 | 69 | 144 |
| Employee Vehicles | 220 | 4,550 | 238 | 4 | 3 |
| TOTAL | 1,320 | 8,610 | 16,600 | 6,720 | 1,410 |
| **2003** | | | | | |
| Vessels[b] | 390 | 799 | 8,060 | 5,500 | 805 |
| Trucks | 247 | 2,230 | 2,660 | 88 | 108 |
| Trains | 20 | 64 | 476 | 35 | 10 |
| Terminal Equipment | 197 | 605 | 2,240 | 59 | 122 |
| Employee Vehicles | 121 | 2,590 | 134 | 4 | 3 |
| TOTAL | 975 | 6,290 | 13,600 | 5,690 | 1,050 |
| **Decrease From Baseline** | 342 | 2,320 | 3,020 | 1,040 | 362 |
| **2010** | | | | | |
| Vessels[b] | 319 | 653 | 6,580 | 4,480 | 655 |
| Trucks | 247 | 2,230 | 2,660 | 88 | 108 |
| Trains | 20 | 64 | 476 | 35 | 10 |
| Terminal Equipment | 162 | 499 | 1,850 | 48 | 101 |
| Employee Vehicles | 57 | 1,390 | 87 | 4 | 3 |
| TOTAL | 806 | 4,840 | 11,700 | 4,650 | 877 |
| **Decrease From Baseline** | 512 | 3,770 | 4,930 | 2,070 | 534 |
| | Total Emissions[c] (tons) | | | | |
| *Year/Emission Source* | *ROG* | *CO* | *NOx* | *SO2* | *PM10* |
| **1996 Baseline** | | | | | |
| Vessels[b] | 60 | 122 | 1,230 | 847 | 124 |
| Trucks | 50 | 304 | 490 | 13 | 39 |
| Trains | 3 | 8 | 62 | 5 | 1 |
| Terminal Equipment | 30 | 93 | 345 | 9 | 19 |
| Employee Vehicles | 29 | 592 | 31 | 1 | 0 |
| TOTAL | 171 | 1,120 | 2,160 | 874 | 183 |
| **2003** | | | | | |
| Vessels[b] | 51 | 104 | 1,050 | 715 | 105 |
| Trucks | 32 | 291 | 346 | 11 | 14 |
| Trains | 3 | 8 | 62 | 5 | 1 |
| Terminal Equipment | 26 | 78 | 291 | 8 | 16 |
| Employee Vehicles | 16 | 337 | 18 | 1 | 0 |
| TOTAL | 127 | 818 | 1,760 | 739 | 136 |
| **Decrease From Baseline** | 45 | 302 | 393 | 135 | 47 |
| **2010** | | | | | |
| Vessels[b] | 41 | 85 | 856 | 582 | 85 |
| Trucks | 32 | 291 | 346 | 11 | 14 |
| Trains | 3 | 8 | 62 | 5 | 1 |
| Terminal Equipment | 21 | 65 | 240 | 6 | 13 |
| Employee Vehicles | 7 | 181 | 11 | 1 | 0 |
| TOTAL | 105 | 630 | 1,510 | 605 | 114 |
| **Decrease From Baseline** | 67 | 490 | 641 | 269 | 69 |

*Notes:*
a. Refer to Appendix I.1, Tables I-67, I-70 through I-77, I-81, and I-82 for detailed calculations. Emissions rounded to three or fewer significant digits.
b. Includes emissions from cruise, maneuvering, and hoteling modes, as well as tug assist emissions. Emissions rounded to three or fewer significant digits.
c. Refer to Appendix I.1, Tables I-67, I-70 through I-77, I-86, and I-87 for detailed calculations. Emissions rounded to three or fewer significant digits.

activities other than dredging, transport, and reuse/disposal (section 5.1.4) would be the same for each of the dredging/reuse/disposal alternatives.

Detailed calculations of dredging, transport, reuse, disposal, and other construction emissions associated with each of the alternatives are provided in Tables I.2-1 through I.2-15 in Appendix I.2. Emissions from each of the 15 potential project alternatives have been ranked in order of air quality preference in Table 8.3-3. Although individual pollutant emissions may in some cases be greater than the next lower-ranked alternative, the ranking is based on total emissions, i.e., total pollutant emissions from a higher-ranked alternative are less than the total emissions from the next lower-ranked alternative. Therefore, alternatives F5 and B4 are the most-preferred and least-preferred alternatives, respectively.

**Table 8.3-3. Comparison of Construction Phase Mitigated Emissions Associated with Each Alternative**

| | Emissions[b] (tons) | | | | | |
|---|---|---|---|---|---|---|
| *Alternative*[a] | *ROG* | *CO* | *$NO_x$* | *$SO_2$* | *$PM_{10}$* | *Total* |
| F5 | 36 | 110 | 275 | 5.9 | 24 | 450 |
| F8 | 38 | 105 | 297 | 6.2 | 26 | 471 |
| F9 | 40 | 121 | 306 | 6.5 | 27 | 500 |
| F4 | 42 | 121 | 333 | 7.1 | 29 | 533 |
| B2 | 42 | 125 | 330 | 7.0 | 29 | 533 |
| F7 | 42 | 139 | 316 | 6.8 | 27 | 531 |
| B5 | 47 | 136 | 371 | 7.9 | 33 | 595 |
| F2 | 47 | 131 | 379 | 8.0 | 34 | 599 |
| F6 | 50 | 153 | 384 | 8.2 | 34 | 629 |
| B1 | 51 | 141 | 408 | 8.6 | 36 | 644 |
| B3 | 51 | 141 | 408 | 8.6 | 36 | 644 |
| B6 | 57 | 155 | 465 | 9.8 | 41 | 729 |
| F1 | 59 | 154 | 490 | 10.3 | 44 | 757 |
| F3 | 59 | 154 | 490 | 10.3 | 44 | 757 |
| B4 | 74 | 188 | 623 | 13.0 | 56 | 953 |

*Note:* a. Alternatives are listed in order of preference from an air quality perspective.
b. All emissions rounded to three or fewer significant digits.

### 8.3.2 Surface Water Resources

***No-Project Alternative***

Water quality parameters would remain the same as they currently exist at both the dredging site and the reuse/disposal sites. Surface water would be controlled through the Port of Oakland's existing stormwater management plan and in compliance with the state of California's general permit for stormwater. Therefore, no impacts are expected under the no-project alternative.

***Alternative B1***

Water quality impacts on the water column from this alternative would be short term, localized, and would not be significant. The reuse/disposal of dredged sediments at New Berth 21, MHEA, and SF-DODS would have transient, localized, and short term impacts on the water column, which would return to ambient conditions.

The impacts of alternatives B2 and B3 would be the same as for Alternative B1 except at SF-DODS, which is not part of this alternative.

*Alternative B4*

The impacts of Alternative B4 would be the same as for Alternative B1 except at SF-DODS, New Berth 21, and NAS Alameda. At SF-DODS, substantially more dredged material would be disposed than under Alternative B1, but this additional volume would not substantively change the water quality impacts. New Berth 21 and NAS Alameda is not part of this alternative, so there would be no impacts.

*Alternative B5*

The impacts of Alternative B5 would be the same as for Alternative B1, excluding the impacts at NAS Alameda and SF-DODS, which are not part of this alternative.

*Alternative B6*

The impacts of Alternative B6 would be the same as for Alternative B1, excluding the impact at NAS Alameda, which is not part of this alternative.

*Alternative F1*

For all the "F" alternatives, the smaller sediment volume (1.7 mcy) dredged from the Outer Harbor Channel compared to the "B" alternatives would reduce the short-term disruption of the water quality in the water column in the area immediately around the dredge.

For the reuse/disposal options, the impacts would be the same as Alternative B1 except that New Berth 21 and NAS Alameda would not be used. Although there are differences in the volume and quality of dredged material for two of the reuse/disposal sites compared to Alternative B1 — a larger volume of cover material and less non-cover material for the MHEA, and a larger volume of SUAD material for the SF-DODS — the impacts from these volumetric changes would not significantly differ from those impacts on the water column described for Alternative B1.

*Alternatives F2 and F3*

The impacts of alternatives F2 and F3 would be the same as for Alternative F1 except that New Berth 21, NAS Alameda, and SF-DODS are not disposal options. These alternatives would be the preferred alternatives. They would have the lowest volume of dredged material and would therefore create the least disturbance at the dredge area. The minimal impacts on SF-DODS would be avoided. Impacts from stormwater runoff would be only from the Vision 2000 Upland (and not New Berth 21) and these would be mitigated to insignificance.

*Alternative F4*

The impact of Alternative F4 would be the same as for Alternative F1, except that New Berth 21 would be used, and all the dredged material placed at the MHEA (7.0 mcy) would be cover quality material (compared to 5.25 mcy cover material and 1.75 mcy non-cover material under F1). The change in the volume of cover material would not have a significant effect on the water column.

New Berth 21 would be included in this alternative, so there would be short-term localized water column impacts at this site. Impacts from stormwater runoff at New Berth 21 would be significant and long term but will be mitigated to a level of insignificance.

*Alternative F5*

The impacts of Alternative F5 would be the same as for Alternative F4, except that the Hamilton site would be substituted for the SF-DODS.

*Alternative F6*

The impacts of alternatives F6 would be the same as for Alternative F4, except that there would be 2.5 mcy of material placed at the Vision 2000 Upland site (not 0.5 mcy), the New Berth 21 site would not be used, and there would be only 3.2 mcy of material disposed at SF-DODS (not 5.2 mcy).

*Alternative F7*

The impacts of Alternative F7 would be the same as for Alternative F6, except that 3.2 mcy would be placed at the Hamilton site instead of disposed at SF-DODS.

*Alternative F8*

The impacts of Alternative F8 would be the same as Alternative F4, except that the Vision 2000 Upland site is not part of this alternative, 0.75 mcy would be placed at NAS Alameda, and only 2.45 mcy would be disposed at SF-DODS (instead of 2.7 mcy).

*Alternative F9*

The impacts of Alternative F9 would be the same as for Alternative F4, except that twice as much material (1.0 mcy) would be placed at the Vision 2000 Upland site (instead of 0.5 mcy) and only 2.2 mcy would be disposed at SF-DODS (instead of 2.7 mcy).

### 8.3.3 Geology and Groundwater

*No-Project Alternative*

Under this option, no dredging would occur, so there would be no dredging-related impacts on sediments. Existing sediment conditions would prevail, as would any existing trends in sediment quality in Oakland Harbor, as influenced by existing and planned measures to control sources of contamination to Harbor sediments. Areas of the Harbor with surface sediments consisting of Younger Bay Muds would continue to show generally higher levels of contaminants than deeper areas where surface sediments consist of Older Bay Muds or Merritt Sands. The benefits of removal of the more contaminated Younger Bay Muds from some areas of the Harbor, which would occur under the other dredging options, would not occur under this option. Sedimentation in the Harbor would continue at existing rates.

*All Project Alternatives*

There would not be great differences among the alternatives with regard to geologic and groundwater impacts. For example, under all of the dredging/disposal alternatives, the greatest

impacts would result from the dredging, which would destabilize channel slopes and undermine pilings and girders. This impact could be mitigated to insignificance. Sediment quality would be improved only in the channel areas that would be widened; this benefit would be slightly greater for the "B" alternatives than for the "F" alternatives because a larger area would be widened under the "B" alternatives. In addition, all of the alternatives would result in beneficial sediment quality impacts at the MHEA.

Based on the ratio of cover to non-cover material at the MHEA, the greatest benefit would occur under alternatives F4, F5, F6, F7, F8, and F9, where all of the 7.0 mcy for this site would be cover material. Alternatives F1, F2, and F3 would be less preferable in terms of the cover to non-cover ratio.

The significant impacts at the New Berth 21 site would occur with alternatives B1, B2, B3, B5, B6, F4, F5, F8, and F9. The insignificant impacts would occur at the SF-DODS with alternatives B1, B4, B6, F1, F4, F6, F8, and F9.

### 8.3.4 Biological Resources

Under all project alternatives except no-project, the biological impacts of dredging would be similar. These include the temporary and insignificant impacts of turbidity and dredging activity on plankton, fish, birds, mammals, and special status species; insignificant toxicity and bioaccumulation due to resuspension of contaminated sediments; and the temporary loss of the benthic community in the dredging area. The impacts of dredging would be identical for all of the "B" alternatives, and for all of the "F" alternatives. The only significant difference between the B and F alternatives is that less of the Outer Harbor would be deepened under the F alternatives, which would avoid the loss of some shallow-water habitat in the shallow shoal area of the Outer Harbor. This would not make a significant difference among the alternatives in terms of biological impacts.

The most important dredged material disposal sites in terms of biological impacts are the MHEA (long-term benefits of habitat enhancement), New Berth 21 (loss of 27 acres of marine habitat), and SF-DODS (adverse but insignificant impacts). It is expected that there would be net benefits from habitat enhancement at the Hamilton and Montezuma projects sites, but these impacts are not directly attributable to the 50-foot project. At the other candidate disposal sites, biological impacts would be minor, assuming impacts to the burrowing owl at the NAS Alameda site could be mitigated.

Considering the large number of candidate disposal sites, and the larger number of combinations of these sites entailed in the various alternatives, it is helpful to group the alternatives for comparison of impacts. In the following evaluation, the alternatives are grouped according to the most important disposal sites in terms of biological impacts, as discussed above. The extent to which impacts at a particular site may vary with disposal volume is not a significant factor when making the gross comparisons in impacts that are the purpose of this section. All of the alternatives include the MHEA, so this site is not a distinguishing feature among the alternatives. It is possible that the potential for toxicological effects at this site may decrease with an increasing ratio of cover to non-cover material, but the potential for these effects is small at any ratio, so this is not considered a significant factor.

*No-Project Alternative*

The no-project alternative would result in no change to existing conditions for the biological resources described in section 4.4. Biological resources would continue to be subject to impacts associated with periodic maintenance dredging, ship movements, and other harbor uses.

The Berth 21 Fill Area and the Middle Harbor Enhancement Area (MHEA) would not be created and direct impacts that would result from a loss of habitat (described in following sections) would not result. Potential impacts associated with use of the other disposal alternatives would not result either.

Under this alternative, biological resources would not experience the benefits that would potentially be generated from the proposed Middle Harbor Enhancement Area.

*Alternatives B1, B6, F4, F8, and F9*

These alternatives are similar in biological impacts because they all would result in the loss of marine habitat at New Berth 21, adverse but not significant impacts at the SF-DODS, and no wetlands restoration (Hamilton or Montezuma). Therefore, these are the least preferable alternatives in terms of biological impacts. The three F alternatives would result in the disposal of substantially less material at the SF-DODS than would the B alternatives.

*Alternatives B2, B3, B5, and F5*

These alternatives are similar to Alternatives F2, F3 and F7, except that they would entail the loss of marine habitat at New Berth 21. They are therefore less preferable than F2/F3/F7 in terms of biological impacts. Alternative B3 includes the Montezuma wetlands project, while the other three alternatives include Hamilton.

*Alternatives B4, F1, and F6*

These alternatives are similar to B1/B6/F4/F8/F9 except they would not result in the loss of habitat at New Berth 21, and are therefore preferable to those five alternatives. Alternative F6 would result in the disposal of the least amount of material at the SF-DODS, while B4 would dispose of the most.

*Alternatives F2, F3, and F7*

These alternatives are similar in their biological impacts because all three would avoid the loss of 27 acres of habitat at New Berth 21 and impacts at the SF-DODS, while contributing to the net biological benefits at either the Hamilton (F2 and F7) or Montezuma (F3) wetland project sites. Therefore, these are the most preferable alternatives in terms of biological impacts. Alternatives F2 and F3 would result in the disposal of less material at the Vision 2000 site and the disposal of more material at the wetlands sites than Alternative F7, but this does not represent a major difference in biological impacts.

*Conclusion*

As discussed above, alternatives F2, F3, and F7 are the most preferable in terms of biological impacts. There is not a significant difference among these three alternatives. The next most preferable group is Alternatives B4, F1 and F6 because they avoid the loss of habitat at New Berth

21, while resulting in adverse but not significant impacts at the SF-DODS and not contributing to wetlands restoration at the Hamilton or Montezuma sites (impacts not directly attributable to this project). Of these alternatives, F6 is the best because it disposes of the smallest volume of material at the SF-DODS. The next most preferable group is alternatives B2, B3, B5 and F5 because these alternatives would result in the loss of habitat at New Berth 21, while avoiding impacts at the SF-DODS and contributing to benefits at the Hamilton or Montezuma wetlands sites. There are no significant differences among these four alternatives. The least preferable group is Alternatives B1, B6, F4, F8 and F9 because these alternatives would result in the loss of habitat at New Berth 21 and the adverse but not significant impacts at the SF-DODS, while not contributing to wetlands restoration at the Hamilton or Montezuma sites. Of these alternatives, the F alternatives are slightly preferable to the B alternatives because they would result in the disposal of less material at the SF-DODS.

### 8.3.5 Cultural Resources

Implementation of any of the alternatives except for Alternatives B3 and F3 would have no effect on cultural resources because of the dredging.

*No-Project Alternative*

The no-project alternative would have no impact on cultural resources.

*Alternatives B1, B2, B4, B5, B6, F1, F2, F4, F5, F6, F7, F8, and F9*

Alternatives B1, B2, B4, B5, B6 and F1, F2, F4, F5, F6, F7, F8, and F9 would have no impact on cultural resources. These alternatives would thus be preferred with respect to minimizing effects to cultural resources.

*Alternatives B3 and F3*

Alternatives B3 and F3 include the Montezuma Wetlands site, where there could be potential significant but mitigable impacts on cultural resources at this site. However, these impacts, which would occur during site development at Montezuma, would not be attributable to the 50-foot project.

### 8.3.6 Socioeconomics

*No-Project Alternative*

The no-project alternative would result in the continuation of Port operations under current conditions without deepening of the Harbor and turning basins. The Port would be expected to continue handling the current level of container movements (approximately 849,000 in 1995, the base year for the economic analysis). The number of direct and induced jobs associated with Port activities would remain unchanged at about 14,127. Total business revenues would be about $702.3 million (1995 dollars) annually through 2010. State and local tax revenues would continue at approximately $88.8 million for the planning horizon. This alternative would have no immediate direct impacts, adverse or beneficial, on the regional economy. However, it should be noted that if the Port does not deepen its channels, the long-term economic effects could be severe. The Port of Oakland would likely become a second-tier port, used only by smaller, older vessels. Eventually, these calls may decline as the ocean carriers phase these older vessels out of service. As indicated in section 1.1.2, two major ocean carriers have already stopped deploying their large,

post-Panamax vessels to Oakland. At worst, international ocean carriers would bypass the Port of Oakland entirely, using only trade gateway ports in the Seattle/Tacoma and Los Angeles/Long Beach regions. Cargo destined to or from the San Francisco Bay Area would be shipped by truck or rail via these trade gateways, causing roadway and rail traffic congestion and other environmental problems. The resulting loss of shipping operations would cause the long-term decline of jobs associated with Port usage and activities. The long-term economic effects of this alternative would adversely affect the regional economy.

*Alternatives B1, B2, B4, B5, B6, F1, F2, F4, F5, F6, F7, F8, and F9*

Under these alternatives, the proposed deepening of the harbor and turning basins would accommodate larger vessels, which could transport more containers. The increased container-handling capacity of the Port would directly translate into minor increases in the capabilities of the Port to handle additional container traffic. These alternatives would generate an 11 percent increase in the number of containers which would be handled at Port facilities, or about 940,300 per year. The growth in container movement would generate about 1,909 new jobs; of these, 1,193 would be directly related to Port operations and 716 would be induced through spending activities of new employees. Total personal income would increase by almost $93.8 million above 1995 and no-project levels. Total business revenue from Port maritime operations would increase to $1,434 million, a 13 percent rise over 1995 and no-project levels. State and local taxes would increase to about $100.8 million. These project impacts are considered beneficial economic effects.

In addition to the direct increases in container movement, the proposed deepening would facilitate a substantial increase in container movements in conjunction with other Port projects such as the Joint Intermodal Terminal and construction of new marine container terminals. The overall increase in Port container throughput and the resulting effects on the regional economy are discussed in section 5.6. These would be indirect beneficial impacts resulting from the proposed deepening project.

*Alternatives B3 and F3*

The impacts for alternative B3 and F3 would be the same as for the other alternatives except for the following difference. The reuse/disposal options for this alternative include the disposal of dredged materials at the Montezuma site. Selection of this site would generate fees paid for the use of the site, incrementally increasing revenues for Solano County. This would be a beneficial economic impact that would not occur under the other alternatives that do not include this site.

### 8.3.7 Transportation

***Vessel Transportation***

*No-Project Alternative*

If the proposed dredging did not take place, the newer, larger vessels could not enter the Port of Oakland while fully laden without experiencing substantial tidal delays. This would constitute an unreasonable delay to commercial vessels plying their trade and, as such, would be considered a significant impact. The expected decline in container vessels calling at the Port under the no-project alternative is shown in Table 8.3-4.

**Table 8.3-4. Number of Average Size (DWT) of Container Vessels Calling at Port of Oakland (No-Project Alternative)**

| *TEU* | 1996 | | 2003 | | 2010 | |
|---|---|---|---|---|---|---|
| *Range* | *Vessel Calls* | *% of Total* | *Vessel Calls* | *% of Total* | *Vessel Calls* | *% of Total* |
| > 5,000 | 49 | 3.0 | -0- | 0 | -0- | 0 |
| 4,000 to 5,000 | 119 | 7.3 | 258 | 20 | 205 | 20 |
| 3,000 to 4,000 | 396 | 24.3 | 582 | 45 | 665 | 65 |
| 2,000 to 3,000 | 577 | 35.4 | 258 | 20 | 154 | 15 |
| < 2,000 | 489 | 30.0 | 194 | 15 | -0- | 0 |
| Total | 1,630 | 100 | 1,292 | 100 | 1,024 | 100 |

*All Project Alternatives*

Impacts would be comparable for all alternatives, since the impacts associated with dredging do not vary with the alternative, and the only significant impact identified with the reuse/disposal options is associated with the MHEA, which is common to all alternatives. Under all of the alternatives, there would also be a beneficial impact: the deeper channels would allow the deeper-draft ships to enter and exit the Port fully laden, eliminating tidal delays. This would improve the efficiency of vessel transportation in the Port of Oakland.

***Ground Transportation***

*No-Project Alternative*

There would be no impacts on ground transportation from the no-project alternative.

*All Project Alternatives*

The ground transportation impacts would be the same regardless of the alternative. Under any alternative, the majority of the sediment would be transported to reuse/disposal sites by water; therefore, the ground transportation impacts of the proposed project would be negligible. Ten (10) trips or less would be generated by project-related employees during both the commute peak hours. A smaller number of trips could be generated at each of the disposal areas by landside inspectors.

Since the significant traffic impacts are associated with only one of the disposal options — the Various Landfills option — and since this disposal option is a constant under all the alternatives, the traffic impacts would be the same regardless of the alternative. Disposal of sediment at any of the three landfills under consideration would cause significant impacts. Mitigation measures include minor improvements at intersections, when necessary, along the routes to the Altamont and Vasco Road landfills and restrictions on the hours that sediment could be hauled to the Redwood Landfill. The mitigation measures described in section 5.7 would reduce transportation impacts to less than significant levels.

*Port Operations after the Proposed Deepening*

In 2003, when the dredging project would be completed, there would be no significant impacts created by the additional container traffic on local intersections or freeway segments. In 2010, the impacts of the additional container traffic would be significant at two intersections in the Port

area. Impacts at the 7th Street/7th Street Extension intersection could be mitigated, if necessary, by adding a second southbound left turn lane. The impacts at the 3rd Street/Adeline Street intersection could be mitigated, if necessary, by changing the existing lane assignment and modifying the signal phasing. These mitigation measures would reduce the transportation impacts to less than significant levels.

### 8.3.8 Noise

Under all the dredging/disposal alternatives, the significant and unavoidable as well as the significant but mitigable impacts associated with proposed dredging and pile driving would occur at Alameda sensitive receptors (see section 8.2.8).

*No-Project Alternative*

Under the no-project alternative, no dredging would occur. Therefore, the identified impacts associated with proposed dredging (section 8.2.8) would not occur. Existing noise levels associated with loading/unloading activities at existing berths would continue. Port-related noise generated along truck routes, railroad facilities, and vessel routes would also continue to be the same.

*Alternatives B1, B2, and F8*

Under Alternatives B1, B2, and F8, the significant but mitigable noise impact associated with the NAS Alameda site would occur. Other disposal sites associated with these alternatives were determined to have adverse but not significant impacts.

*Alternative B3*

The noise impacts under Alternative B3 would be the same as under alternatives B1, B2, and F8, except for the following difference. Alternative B3 would have one additional significant but mitigable impact due to use of the Montezuma Wetlands Restoration site, but this impact would not be attributable to the proposed project.

*Alternatives B4, B5, and B6*

Adverse but not significant noise impacts would occur at the disposal sites associated with these alternatives.

*Alternatives F1, F2, F4, F5, F6, F7, and F9*

Adverse but not significant noise impacts would occur at the disposal sites associated with these alternatives.

*Alternative F3*

Alternative F3 would have one significant but mitigable impact due to use of the Montezuma Wetlands Restoration site, but this impact would not be attributable to the proposed project. Other disposal sites associated with this alternative were determined to have adverse but not significant impacts.

### 8.3.9 Human Health and Risk

*No-Project Alternative*

Under the no-project alternative, no impacts on human health would be expected. As long as the channel sediments are not disturbed, people would not come into contact with them, and no adverse health effects can result.

*All Project Alternatives*

As explained in section 8.2.9, management of contaminated sediment is required under any of the project alternatives. This is reflected in the fact that all alternatives include use of the Vision 2000 Upland site. The only difference between the alternatives is that alternatives B1 through B6 require the handling of a somewhat greater volume of sediment compared to alternatives F1 through F9, including approximately 1 mcy of slightly contaminated material. Thus contaminated sediment would need to be handled for a proportionately longer time under alternatives B1 through B6, which may have a slight effect on the overall potential human health risks. To minimize potential human exposures, alternatives F1 through F9 would therefore be preferred to alternatives B1 through B6.

Alternative F8 does not require the use of the Vision 2000 Upland site as a reuse location, which appears to make it the preferred alternative due to the potential minor adverse impact associated with use of the Vision 2000 Upland site. However, the potential impact associated with the Vision 2000 Upland site is due to the presence of the rehandling facility at this location. If the Vision 2000 Upland is eliminated, the rehandling facility would have to be located elsewhere, which would then create the same type of impact at that location. The total potential human health impacts resulting from disposal of contaminated dredged material would not change with the selected reuse/disposal option, only with the quantity and quality of the dredged material. In this regard, all the "F" alternatives are equivalent and would be preferred in terms of human health.

### 8.3.10 Hazardous Materials and Contaminated Wastes

*No-Project Alternative*

Under the no-project alternative, the long-term benefit of removing highly contaminated sediments from the Inner Harbor turning basin would not occur. The negligible impacts associated with disposing of contaminated sediment at the Vision 2000 Upland area or the Various Landfills option also would not occur. The growth in cargo would be somewhat slower and thus total hazardous materials transferred through the Port would be somewhat less than with the project.

*All Project Alternatives*

All alternatives would result in the same cargo throughput, and thus the same shipping rates of hazardous materials. The impacts associated with contaminated wastes would therefore be the same for all the alternatives. The removal of the highly contaminated sediments from the Inner Harbor turning basin, which would occur under any of the alternatives, would be a long-term beneficial impact. There would be two significant but mitigable impacts associated with the rehandling facility at the Vision 2000 Upland site (see section 8.2.10), which would occur under

any of the alternatives. All of the project alternatives would result in the same cargo throughput, and thus the same hazardous materials shipping rates.

All alternatives would have the same disposal quantity under the Various Landfills option. All alternatives also require management of the contaminated sediment. The contaminated sediment would be determined to be non-soluble and non-mobile before it could be placed at a reuse site, or special precautions would be required before the material was reused. Because the contaminated sediment is the same for all alternatives, the potential impact is the same for all alternatives.

### 8.3.11 Public Services

*No-Project Alternative*

There would be no impact on public services from the no-project alternative.

*All Project Alternatives*

The same types of impacts on public services would occur under any of the alternatives and they would be due only to the dredging; the choice of reuse/disposal options would thus have no effect on these impacts. The significant impacts include damage to the anode platforms and cables associated with the BART cathodic protection system, which would need to be replaced; and the need to relocate the existing 16-inch sanitary sewer force main that crosses Inner Harbor to the former NAS Alameda. Both impacts could be mitigated to insignificance.

Under the "F" alternatives, the impacts on public services would be the same as described above, with one exception. A smaller portion of the cables associated with the BART cathodic protection system would be impacted due to the reduced channel widening that would occur under this option. The impact would remain significant but mitigable.

### 8.3.12 Land Use

*No-Project Alternative*

The no-project alternative would avoid the need to take land for construction of the Inner Harbor turning basin. However, the proposed habitat enhancement at the MHEA and associated beneficial impact of providing additional land for public access and open space would not be realized under this alternative.

*All Project Alternatives*

No significant impacts are associated with the proposed dredging in the Inner Harbor (section 8.2.12).The dredging-related impact would be unavoidable, although the City of Alameda and Beery would be appropriately compensated for the loss of this land. At any of the reuse/disposal sites, land use impacts would be either insignificant (NAS Alameda, SF-DODS) or no impact (all other reuse/disposal sites). The only beneficial impacts would occur at the MHEA (providing additional land for public access, habitat mitigation, and open space), which is a part of all the alternatives. For these reasons, none of the alternatives would be clearly preferable from the perspective of land use impacts, although those alternatives that avoided the insignificant impacts at NAS Alameda and SF-DODS (alternatives B5, F2, F3, F5, and F7) could be considered marginally preferable.

### 8.3.13 Visual Resources

*No-Project Alternative*

The beneficial visual impacts associated with the MHEA would not be realized under this alternative.

*All Project Alternatives*

There would be no significant impacts from any of the project alternatives.

# 9.0 CUMULATIVE IMPACTS

## 9.1 DESCRIPTION OF CUMULATIVE PROJECTS

An EIS/R must discuss cumulative impacts when they are significant and, when not significant, the document should explain the basis for that conclusion. Cumulative impacts are defined as two or more individual effects that, when considered together, are considerable or that compound or increase other environmental impacts. Individual effects may be changes resulting from a single project or a number of separate projects. Cumulative effects from several projects are the change in the environment that results from the incremental impact of the project when added to other closely related past, present, and reasonably foreseeable future projects. Cumulative effects can result from individually minor but collectively significant projects occurring over the lifetime of the project under consideration.

The National Environmental Policy Act (NEPA) defines cumulative effects as:

> The impact on the environment which results from the incremental impact of an the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions (40 CFR 1508.7).

Cumulative effects analysis is an emerging discipline, and the continuing challenge of this analysis is to focus on the important cumulative issues, recognizing that a better decision, rather than a perfect cumulative effects analysis, is the goal of NEPA. Determining the threshold beyond which cumulative effects significantly degrade a resource, ecosystem, and human community is often problematic, as no definitive thresholds for cumulative analysis exist. Ultimately, however, cumulative effects analysis under NEPA should be incorporated into the agency's overall environmental planning and the regional planning of other federal agencies and stakeholders (CEQ 1997).

The following description is adapted largely from the FISCO/Vision 2000 Final EIS/R (U.S. Navy and Port of Oakland 1997b). The analysis of cumulative impacts must include regional effects in addition to potential cumulatively significant localized effects. The region considered in this analysis is the East Bay. The proposed project would be implemented concurrently with other nearby military base closure and reuse activities, such as at Naval Air Station (NAS) Alameda. In addition, other major nonmilitary projects in the more immediate region of the project that could contribute to locally cumulative impacts are considered.

The methodology used to develop the cumulative analysis included discussing potential future projects with the City of Oakland, Port of Oakland, and City of Emeryville and compiling a list of ongoing and proposed specific projects near the project site that could reasonably contribute to cumulative impacts.

### 9.1.1 Projects Initially Considered but Eliminated from the Cumulative Impact Analysis

Projects in the City of Oakland that were initially considered but eliminated from the cumulative impacts analysis include the following:

- Oakland-Alameda County Coliseum Complex – Arena Increased Seating Capacity (Draft EIR released for public review on February 14, 1996);
- Dreyers Headquarters Expansion Project (Final EIR approved by the City of Oakland Planning Commission on February 7, 1996);
- The Chabot Observatory and Science Center Project (Final EIR approved by the City of Oakland Planning Commission in 1995);
- The Caltrans Cypress Freeway Rebuilding Project; and.
- Replacement of the eastern span of the Bay Bridge.

The Oakland-Alameda County Complex (located approximately 6.5 miles east of FISCO), Dreyers Headquarters (located approximately 4.5 miles northeast of FISCO), and the Chabot Observatory (located about 13 miles east of FISCO) were all determined to be too far away to have cumulative impacts when considered with the proposed project and were therefore eliminated from further cumulative impacts analysis. The Caltrans Cypress Freeway Rebuilding Project was also not considered in the cumulative analysis because it will be completed (including construction of all new onramps) in 1998, well before the proposed project begins construction. Finally, the proposed replacement of the eastern span of the Bay Bridge was not considered in the cumulative analysis because details of this project have not been defined and construction of the proposed project is expected to be completed before construction of Bay Bridge replacement begins.

No other major development projects in the City of Oakland are proposed that would result in significant cumulative impacts in conjunction with the proposed project.

### 9.1.2 Projects Considered in the Cumulative Impact Analysis

A list of the projects considered in the cumulative impact analysis is presented in Table 9.1-1 and their location is shown on Figure 9.1-1.

Of particular importance to the cumulative impact assessment are two projects proposed by the Port: the Berth 55-58 project and the Joint Intermodal Terminal (JIT) project. These two projects are shown as items 15 and 16 in Table 9.1-1 and Figure 9.1-1. The proposed deepening project and these two projects would occur close together in time and space. The relative timing of the 50-foot project, the Berth 55-58 project, the JIT, and other related Port projects (Terminal 59 and Berth 21) are shown on Figure 9.1-2. The Berth 55-58 project and the JIT are part of the Port's Vision 2000 Program. The impacts of the berth and JIT projects were considered in a programmatic sense in the Vision 2000 Program EIS/R (U.S. Navy and Port of Oakland 1997b). Analysis of this dredging project was considered in the cumulative analysis for Vision 2000; that document was approved by the Port Board of Commissioners on September 2, 1997. These two projects are closely related to the Port's effort to modernize Oakland Harbor and completion of these projects would make the Port more competitive with other west coast ports. For these reasons, the Berth 55-58 project and the JIT are described in more detail below than the other projects considered in the cumulative analysis.

The time frame for evaluating the cumulative impacts of the proposed deepening with all of the projects listed in Table 9.1-1 is the 4-year period of the proposed dredging and reuse/disposal activities (early February 2000 to early February 2004), since this is the period of maximum impact

**Table 9.1-1. Foreseeable Projects**
(page 1 of 4)

| *Reference Number in Figure 9.1-1* | *Project Name* | *Project Size* | *Historical Uses* | *Project Description* | *Completion Date of Planning Document* | *Projected Completion Date* | *Historical Population* | *Projected Future Population* | *Net Population Change* |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Buildout of Oakland Comprehensive Plan | Variable | Civilian urbanized | Infill and redevelop urbanized areas | 1992 | 2005 | 356,200 in 1990 | 370,900 in 2005 | 14,700 |
| 2 | NAS Alameda/ FISC Annex | 2,842 acres | Military | Reuse property for civilian residential and nonresidential purposes | January 1996 | 2020 | 5,736 | 21,939-28,097 | 16,203-22,361 |
| 3 | Port of Oakland Site "B" Project | 9 acres | Vacant and parking lot | Develop 250-300 medium density residential units along Oakland Inner Harbor, southeast of Alice Street | November 1996 | December 1999 | 0 | 600-700 | 600-700 |
| 4 | Port of Oakland Development Recreational Boathouse | 1 acre | Recreational area at Estuary Park | Construct boathouse along Oakland Inner Harbor for storage, maintenance, and operation of recreational watercraft for club and individual sports | Unknown | Unknown | 0 | 0 | 0 |
| 5 | Port of Oakland – Buildout of Jack London Square Master Development Plan – Phase 1 | <1 acre (Hotel site) | KTVU-2 television station, Gallagher's Restaurant | Occupancy of vacant retail space along Water Street and ground floor of Washington Street Parking Garage along Embarcadero | 1998 | Unknown | 0 | 0 | 0 |

**Table 9.1-1. Foreseeable Projects**
(page 2 of 4)

| *Reference Number in Figure 9.1-1* | *Project Name* | *Project Size* | *Historical Uses* | *Project Description* | *Completion Date of Planning Document* | *Projected Completion Date* | *Historical Population* | *Projected Future Population* | *Net Population Change* |
|---|---|---|---|---|---|---|---|---|---|
| 5 | Port of Oakland – Buildout of Jack London Square Master Development Plan – Phase 1 | | | Development of mid-rise hotel (up to 200 rooms) adjacent to 530 Water Street and office and restaurant or retail development at southwest corner of Broadway/ Embarcadero | | | | | |
| 6 | Port of Oakland – Jack London Square Marina | | Marina and public access | Moderate dredging and berth reconstruction, public access walkway/ promenade between Jack London Village and Webster Street pier and new Harbor Master's office | January 1994 | 1999 | 0 | 0 | 0 |
| 7 | Port of Oakland Berth 22 Extension Project | 26 acres | Port berth | Fill 26 acres to extend Berth 22 | Uncertain | 2002-2007 | 0 | 0 | 0 |
| 8 | Oakland Army Base | 422 acres | Military | Currently unknown civilian reuse of base | Uncertain | Uncertain | Uncertain | Uncertain | Uncertain |
| 9 | Treasure Island/Yerba Buena Island | 558.7 acres | Military | Currently unknown civilian reuse of island | 1996-1997 | Estimated 2010-2020 | | Unknown | Unknown |

**Table 9.1-1. Foreseeable Projects**
(page 3 of 4)

| *Reference Number in Figure 9.1-1* | *Project Name* | *Project Size* | *Historical Uses* | *Project Description* | *Completion Date of Planning Document* | *Projected Completion Date* | *Historical Population* | *Projected Future Population* | *Net Population Change* |
|---|---|---|---|---|---|---|---|---|---|
| 10 | Redevelopment of Alameda Encinal Terminal | Approx. 35 acres | Civilian marine terminal | Preliminary planning for a 360,000-square-foot research and development facility | Planning work ongoing (1997) | 2000 | 0 | Unknown | Unknown |
| 11 | Buildout of Alameda General Plan | Mostly small develop-ments less than 100 acres | Civilian urbanized | Development and infill of existing parcels and some redevelopment of existing urbanized area | 1991 | 2010 | 74,139 in 1990 | 81,400 in 2010 | 7,261 |
| 12 | Chiron Life Sciences Research Center | 24 acres | Warehouse/ retail | 2,200,000 square feet for corporate headquarters and biotechnology research | 1995 | 2005 | 0 | 0 | 0 |
| 13 | South Bay Front | 25 acres (5 acres in Port of Oakland jurisdiction) | Warehouse/ retail | 750,000 to 1 million square feet of commercial, retail, and entertainment. Possible office, hotel, and 100 to 250 housing units | end of 1997 | Unknown | 0 | Estimated at 200 to 300 | 200-800 |
| 14 | Pixar Corporation Headquarters | 15 acres | Warehouse/ retail | 500,000 square-foot office development for corporate headquarters | 1997 | Construction began in fall 1997 | 0 | 0 | 0 |
| 15 | Port of Oakland Berth 55-58 Project | 240 acres | FISCO property | Construct four new berths (Berths 55, 56, 57, and 58) | 1998 (expected) | 2001 | 0 | 0 | 0 |

**Table 9.1-1. Foreseeable Projects**
(page 4 of 4)

| *Reference Number in Figure 9.1-1* | *Project Name* | *Project Size* | *Historical Uses* | *Project Description* | *Completion Date of Planning Document* | *Projected Completion Date* | *Historical Population* | *Projected Future Population* | *Net Population Change* |
|---|---|---|---|---|---|---|---|---|---|
| 16 | Port of Oakland Joint Intermodal Terminal (JIT) | 150 acres | FISCO property | Construct a joint intermodal terminal to consolidate the UP, SP, and BNSF rail yards | 1998 (expected) | 2010 | 0 | 0 | 0 |
| 17 | Port of Oakland Terminal 59 | 45 acres | FISCO property | Develop the backland behind future Terminal 59 to be used as dryland for containers associated with future Berths 57 and 58 | 2001 | 2002 | 0 | 0 | 0 |
| 18 | Port of Oakland Berth 21 | 27 acres | Oakland Army Base | Develop new Berth 21 | 2002 | 2003 | 0 | 0 | 0 |

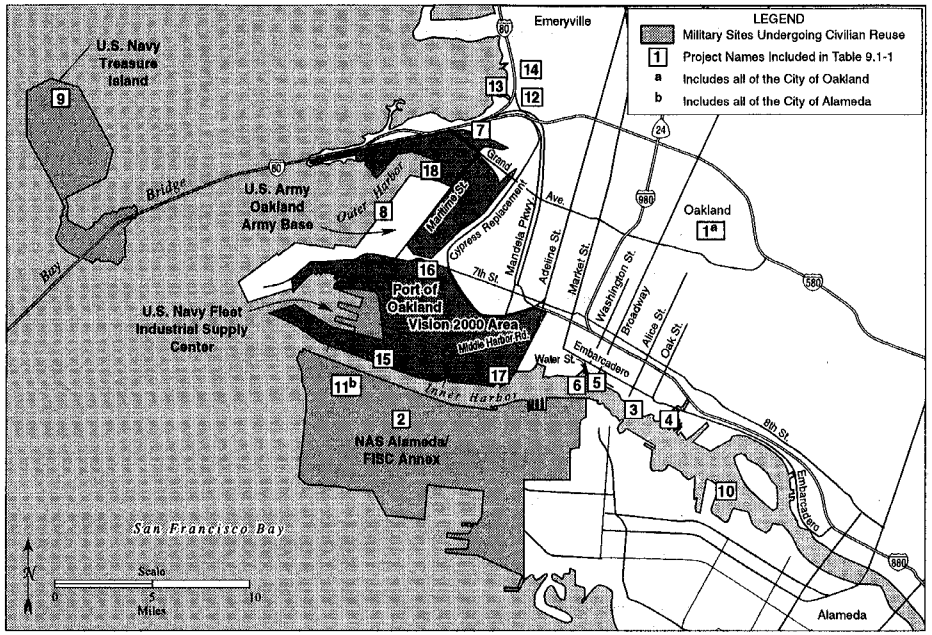



**Figure 9.1-1**

**PROJECTS CONSIDERED IN THE CUMULATIVE IMPACT ANALYSIS**

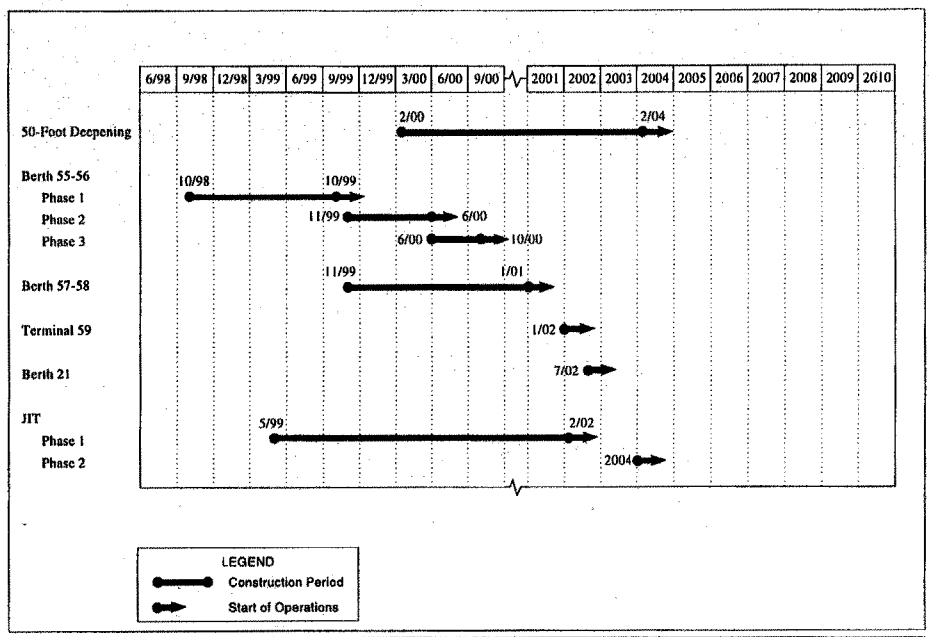



**Figure 9.1-2**

**TIMING OF PROPOSED 50-FOOT PROJECT AND OTHER RELATED PORT PROJECTS**

of the proposed project. After the dredging and reuse/disposal activities are completed, the impacts of the proposed project would be much less — essentially limited to the impacts of the additional vessel traffic that the deeper channels in Oakland Harbor would allow (including the secondary impacts on additional container throughput traffic that the additional vessels would generate).

*Berth 55-58 Project*

The Port is proposing to construct four new berths and associated marine terminals, and a new tug boat wharf. The berths are referred to as Berth 55 through 58, and would be located along the Oakland Inner Harbor (Figure 9.1-1). The marine terminals are the land area immediately north of the proposed berths, in the area of the former Fleet and Industrial Supply Center Oakland (FISCO). The proposed berths would be located along what is currently the UP intermodal railyard on the south side of FISCO. The construction of the new berths and marine terminals would provide capacity sufficient to support the growth in cargo coming through the existing Port facilities. The project would involve the following components:

- Demolition of the existing FISCO wharves in the Middle Harbor;
- Relocation of existing cargo support activities at the Harbor Transportation Center at FISCO;
- Construction of:
  - A dike in Middle Harbor;
  - Approximately 5000 linear feet of wharf space;
  - 230 acres of marine terminal yards in 50- to 100-acre phases;
  - A 550-foot long tug wharf to replace the existing tug boat facility at Berth 40;
  - 31 acres of new public access improvements along the Middle Harbor shoreline from existing Port View Park to the Union Pacific Railroad Mole.
- Construction and operation of a dredged material rehandling facility in the Vision 2000 Upland area.
- Modifications to the Inner Harbor bank:
  - Cut and excavation of approximately 6,500 linear feet of the Inner Harbor bank (including approximately 950 linear feet associated with non-berth channel construction);
  - Dredging and deepening of approximately 6,500 linear feet of the Inner Harbor bank to 44 feet below mean lower low water (MLLW);
- Placement of fill:
  - 31.5 acres (1.7 mcy) of solid fill behind a dike in the Middle Harbor;
  - 1.0 to 2.0 mcy of fill on FISCO to raise grades prior to the construction of the new marine terminals;
  - 0.75 to 1.0 mcy of fill at the proposed JIT to raise grades for the construction of the new JIT;
  - About 0. 50 mcy of sandy fill at Galbraith Golf Course to construct the drainage sublayer required for reconstruction of the golf course;

- Installation of eight to twelve 100-foot gauge container cargo cranes along the face of the wharf;

- Road improvements:
  - Road access from 7th Street to new marine terminals and Point Arnold; and,
  - Realignment of the existing Middle Harbor Road.

The Berth 55-58 project would be constructed in phases. The initial phase is scheduled to begin in October 1998 and would include construction of the dike in Middle Harbor, creation of the rehandling facility, the bank cut and dredging/deepening along the Inner Harbor bank, placement of fill on FISCO and in Middle Harbor, placement of fill at the JIT, and delivery of sand to Galbraith Golf Course. Berths 55-56 and the first portion of the new terminal land area (approximately 50 acres) would be constructed as soon as the bank cut has proceeded sufficiently far to allow berth construction to begin. Berths 55-56 and the initial 50 acres of terminal area are expected to be completed by October 1999. Berths 57-58 and an additional 50 acres of terminal area would begin construction immediately following the completion of Berths 55-56. Construction of the additional land area would be completed by June 2000. An additional 28 acres of terminal area at Berths 55-56 would be constructed between June and October 2000, completing the full build-out of the marine terminal area at Berths 55-56. Berths 57-58 are expected to be completed by January 2001 and include 100 acres of new marine terminal area.

*Joint Intermodal Terminal*

The Joint Intermodal Terminal (JIT) project is the development of a railyard consisting of a series of railroad tracks, an access gate, and support structures to facilitate the transfer of containers from ship to rail for national distribution. The JIT is part of the Vision 2000 Program that has been designed by the Port of Oakland to increase capacity and improve efficiency of integrated intermodal cargo transportation services throughout the Port. Phase 1 of the new JIT would cover about 150 acres in the northern portion of the former FISCO property. Approximately 100 structures would be demolished for the development of the JIT. Prior to demolition, all buildings on the site would be remediated. Demolition activities have already begun, and would be phased for the different stages of the JIT development.

There are currently two intermodal railyards in the Port area: one is the Union Pacific (UP) yard, south of FISCO; the other is the former Southern Pacific (SP) yard, north and northeast of FISCO. The existing UP yard is proposed to be converted to wharves and marine terminals as part of the construction of Berths 55 through 58. As a result of the UP/SP merger, UP/SP operations can be consolidated at the former SP yard. Both existing intermodal railyards are located on property leased from the Port. The other intermodal rail yard in the Bay Area is currently located in Richmond, and serves the Burlington Northern/Santa Fe (BNSF) railroad, another recently merged railroad.

The construction of the proposed JIT has been divided into two major phases: Phase 1 would create a new yard to allow the BNSF to move its operations from Richmond into the Port of Oakland, and Phase 2 would connect this new yard to the existing UP/SP yard, further streamlining operations. All the time of writing this EIS/R, the Port has committed to constructing only Phase 1 of the JIT development. The full build-out of Phase 1 would consist of four new sets of tracks (each set contains two parallel tracks) ranging from 3,500 to 6,500 feet in length. Three of the tracks would be working tracks; the fourth track would be a service track. During the construction of Phase 1, up to 2 feet of fill would be placed over the existing grade at

the JIT. The fill would consist of dredged material or material generated as a result of the wharf construction at Berths 55 through 58. The full Phase 1 build-out would cover approximately 150 acres.

In Phase 2, the working tracks constructed in Phase 1 would be lengthened and connected to existing trackage at the UP/SP yard. The specific plans and timing for the Phase 2 build-out are uncertain at this time. Tentatively, the three track extensions would be built individually — in approximately 2005, 2008, and 2010 — with the full JIT being operational by the end of 2010.

*City of Emeryville Projects*

Projects that would be located in the City of Emeryville that are considered in the cumulative impact analysis include:

- Chiron Life Sciences Research Center;
- South Bay Front; and
- Pixar Corporation Headquarters.

The three projects are all located within approximately 2 to 2.5 miles northeast of the project site. These projects are described in more detail in Table 9.1-1.

Additional sources were used to identify reasonably foreseeable projects because the general plans for the area do not include some of the most recent land use proposals nor proposals for surrounding jurisdictions. The projects listed in Table 9.1-1 were considered with the proposed project to prepare the following cumulative analysis.

## 9.2 CUMULATIVE IMPACT ANALYSIS

### 9.2.1 Air Quality

Air quality emissions from dredging, transport, reuse, disposal, and other construction activities during the construction period will not contribute to a significant cumulative impact under the standards set forth in the BAAQMD CEQA Guidelines, which are adopted as the significance criteria for analyzing construction impacts in this EIS/R. Furthermore, it is expected that annual average emissions during the 4-year construction period will be less than the *de minimis* levels used to establish conformity of the project. By definition, if a project is found to be in compliance with the Section 176(c), 40 CFR 93 Subpart B rules for determining General Conformity, the project would not (1) cause or contribute to any new ambient air quality standard violation, (2) increase the frequency or severity of any existing standard violation, or (3) delay timely attainment of any standard. However, operational emissions from *new* sources of emissions such as increased vessel activity, cargo handling, land-side cargo transport (by trucks and trains), and new employee commute mileage allowed by the completion of the channel deepening would be affected in a cumulative manner by the concurrent emissions from other projects in the area. As previously shown in section 5.1.5, project operation emissions would exceed the BAAQMD significance thresholds of 80 pounds per day and 15 tons per year for $NO_x$ and $SO_x$ in 2003. By 2010, these thresholds would be exceeded for ROG, $NO_x$, $SO_x$, and $PM_{10}$ (Table 9.2-1). The cumulative impact of project emissions with emissions from other projects could cause the significance thresholds to be exceeded for all pollutants during the entire period of project operation (beginning in 2001

**Table 9.2-1. Summary of Significant Cumulative Impacts and Mitigation Measures**
(page 1 of 4)

| *Resource Area* | *Significant Cumulative Impact* | *Mitigation Measure* | *Significance after Mitigation* |
|---|---|---|---|
| Air Quality | Increases on ROG, $NO_x$, $SO_x$, and $PM_{10}$ emissions from the new vessel, truck, train, and terminal sources that would be allowed by the channel deepening and other cumulative projects would exceed BAAQMD significance thresholds of 80 pounds/day and 15 tons/year. | • Refer to Table 5.1-11 in section 5.1.5 for a list of proposed air quality mitigation measures.<br>• Continue to implement and evaluate effectiveness of operations-related mitigation measures.<br>• Participate in regional and local air quality planning programs.<br>• Support long-term air quality planning and mitigation efforts through the Port of Oakland proposed long-term air quality program. | Significant |
| Surface Water | Turbidity impacts could occur if dredging and filling for the Berth 55-58 project overlaps with the 50-foot project in the same vicinity. | • Dredge the 50-foot project at a location sufficiently distant from contemporaneous dredging in the Berth 55-58 area.<br>• Alternatively, mitigate by choice of appropriate dredging equipment. | Not significant |
| Biological Resources | Loss of deep-water marine habitat | Fastland would be excavated as part of the Berth 55-58 project if that project is approved. | Not significant |
| | Disturbance of roosting, nesting or foraging by birds. | To minimize conflicts between wildlife and public access,<br>• Active uses shall occur near Point Arnold. Only passive recreation, individual, and organized interpretative education activities shall occur on the U.P. Mole.<br>• A vegetative, passive access buffer shall be provided along the north side of the U.P. Mole and shall be designed to restrict human and domestic animal access to sensitive shoreline areas. | Not significant |

**Table 9.2-1. Summary of Significant Cumulative Impacts and Mitigation Measures**
(page 2 of 4)

| *Resource Area* | *Significant Cumulative Impact* | *Mitigation Measure* | *Significance after Mitigation* |
|---|---|---|---|
| Biological Resources | Disturbance of roosting, nesting or foraging by birds. | • Only non-motorized vessel access shall be authorized within the MEHA and no vessel access shall occur in the area within the U.P. Mole as defined within the MEHA Final Concept Plan.<br>• Maintenance of barrier vegetation, interpretative facilities and signage, as well as necessary modification to buffer designs to ensure successful access restrictions shall be provided for through the parkland or refuge management financing program.<br>• Upland buffering has been incorporated to protect sensitive bird loafing and roosting areas along the northern shore of the U.P. Mole. | Not significant |
| Cultural Resources | Loss of historic property through demolition and reuse of military and non-military property and if the former Todd Shipyard is determined to be eligible for the National Register of Historic Places and if the expansion of the Inner Harbor turning basin significantly impacts that shipyard. | Enter into Memoranda of Agreement (MOAs) with the State Historic Preservation Office (SHPO) and Advisory Council on Historic Preservation (ACHP) for the recordation, partial preservation, and public interpretation of and access to remnants of affected resources as well as data recovery. | Not significant |
| Ground Transportation | In the year 2000, the impacts from cumulative construction would be the same as for construction of the proposed project. See Table S-2 for a summary of impacts. | The mitigation measures for cumulative construction would be the same as for construction of the proposed project. See Table S-2 for a summary of mitigation measures. | Not significant |
| | In the year 2003, the 3rd Street/Adeline Street intersection would operate at LOS F during the morning and evening peak hours. | As necessary, at the 3rd Street/Adeline Street intersection, convert the eastbound and westbound combination thru-left turning lanes to exclusive left turn lanes and run permitted left turn phasing instead of split phasing. | Not significant |

**Table 9.2-1. Summary of Significant Cumulative Impacts and Mitigation Measures**
(page 3 of 4)

| *Resource Area* | *Significant Cumulative Impact* | *Mitigation Measure* | *Significance after Mitigation* |
|---|---|---|---|
| Ground Transportation | In the year 2003, on I-880 south of I-238, the level of service would drop from LOS E to LOS F during the morning peak hour in both the northbound and southbound directions. | • Participate actively in corridor/area-wide transportation planning process, including specific studies.<br>• Serve on the technical working groups and advise steering committees for the I-880 Corridor Study and I-80 Corridor Study.<br>• Maintain active membership in the Alameda County CMA Technical Advisory Committee, the Measure B Reauthorization Expenditure Plan Development Committee, the Bay Area Partnership finance and operations committees, the Caltrans Statewide Intermodal Goods Movement Advisory Committee, and the MTC Freight Advisory Committee. | Significant |
| | In the year 2010, two intersections would be affected:<br>• 3rd Street/ Adeline Street intersection would operate at LOS F during the morning and evening peak hours.<br>• 7th Street/ I-880 NB offramp would operate at LOS F during the morning commute hours. | • As necessary, at the 3rd Street/ Adeline Street intersection, convert the eastbound and westbound combination thru-left turning lanes to exclusive left turn lanes and run permitted left turn phasing instead of split phasing.<br>• As necessary, at the 7th Street/I-880 NB offramp intersection, convert the northbound thru lane to a combination left-thru lane, and provide split phasing of the north and southbound approaches to the intersection. | Not significant |

**Table 9.2-1. Summary of Significant Cumulative Impacts and Mitigation Measures**
(page 4 of 4)

| *Resource Area* | *Significant Cumulative Impact* | *Mitigation Measure* | *Significance after Mitigation* |
|---|---|---|---|
| Ground Transportation | Significant impacts would occur in the peak commute direction on I-880 South of I-908, and on I-238 during both the morning and evening commute hours. | • Participate actively in corridor/area-wide transportation planning processes, including specific studies.<br>• Serve on the technical working groups and advise steering committees for the I-880 Corridor Study and I-80 Corridor Study.<br>• Maintain active membership in the Alameda County CMA Technical Advisory Committee, the Measure B Reauthorization Expenditure Plan Development Committee, the Bay Area Partnership finance and operations committees, the Caltrans Statewide Intermodal Goods Movement Advisory Committee, and the MTC Freight Advisory Committee. | Significant |
| Noise | Planned development of residential uses in the waterfront area south of Jack London Square could result in future noise compatibility problems between trucks and residential noise receptors. | To resolve conflicts between planned residential development and industrial uses and the waterfront area south of Jack London Square, trucks could be banned from the street segment. | Not significant |

through at least 2010). In particular, this project combined with the Berth 55-58, JIT, Terminal 59, and Berth 21 projects (reference numbers 15 through 18 in Table 9.1-1) would result in increases in vessel, cargo, truck/train transport, and employee commute activity in the immediate area of the Port. The cumulative impact of emissions from these and other area projects with the deepening project would cause a significant, unavoidable air quality impact.

Mitigation measures to reduce cumulative impacts will be applied as described in section 5.1.5. In addition, the Port proposes to embark upon a long-term air quality program as a result of the Vision 2000 Program. The air quality program will serve as a clearinghouse for air quality impacts resulting from the Vision 2000 Program and related maritime activities that include the 50-foot deepening project, and to study and propose implementation of feasible mitigation measures.

Mitigation of the 50-foot project's contribution to cumulative impacts will include the Port's actions to:

- Continue to implement and evaluate effectiveness of operations-related mitigation measures
- Participate in regional and local air quality planning programs
- Support long-term air quality planning and mitigation efforts through the Port of Oakland proposed long-term air quality program.

A list of the operations-related mitigation measures that will also be applied to reduce significant cumulative impact is provided in Table 5.1-1. Despite the application of the mitigation measures described in Table 5.1-1 and above, the emission reductions would not be sufficient to reduce emissions below the BAAQMD significance thresholds. The cumulative impact of emissions from the 50-foot deepening project and other area projects would remain significant.

### 9.2.2 Surface Water Resources

There is the potential for cumulative impacts on water quality from the proposed 50-foot dredging project combined with dredging for the Berth 55-58 project. Berth 55-58 would require dredging parts of the Oakland Inner Harbor bank. If the dredging of the Inner Harbor bank occurred before the 50-foot project, there would be no cumulative impact. However, if the dredging for the Berth 55-58 project overlaps with dredging in the same area for the 50-foot project, there is the potential for cumulative impacts due to increased turbidity if the construction equipment for the two projects is working in close proximity. This impact could be mitigated by dredging for the 50-foot project at a location sufficiently distant from contemporaneous dredging in the Berth 55-58 area. This impact could also be mitigated through appropriate choice of dredging equipment.

### 9.2.3 Geology and Groundwater

Several of the projects considered in the cumulative impact analysis would affect sediments in Oakland Harbor; none of these projects would have significant impacts on sediments, however. Construction and operation of the Port of Oakland Development Recreational Boathouse (Project 4 in Table 9.1-1) could have minor adverse impacts on sediment quality. Construction of the Jack London Square Marina (Project 6) would temporarily disrupt sediments of the site and would remove some possibly contaminated surface sediments. The Berth 55-58 project (Project 15) would fill 31.5 acres of deep-water marine habitat in the Harbor, and the Berth 21 project (Project 18)

would fill an additional 27 acres of similar habitat. The actions would not significantly affect sediment quality of the berth sites per se, but there could be minor adverse impacts on sediment quality in adjacent areas. Considering these factors and the fact that the net sediment impact of the 50-foot project would be slightly beneficial (some contaminated sediments would be removed through dredging), the 50-foot project would not have significant cumulative impacts on sediment quality with the other projects considered in this analysis.

### 9.2.4 Biological Resources

Several of the projects included in this cumulative impact analysis (Table 9.1-1) would have biological impacts. The largest cumulative biological impact among these projects is loss of marine habitat. The New Berth 21 project, which could be implemented independently of the 50-foot project, would fill 27 acres of marine habitat. The Berth 55-58 project would fill an additional 31.5 acres of marine habitat. The habitat in both of these project sites is deep-water habitat, which is less productive than shallow-water habitat and is not used extensively for specialized functions such as fish spawning or nursery/rearing. In addition, the benthic communities in these areas are limited in diversity and abundance, presumably due to the industrialized character of the areas and frequent disturbance of the seafloor by ship movement (propwash, etc.) and periodic maintenance dredging (section 5.4.3). Still, these are reasonably productive marine habitats that provide a variety of functions; they provide surface water and water column habitat as well as benthic habitat. In addition, piers would be removed at both sites, resulting in the loss of approximately 12 acres of deep-water piling habitat. As presently formulated, the 50-foot project would not contribute to this loss of marine habitat. However, these habitat losses are considered a significant cumulative impact of projects in Oakland Harbor. These impacts would need to be mitigated or compensated for in some manner. These impacts would be compensated for, at least in part, by excavation of existing fastland as part of the Berth 55-58 project (an EIR is being prepared for that project).

In addition to the 50-foot project, several of the other projects planned for the Oakland Harbor area (listed in section 9.2.3) would entail in-water construction. All of these projects are likely to cause localized and temporary turbidity, which would disturb fish, plankton and benthic organisms, and interfere with foraging by fish, birds, and marine mammals. These effects would be limited in area and in time, and relatively few organisms would be affected. This would not result in significant biological impacts, even considering the impacts of all of the relevant projects in combination.

Most of the projects listed in Table 9.1-1 would involve construction of some type in the Oakland Harbor area. Any construction activity has the potential to disturb roosting, nesting, or foraging by birds; several special status birds species are known to occur in the Oakland Harbor area. The potential for disturbing these birds is greatest in project sites near their foraging habitat. However, these projects are planned for developed industrial or commercial areas that include no known important foraging areas for birds, except water areas as addressed in the preceding paragraph. Very few of these projects are likely to be adjacent to important foraging areas, so that disturbance of roosting or perching on structures in these project sites is not likely to significantly affect these species; these functions could be moved to other natural or man-made structures in the vicinity. The exception to this statement is the proposed public access surrounding the Middle Harbor Enhancement Area to be constructed as part of the Berths 55-58 project. Integration of the habitat and public access elements is reflected in the adoption of a predominantly subtidal habitat design for the Middle Harbor Enhancement Area that favors disturbance-tolerant organisms such as fish, benthic organisms, and actively foraging birds. Habitats that are highly susceptible to

disturbance (i.e., tidal wetlands, shorebird roosting sites, mudflats) will be buffered from water-use encroachment by defined no-access markers in the southeast portion of the habitat area. In addition, upland buffering has been incorporated to protect sensitive bird loafing and roosting areas along the northern shore of the U.P. Mole.

To minimize conflicts between wildlife and public access, the following constraints will guide the public access design under the Berths project:

- Active uses such as ball fields, food vendors, etc., if adopted through the public access process, shall occur near Point Arnold. Only passive recreation, individual and organized interpretive and education activities uses shall occur on the U.P. Mole;

- A vegetated, passive access buffer shall be provided along the north side of the U.P. Mole. This buffer shall incorporate overlooks and interpretive trails but shall be designed to restrict human and domestic animal access to sensitive shoreline areas;

- Only non-motorized vessel access shall be authorized within the MHEA and no vessel access shall occur within the area near the U.P. Mole as defined within the MHEA Final Concept Plan; and

- Maintenance of barrier vegetation, interpretive facilities and signage, as well as necessary modification to buffer designs to ensure successful access restrictions, shall be provided for through the parkland or refuge management financing program.

Therefore, with the inclusion of the constraints discussed above, construction of multiple projects in the Oakland Harbor area would not result in significant cumulative impacts of this type.

At the Hamilton Wetlands restoration site, the 50-foot project would contribute, along with any other project that contributes dredged material to this wetlands project, to the biological impacts of the project, both beneficial and adverse. Adverse impacts would include loss of existing wetlands and habitat for special-status species, noise and other construction disturbance of biota, and entrainment of marine organisms in the slurry pipe. These impacts would be mostly temporary and more than offset in the long term by the restoration of wetlands and related enhancement of habitat for a wide range of species at the site. It is likely that this project would proceed, and the associated adverse and beneficial impacts would occur, even without dredged material from the 50-foot project.

### 9.2.5 Cultural Resources

Cultural resources are unique and non-renewable resources. Private and public development activities continue to damage and destroy these resources often before the information inherent in them can be reviewed, recorded and interpreted. The proposed navigation improvements, in association with other development in the surrounding region, may add to the cumulative effects on cultural resources that have occurred through the ongoing demolition of historic buildings and structures within the Navy Fleet and Industrial Supply Center, Oakland and could potentially occur within the Oakland Army Base and the NAS Alameda Historic Districts.

The loss of historic properties through demolition and reuse on the Navy Fleet and Industrial Supply Center, Oakland, other military bases proposed for disposal and reuse, and nonmilitary development projects could result in a cumulatively significant impact; this project may contribute

to this impact if the former Todd Shipyard is determined to be eligible for the National Register of Historic Places and if the expansion of the Inner Harbor turning basin significantly impacts that shipyard. Mitigation for this cumulative significant impact could include Memoranda of Agreement (MOAs) with the State Historic Preservation Office (SHPO) and Advisory Council on Historic Preservation (ACHP) for the recordation, partial preservation and public interpretation of and access to any remnants of the affected resources.

### 9.2.6 Socioeconomics

The cumulative socioeconomic effects associated with the Port's proposed dredging project in conjunction with other projects planned by the Port are presented in Table 9.2-2. The table also indicates current socioeconomic conditions for the purpose of evaluating and comparing the potential cumulative socioeconomic effects of the Port's combined projects. In addition to the direct increase in container movements resulting from the dredging project, the proposed project would facilitate substantial increases in container movements in conjunction with other Port projects such as the JIT and construction of marine container terminals.

**Table 9.2-2. Cumulative Socioeconomic Effects**

| | *1995* | *2000* | *2003* | *2010* |
|---|---|---|---|---|
| Direct Jobs | 8,800 | 9,500 | 11,000 | 14,100 |
| Induced Jobs | 5,300 | 5,700 | 6,500 | 8,200 |
| Total Direct and Induced Jobs | 14,100 | 15,100 | 17,500 | 22,300 |
| Gain over 1995 | — | 1,000 | 3,300 | 8,200 |
| State, County, and Local Taxes (millions) | $89 | $95 | $110 | $140 |
| Gain over 1995 (millions) | — | $6 | $21 | $51 |
| Total Personal Income (millions) | $702 | $746 | $849 | $1,057 |
| Gain over 1995 (millions) | — | $44 | $147 | $355 |
| Total Business Revenue (millions) | $1,269 | $1,436 | $1,880 | $2,787 |
| Gain over 1995 (millions) | — | $167 | $610 | $1,518 |

*Source:* Martin Associates 1996; JWD 1997.

The proposed dredging project together with other anticipated Port projects would increase the number of containers handled by the Port to 1,915,300. This increase in Port activity would generate 14,100 direct jobs and 8,200 induced jobs, for a total of 22,300 jobs; these levels of employment represent a 57 percent increase over the current level of Port-related jobs. Total business revenue would reach $2,787 million, while total personal income would increase to $1,057 million. State and local taxes would increase to about $140 million. These cumulative socioeconomic impacts are considered beneficial economic effects of the proposed dredging and associated projects.

The overall increase in the Port's capacity and the resulting effects on the regional economy are discussed in section 5.6. These would be indirect beneficial impacts resulting from the Port's proposed dredging project.

*Employment and Income.* The cumulative socioeconomic effects of implementing the proposed dredging project in conjunction with other Port projects would generate approximately 8,200 new jobs (direct and induced) above 1995 levels. Total personal income would increase by about $1.06 billion over 1995 income levels through the implementation of the joint Port projects. Worker

spending from increased personal income would create additional economic benefits throughout the Bay Area.

The increase in employment and income from new jobs would be beneficial to the Bay Area economy, particularly to Alameda, Contra Costa, and San Francisco counties, which presently supply approximately 72 percent of the Port's labor force. Most of the jobs associated with the Port's activities are related to the surface transportation of maritime services sectors; many of the jobs would be filled by unionized longshoremen and railroad workers.

*Population and Housing*. The additional 8,200 workers needed for positions resulting from the dredging options would constitute only 0.2 percent of the Bay Area's projected labor force in 2010 and only 0.4 percent of the projected labor force in Alameda, Contra Costa, and San Francisco counties. In addition, the 8,200 new workers would constitute only 0.9 and 2 percent of the total new jobs anticipated for the Bay Area region and the three-county area by 2010, respectively. Given the availability of labor in the region and extraregional residential location of some railroad employees working at Port facilities, no impact on the population and housing in the project region would result.

### 9.2.7 Transportation

*Vessel Transportation*

The dredged channels, including the turning basins, are being designed to safely accommodate the projected increases in the number and size of vessels that would be expected to call at the Port, given the planned improvements to marine terminals. No significant cumulative impacts would occur.

*Land Transportation*

Three cumulative scenarios were evaluated to determine impacts on Bay Area freeways and streets. A cumulative construction scenario was evaluated to determine the combined effect of dredging project construction activities with the construction activities of other projects at the Port of Oakland. Cumulative scenarios were also developed for 2003 and 2010, to address the potential for the combined impacts of the proposed project and other projects at the Port during the operational phase of the project. All cumulative analyses were performed using future traffic forecasts as the basis for the study.

For all three cumulative scenarios, the traffic effects of many potential development projects were considered in the analysis. The analysis was based on the Alameda Countywide Transportation Model, which included land use forecasts developed by the Association of Bay Area Governments (ABAG). Many of the projects considered in the cumulative analysis are included in the ABAG forecasts.

Additional transportation effects could result from development plans that exceed the ABAG projections and that have not been included in the Alameda Countywide Transportation Model. Military base reuse projects in the Bay Area currently being planned would likely exceed the ABAG land use forecasts. The potential traffic impacts caused by these projects, in combination with Port development, would include impacts on Bay Area freeways and intersections and would exacerbate the traffic-related impacts of the proposed dredging project.

Traffic growth on Bay Area highways will occur over time whether or not the dredging project is implemented. To the extent that the Alameda Countywide Transportation Models reflect the lower bound of transportation impacts due to cumulative growth, it is apparent that cumulative growth in the project area without the dredging project would result in significant and unavoidable impacts on the region's freeway system. The analysis shown in Appendix S shows that several freeway segments would fail to comply with CMP level of service standards even if the dredging project is not undertaken.

It is not practical to mitigate cumulative traffic impacts on freeways to levels that are not significant. Increasing freeway capacity by adding lanes would not be feasible because of the high cost, the negative impacts on air quality, and other factors. Adding lanes is also inconsistent with the policies of the responsible regional agencies. The Port could participate in ongoing transportation planning efforts (see Table 9.2-1). Other possible mitigation measures might include implementing ramp metering, high occupancy vehicle lanes, or intelligent transportation systems to improve the efficiency of the freeways. However, these measures are not within the jurisdiction of the Port and are not proposed to mitigate the impacts of the proposed project.

The disposal and reuse of the Oakland Army Base could result in cumulative impacts on local roadways such as Maritime Street, 7th Street, and the I-880 interchange ramps. The plans for redevelopment of the Oakland Army Base are not well enough defined to develop an accurate assessment of the types of impacts likely to occur or to define mitigation measures required to comply with City of Oakland service standards. The EIR for the Oakland Army Base will need to consider roadway design modifications required to mitigate cumulative impacts that cannot be accurately assessed at this time.

Below is a discussion of the cumulative impacts of each of the three scenarios identified above.

*Cumulative Construction Conditions*

IMPACTS

During the year 2000, proposed construction activities are expected to peak at the Port of Oakland. The activities that would be occurring during this period include the following:

- Phase I construction of Berths 55 and 56 would be complete, and the new facilities would be operational.
- Phase II construction of Berths 55 and 56 would be underway.
- Berths 57 and 58 would be under construction.
- The Middle Harbor public recreation area would be under construction.
- Phase I JIT construction would be underway.
- The final phase of construction would be underway for the relocation of Middle Harbor Road.

An analysis of transportation impacts was conducted assuming all the above activities would be occurring at the same time as sediment from the proposed project would be hauled to one of the

landfills (the only reuse/disposal option that affects ground transportation). This assumption would result in a conservative evaluation of possible project impacts.

One other change in the Port operations is reflected in the cumulative construction scenario. The UP railyard would be closed for construction of the Berth 55-56 and Berth 57-58 projects. UP waterfront railyard operations would be accommodated at the former SP Railyard.

The potential cumulative ground transportation impacts of the projects listed above would be primarily related to the effects of employees traveling to and from the various construction projects combined with the hauling of sediment to one of the landfills. There would also be some transportation of construction equipment to and from the construction sites, but this type of activity would require relatively few trips and would occur, to a large extent, outside the peak commuter hours. The number of employees likely to be working at peak times for each of the construction projects is shown in Table 9.2-3.

**Table 9.2-3. Cumulative Construction Employees**

| *Construction Site* | *Employees* |
|---|---|
| Berth 55-56 Phase II | 70 |
| Berth 55-59 | 70 |
| Middle Harbor Recreation Area | 60 |
| JIT Phase I | 30 |
| Middle Harbor Road Relocation | 30 |
| Sediment Rehandling Facility | 20 |

*Source:* U.S. Navy and Port of Oakland 1997b.

The analysis of intersection operations near the Port for cumulative construction conditions in year 2000 is summarized in Table 9.2-4 (for the A.M. peak hour) and Table 9.2-5 (for the P.M. peak hour). The intersection operations near the landfills would be the same as described in section 5.7.3. A summary of the analysis of freeway segments is shown in Appendix S. The tables below and the tables in Appendix S show the operations for the intersections and freeway segments in the Port vicinity. Traffic operations for the more remote locations near the landfills would be the same as described in section 5.7.3.

The impacts shown for cumulative construction conditions would be essentially the same as for construction of the proposed project. The 3rd Street/Adeline Street intersection would operate at LOS E during the P.M. peak hour for sediment disposal at either the Altamont or Vasco Road landfills. For disposal at the Redwood Landfill, the intersection of Sanitary Landfill Road and U.S. 101 would operate at LOS F during both the morning and evening peak hours. The intersections near the disposal sites and all freeway segments would operate essentially the same as described for non-cumulative conditions.

**Table 9.2-4. Intersection Operations for Cumulative Project Construction — Year 2000 A.M. Peak Hour**

| | *No-Project* | | *Altamont Landfill Disposal*[1] | | *Redwood Landfill Disposal*[1] | | *Vasco Road Landfill Disposal*[1] | |
|---|---|---|---|---|---|---|---|---|
| *Intersection* | *LOS* | *Delay*[2] | *LOS* | *Delay*[2] | *LOS* | *Delay*[2] | *LOS* | *Delay*[2] |
| 1. Maritime St./W. Grand Ave. | C | 21.6 | | | | | | |
| 2. Maritime St./Burma Rd. | B | 10.2 | B | 10.4 | B | 10.4 | B | 10.4 |
| 3. Maritime St./14th St. | B | 10.8 | C | 18.7 | C | 18.7 | C | 18.7 |
| 4. Maritime St./7th St. Extension | B | 12.5 | B | 12.8 | B | 12.8 | B | 12.8 |
| 5. 7th St./7th St. Extension | C | 24.5 | D | 27.7 | D | 28.0 | D | 27.7 |
| 6. 3rd St./Adeline St. | C | 24.7 | D | 30.6 | D | 25.5 | D | 30.6 |
| 7. 3rd St./Market St. | | | | | | | | |
| NB Left Turn | B | 6.2 | B | 6.3 | B | 6.3 | B | 6.3 |
| NB Thru-Right Turn | A | 4.8 | | | | | | |
| SB Left Turn | B | 5.9 | | | | | | |
| SB Thru-Right Turn | A | 3.9 | | | | | | |
| EB Left Turn | A | 2.6 | | | | | | |
| WB Left Turn | A | 2.2 | | | | | | |
| 8. W. Grand Ave./I-880 Fr. Rd. | C | 19.1 | C | 20.0 | C | 20.6 | C | 20.0 |
| 9. 7th St./I-880 SB On Ramp | A | 2.8 | | | | | | |
| 10. 7th St./I-880 NB Off Ramp | C | 16.6 | C | 22.0 | C | 21.5 | C | 22.0 |
| 11. 5th/Union/ I-880 N. Ramps | C | 16.6 | | | | | | |
| 12. 5th St./Adeline St. | B | 12.4 | C | 17.2 | | | C | 17.2 |
| 13. I-880 Off Ramp / Market St. | B | 9.8 | | | | | | |

*Note:* 1. LOS and delay are shown only where the disposal alternative delay is higher than the delay for the no-project alternative.
2. Delay in seconds per vehicle.
3. Bold text indicates a significant impact.
*Source:* Dowling Associates, Inc. 1997.

**Table 9.2-5. Intersection Operations for Cumulative Project Construction — Year 2000 P.M. Peak Hour**

| | *No-Project* | | *Altamont Landfill Disposal*[1] | | *Redwood Landfill Disposal*[1] | | *Vasco Road Landfill Disposal*[1] | |
|---|---|---|---|---|---|---|---|---|
| *Intersection* | *LOS* | *Delay*[2] | *LOS* | *Delay*[2] | *LOS* | *Delay*[2] | *LOS* | *Delay*[2] |
| 1. Maritime St./W. Grand Ave. | C | 21.6 | C | 22.0 | C | 22.0 | C | 22.0 |
| 2. Maritime St./Burma Rd. | B | 10.7 | B | 10.9 | B | 10.9 | B | 10.9 |
| 3. Maritime St./14th St. | B | 13.6 | B | 14.8 | B | 14.8 | B | 14.8 |
| 4. Maritime St./7th St. Extension | B | 13.3 | | | | | | |
| 5. 7th St./7th St. Extension | C | 24.4 | | | D | 26.1 | | |
| 6. 3rd St./Adeline St. | D | 33.5 | E[3] | 43.5 | | | E[3] | 43.5 |
| 7. 3rd St./Market St. | | | | | | | | |
| NB Left Turn | B | 6.6 | | | | | | |
| NB Thru-Right Turn | A | 4.7 | | | | | | |
| SB Left Turn | B | 6.4 | | | | | | |
| SB Thru-Right Turn | A | 3.5 | | | | | | |
| EB Left Turn | A | 2.5 | | | | | | |
| WB Left Turn | A | 2.4 | | | | | | |
| 8. W. Grand Ave./I-880 Fr. Rd. | C | 20.0 | C | 20.9 | C | 21.2 | C | 20.9 |
| 9. 7th St./I-880 SB On Ramp | B | 6.7 | | | | | | |
| 10. 7th St./I-880 NB Off Ramp | C | 16.9 | C | 17.0 | | | C | 17.0 |
| 11. 5th/Union/ I-880 N. Ramps | C | 16.0 | | | | | | |
| 12. 5th St./Adeline St. | C | 19.5 | | | | | | |
| 13. I-880 Off Ramp / Market St. | B | 10.6 | B | 11.1 | | | B | 11.1 |

*Note:* 1. LOS and delay are shown only where the disposal alternative delay is higher than the delay for the no-project alternative.
2. Delay in seconds per vehicle.
3. Bold text indicates a significant impact.
*Source:* Dowling Associates, Inc. 1997.

Although there would be some additional traffic at these intersections and on the freeways, no new intersections or freeway segments would experience significant impacts. The additional traffic volumes resulting from cumulative construction and the levels of service at intersections and on freeways are contained in Appendix S.

MITIGATION MEASURES

No mitigation measures are required beyond those identified for the proposed project (see section 5.7.3).

*2003 Cumulative Conditions*

IMPACTS

In 2003, when the dredging would be complete, several Port projects other than the dredging project could be operational. Berths 55-58 and the JIT Phase I project could be completed by 2003. The cumulative effects of these projects in combination with the completed dredging project were assessed for the 2003 cumulative analysis scenario. The UP waterfront railyard would no longer exist. The UP operations would be consolidated with SP operations at the West Oakland railyard.

The analysis of intersection operations near the port for 2003 cumulative conditions is summarized in Table 9.2-6. A summary of the analysis of freeway segments is shown in Appendix S.

**Table 9.2-6. Intersection Operations — Year 2003 Cumulative Conditions**

| | *A.M. Peak Hour* | | | | *P.M. Peak Hour* | | | |
|---|---|---|---|---|---|---|---|---|
| *Intersection* | *No Project* | | *Project* | | *No Project* | | *Project* | |
| | *LOS* | *Delay*[2] | *LOS* | *Delay*[2] | *LOS* | *Delay*[2] | *LOS* | *Delay*[2] |
| 1. Maritime St./W. Grand Ave. | C | 21.8 | | | C | 21.7 | C | 22.4 |
| 2. Maritime St./Burma Rd. | B | 10.3 | B | 10.7 | B | 10.8 | B | 11.2 |
| 3. Maritime St./14th St. | C | 17.8 | C | 19.0 | B | 14.8 | | |
| 4. Maritime St./7th St. Extension | B | 12.8 | B | 13.1 | B | 13.5 | | |
| 5. 7th St./7th St. Extension | D | 29.4 | | | D | 25.8 | D | 26.4 |
| 6. 3rd St./Adeline St. | C | 25.0 | F[3] | 80.8 | D | 35.5 | F[3] | 80.1 |
| 7. 3rd St./Market St. | | | | | | | | |
| NB Left Turn | B | 6.4 | B | 7.1 | B | 6.7 | B | 6.8 |
| NB Thru-Right Turn | A | 4.9 | | | A | 4.8 | | |
| SB Left Turn | B | 5.9 | | | B | 6.5 | | |
| SB Thru-Right Turn | A | 3.9 | | | A | 3.5 | | |
| EB Left Turn | A | 2.6 | | | A | 2.5 | | |
| WB Left Turn | A | 2.2 | | | A | 2.4 | | |
| 8. W. Grand Ave./I-880 Fr. Rd. | C | 19.9 | | | C | 20.8 | C | 20.9 |
| 9. 7th St./I-880 SB On Ramp | A | 2.3 | | | B | 6.8 | | |
| 10. 7th St./I-880 NB Off Ramp | C | 21.2 | C | 22.1 | C | 16.9 | C | 17.1 |
| 11. 5th/Union/ I-880 N. Ramps | C | 16.6 | | | C | 16.0 | C | 16.4 |
| 12. 5th St./Adeline St. | B | 12.4 | C | 18.9 | C | 19.6 | C | 20.0 |
| 13. I-880 Off Ramp / Market St. | B | 9.8 | | | B | 10.7 | B | 10.8 |

*Note:* 1. LOS and delay are shown only where the disposal alternative delay is higher than the delay for the no-project alternative.
2. Delay in seconds per vehicle.
3. No significant impacts were identified.

*Source:* Dowling Associates, Inc. 1997.

For 2003 cumulative conditions, significant impacts would occur at one intersection and at one freeway location. The 3rd Street/Adeline Street intersection would operate at LOS F during the A.M. and P.M. peak hours. On I-880 south of I-238, the level of service would drop from LOS E to LOS F during the A.M. peak hour in both the northbound and southbound directions.

Five additional trains per day would be generated by all the projects included in the 2003 cumulative scenario. The impacts on traffic at highway/rail grade crossings would not be significant as shown in the FISCO/Vision 2000 EIS/R (U.S. Navy and Port of Oakland 1997b). The duration of gate down time at railroad crossings would be relatively short and cause little delay for motorists. Many freight trains move at night when vehicle traffic volumes are low. The number of trains generated for 2003 cumulative conditions is contained in Appendix S.

MITIGATION MEASURES

- As necessary, at the 3rd Street/Adeline Street intersection, convert the eastbound and westbound combination through-left turning lanes to exclusive left turn lanes and run permitted left turn phasing instead of split phasing. After mitigation, the intersection would operate at LOS C during both the A.M. and P.M. peak hours.

- It is not practical to mitigate cumulative traffic impacts on freeways to levels that are not significant. Increasing freeway capacity by adding lanes would not be feasible because of the high cost, the negative impacts on air quality, and other factors. Adding lanes is also inconsistent with the policies of the responsible regional agencies. Because no feasible mitigation measures have been identified, the traffic from the proposed project in combination with other traffic growth in the area would result in residual significant impacts on some Bay Area freeways.

*2010 Cumulative Conditions*

IMPACTS

The analysis of cumulative conditions assumed the following Port development elements could be in place by year 2010:

- Berth 55-58
- Terminal 59
- Berth 21
- JIT (complete buildout)

The cumulative effects of these projects in combination with the completed dredging project were assessed for the 2010 cumulative analysis scenario. The UP waterfront railyard would no longer exist and much of the West Oakland railyard would be replaced by the JIT. A small portion of the West Oakland railyard would be left in place as a service and storage area for UP and SP.

The analysis of intersection operations near the Port for 2010 cumulative conditions is summarized in Table 9.2-7. A summary of the analysis of freeway segments is shown in Appendix S.

For 2010 cumulative conditions, significant impacts would occur at the two following intersections:

- 3rd Street / Adeline Street
- 7th Street/I-880 NB offramp

**Table 9.2-7. Intersection Operations – Year 2010 Cumulative Conditions**

| | *A.M. Peak Hour* | | | | *P.M. Peak Hour* | | | |
|---|---|---|---|---|---|---|---|---|
| *Intersection* | *No Project* | | *Project* | | *No Project* | | *Project* | |
| | *LOS* | *Delay*[2] | *LOS* | *Delay*[2] | *LOS* | *Delay*[2] | *LOS* | *Delay*[2] |
| 1. Maritime St./W. Grand Ave. | C | 22.2 | C | 25.7 | C | 22.0 | C | 23.3 |
| 2. Maritime St./Burma Rd. | B | 10.5 | B | 11.7 | B | 11.0 | B | 12.0 |
| 3. Maritime St./14th St. | C | 17.9 | D | 33.4 | C | 15.1 | C | 16.2 |
| 4. Maritime St./7th St. Extension | B | 13.1 | C | 16.2 | B | 13.7 | | |
| 5. 7th St./7th St. Extension | D | 32.7 | C | 20.8 | E | 43.3 | C | 15.7 |
| 6. 3rd St./Adeline St. | D | 26.0 | **F**[3] | 81.2 | E | 42.3 | **F**[3] | 76.4 |
| 7. 3rd St./Market St. | | | | | | | | |
| NB Left Turn | B | 6.7 | B | 7.4 | B | 7.0 | | |
| NB Thru-Right Turn | A | 5.0 | | | A | 4.9 | | |
| SB Left Turn | B | 6.1 | | | B | 6.8 | | |
| SB Thru-Right Turn | A | 4.0 | | | A | 3.5 | | |
| EB Left Turn | A | 2.7 | | | A | 2.6 | | |
| WB Left Turn | A | 2.2 | | | A | 2.4 | | |
| 8. W. Grand Ave./I-880 Fr. Rd. | C | 20.0 | C | 20.4 | C | 21.0 | C | 21.3 |
| 9. 7th St./I-880 SB On Ramp | A | 2.2 | | | B | 6.8 | | |
| 10. 7th St./I-880 NB Off Ramp | D | 28.8 | **F**[3] | 76.1 | C | 16.9 | C | 17.6 |
| 11. 5th/Union/ I-880 N. Ramps | C | 16.6 | | | C | 16.1 | C | 16.2 |
| 12. 5th St./Adeline St. | B | 12.1 | C | 19.4 | C | 20.0 | | |
| 13. I-880 Off Ramp / Market St. | B | 9.9 | | | B | 10.9 | B | 11.0 |

*Notes:* 1. LOS and delay are shown only where the disposal alternative delay is higher than the delay for the no-project alternative.
2. Delay in seconds per vehicle.
3. Bold text indicates a significant impact.

*Source:* Dowling Associates, Inc. 1997.

The 3rd Street/Adeline Street intersection would operate at LOS F during both the A.M. and P.M. peak hours. The 7th Street/I-880 NB offramp intersection would operate at LOS F during the A.M. peak hour.

There would also be significant impacts on freeways south of the Port for 2010 cumulative conditions. Significant freeway impacts would occur in the peak commute directions on I-880 South of I-980 during both the A.M. and P.M. peak hours. The peak direction volume/capacity (V/C) ratio would increase by 0.03 to 0.05 depending on the section. Significant impacts would also occur on I-238, where the level of service would drop from LOS E to LOS F in the eastbound direction during the P.M. peak hour.

Thirteen (13) additional trains per day would be generated by all the projects included in the 2010 cumulative scenario. The impacts on traffic at highway/rail grade crossings would not be significant as shown in the FISCO/Vision 2000 EIS/R (U.S. Navy and Port of Oakland 1997b). The duration of gate down time at railroad crossings would be relatively short and cause little delay for motorists. Many freight trains move at night when traffic volumes are low. The number of trains generated for cumulative conditions in 2010 is contained in Appendix S.

- As necessary, at the 3rd Street/Adeline Street intersection, convert the eastbound and westbound combination through-left turning lanes to exclusive left turn lanes and run permitted left turn phasing instead of split phasing. After mitigation, the intersection would operate at LOS C during both the A.M. and P.M. peak hours.

- As necessary, at the 7th Street/I-880 NB offramp intersection, convert the northbound through lane to a combination left-through lane, and provide split phasing for the north and southbound approaches to the intersection. After mitigation, the intersection would operate at LOS C during both the A.M. and P.M. peak hours.

- It is not practical to mitigate cumulative traffic impacts on freeways to levels that are not significant. Increasing freeway capacity by adding lanes would not be feasible because of the high cost, the negative impacts on air quality, and other factors. Adding lanes is also inconsistent with the policies of the responsible regional agencies. Because no feasible mitigation measures have been identified, the traffic from the proposed project in combination with other traffic growth in the area would result in residual significant impacts on some Bay Area freeways.

### 9.2.8 Noise

The primary cumulative noise impacts would be related to the following factors: (1) construction-related noise increases from proposed new facilities on lands owned by the Port of Oakland; (2) operational noise increases associated with increased activity at marine terminals and railyards at the Port as well as secondary increases in ship, rail, and truck traffic; and (3) planned increase in the number of sensitive receptors in the vicinity of Port facilities. In general, the combination of increasing construction and operational noise levels in the Port vicinity could conflict with existing and planned residential uses in the vicinity of the Port.

***Construction Noise***

During the year 2000, proposed construction activities are expected to peak at the Port of Oakland. Construction activities at the proposed Berth 55-58 facility, Middle Harbor Enhancement Area, and JIT could occur at the same time as project-related dredging and disposal activities. UP railyard operations would also be relocated to the West Oakland Railyard and the newly completed Phase IA of the JIT. In addition, it is possible that some of the former on-base bachelors' and officers' housing units as well as off-base housing on Mosely and Marina Village will be occupied by this time.

If construction equipment were operated simultaneously at the Berth 55-58 facility, Middle Harbor Enhancement Area, JIT, and areas proposed for dredging, the combined noise levels that would occur at existing and planned sensitive receptors are listed in Table 9.2-8. This table indicates that combined noise levels would generally comply with Oakland Noise Ordinance construction noise limits for West Oakland residential receptors. Although projected combined noise levels at West Oakland residential receptors in the Brush Street and 4th Street vicinity would be 47 dBA ($L_{eq}$), which is slightly higher than the nighttime noise standard of 45 dBA, the ambient noise level in this area is higher than 45 dBA due to the proximity of the I-880 freeway. (Pile driving activities are also proposed to be limited to the daytime hours, further minimizing potential nighttime noise impacts.) Therefore, combined construction noise at these receptors is not expected to exceed the

**Table 9.2-8. Cumulative Construction-Related Noise Impacts at Sensitive Receptors**
(page 1 of 3)

| *Sensitive Receptor** | *Closest Project Sites* | *Estimated Exterior Noise Level Components at Receptor* | *Total Estimated Exterior Noise Level at Receptor* | *Combined Noise Level at Receptor* |
|---|---|---|---|---|
| 1. West Oakland residences in 3rd St. neighborhood (near Lewis St.) | Inner Harbor Turning Basin | Dredge: 45 dBA + Tug: 46 dBA = 49 dBA (combined) - 15 dBA[1] - 3 dBA[2]<br><br>Pile Driving at Berths: 65 dBA w/o & 59 dBA w/ controls - 15 dBA[1] - 3 dBA[2] | 31 dBA (Leq)<br><br>47 dBA w/o & 41 dBA w/ controls (Lmax) | **42 dBA (Leq)** with all listed equipment and feasible noise controls. |
| | Vision 2000 Upland and Rehandling Facility | Bulldozer/Backhoe: 44 dBA (Leq) - 15 dBA[1] - 3 dBA[2]<br><br>Concrete Crusher: 49 dBA (Leq) or 54 dBA (Lmax) - 15 dBA[1] - 3 dBA[2] | 26 dBA (Leq)<br><br>31 dBA (Leq) or 36 dBA (Lmax) | |
| | Inner Harbor | Dredge: 52 dBA + Tug: 45 dBA = 53 dBA - 15 dBA[1] - 4 dBA[2] | 34 dBA (Leq) | |
| 1. West Oakland residences in the 8th St. and Pine St. neighborhood | Vision 2000 Upland and Rehandling Facility | Bulldozer/Backhoe: 40 dBA - 15 dBA[1] - 11 dBA[2] | 14 dBA (Leq) | **42 dBA (Leq)** with all listed equipment and feasible noise controls. |
| | Outer Harbor | Cutterhead Dredge: 49 dBA + Tug: 42 dBA = 50 dBA - 15 dBA[1] - 7 dBA[2]<br><br>Bulldozer/Backhoe: 40 dBA -15 dBA[1] - 7 dBA[2]<br><br>Pile Driving at Berths: 61 dBA w/o and 55 dBA w/controls -15 dBA[1] - 7 dBA[2] | 28 dBA (Leq)<br><br>18 dBA (Leq)<br><br>39 dBA w/o & 33 dBA w/controls (Lmax) | |

**Table 9.2-8. Cumulative Construction-Related Noise Impacts at Sensitive Receptors**
(page 2 of 3)

| *Sensitive Receptor** | *Closest Project Sites* | *Estimated Exterior Noise Level Components at Receptor* | *Total Estimated Exterior Noise Level at Receptor* | *Combined Noise Level at Receptor* |
|---|---|---|---|---|
| 1. West Oakland residences in the 8th St. and Pine St. neighborhood (cont.) | New Berth 21 | Dredge: 43 dBA + Tug: 44 dBA = 47 dBA - 15 dBA[1] - 5 dBA[2]<br><br>Bulldozer/Backhoe: 42 dBA - 15 dBA[1] - 5 dBA[2] | 27 dBA (Leq)<br><br>22 dBA (Leq) | |
| | Middle Harbor Enhancement Area (MHEA) | Dredge: 38 dBA + Tug: 39 dBA = 42 dBA (Leq) -15 dBA[1] - 11 dBA[2]<br><br>Bulldozer/Backhoe: 40 dBA - 15 dBA[1] - 11 dBA[2] | 16 dBA (Leq)<br><br>14 dBA (Leq) | |
| 1. West Oakland residences in Brush St. and 4th St. vicinity | Inner Harbor Turning Basin | Dredge: 49 dBA + Tug: 50 dBA = 53 dBA - 15 dBA[1] - 1 dBA[2]<br><br>Pile Driving at Berths: 69 dBA w/o & 63 dBA w/ controls - 15 dBA[1] - 1 dBA[2] | 37 dBA (Leq)<br><br>53 dBA w/o & 47 dBA w/ controls (Lmax) | **47 dBA (Leq)** with all listed equipment and feasible noise controls. |
| 3. Off-Base North Housing on Mosely Ave. - Alameda | Inner Harbor Turning Basin | Dredge: 61 dBA + Tug: 62 dBA<br><br>Pile Driving at Beery | 65 dBA (Leq)<br><br>81 dBA w/o & 75 dBA w/ controls (Lmax) | **65 dBA (Leq)** with all listed equipment except when pile driving. Operation of pile driver would result in a combined noise level of **75 dBA (Leq)** with feasible noise controls. |
| | Former NAS Alameda Construction Fill | Bulldozer/Backhoe: 40 dBA (Leq) - 8 dBA[2] | 32 dBA (Leq) | |
| 4. On-Base Officers Housing on Barbers Point Rd. & southward - Alameda | Inner Harbor Turning Basin | Dredge: 59 dBA + Tug: 60 dBA<br><br>Pile Driving at Beery | 63 dBA (Leq)<br><br>79 dBA w/o & 73 dBA w/controls (Lmax) | **63 dBA (Leq)** with all listed equipment except when pile driving or cutterhead dredge are operating. Operation of both these pieces of equipment would result in a combined noise level of **75 dBA (Leq)** with feasible noise controls. |
| | Former NAS Alameda Construction Fill | Bulldozer/Backhoe: 46 dBA (Leq) - 2 dBA[2] | 44 dBA (Leq) | |
| | Inner Harbor | Dredge: 69 dBA + Tug: 62 dBA | 70 dBA (Leq) | |

**Table 9.2-8. Cumulative Construction-Related Noise Impacts at Sensitive Receptors**
(page 3 of 3)

| *Sensitive Receptor** | *Closest Project Sites* | *Estimated Exterior Noise Level Components at Receptor* | *Total Estimated Exterior Noise Level at Receptor* | *Combined Noise Level at Receptor* |
|---|---|---|---|---|
| 6. On-Base Bachelors Housing (south of W. Redline Ave.)- Alameda | Vision 2000 Upland and Rehandling Facility | Bulldozer/Backhoe: 47 dBA (Leq) - 1 dBA[2]<br><br>Concrete Crusher: 52 dBA (Leq) or 57 dBA (Lmax) - 1 dBA[2] | 46 dBA (Leq)<br><br>51 dBA (Leq) or 56 dBA (Lmax) | **52 dBA (Leq) with all listed equipment except when cutterhead dredge is operating. Noise from dredge dominates over all other equipment, generating a combined noise level of 63 dBA (Leq).** |
| | Former NAS Alameda Construction Fill | Bulldozer/Backhoe: 46 dBA (Leq) - 2 dBA[2]<br><br>Dredge: 47 dBA + Tug: 48 dBA = 51 dBA (Leq) - 2 dBA[2] | 44 dBA (Leq)<br><br>49 dBA (Leq) | |
| | Inner Harbor | Dredge: 62 dBA + Tug: 55 dBA | 63 dBA (Leq) | |

*Notes:* Source for Estimated Noise Level at Receptors is Table 5.8-1.
* Receptor locations shown on Figure 4.8-2.
1. For residential receptors to the north of the channel, a 15 dBA attenuation rate is applied due to the noise barrier provided by the I-880 freeway and associated noise walls and/or intervening buildings. None of these receptors have a direct line-of-sight to the channel. For the Marina Village residences, a 10 dBA attenuation rate is applied to shoreline activities due to partial noise attenuation provided by the Gateway Center building.
2. A supplemental distance attenuation factor is added to account for the increased atmospheric absorption effects with distances over 1,000 feet.

*Source:* Geier & Geier Consulting, Inc. 1997.

ambient noise level, which would be the applicable noise limit as specified by the Oakland Noise Ordinance.

When pile driving occurs in the Inner Harbor turning basin and the cutterhead dredge is operating in the Inner Harbor, the combined noise level at Alameda receptors would be dominated by these two sources so that the other equipment would not contribute significantly to construction-related noise increases. Therefore, cumulative noise increases associated with pile driving and operation of the cutterhead dredge in the Inner Harbor and Inner Harbor turning basin would be the same as project-related impacts. Feasible noise controls and hourly limits to pile-driving activities would reduce noise impacts to a level of insignificance except at one location in Alameda (specifically four to eight residential units fronting on Mosely Avenue in North Housing). Operation of the cutterhead dredge would not comply with the hourly time limits of the Alameda Noise Ordinance and reduced dredging-related noise would still exceed Oakland noise standards at this one Alameda location; both dredging-related impacts would be an unavoidable significant impact.

***Operational Noise***

Once proposed dredging has been completed, several other Port projects could be operational. They include Berths 55 through 58, Terminal 59, Berth 21, and the JIT (complete buildout). Operation of these facilities would result in cumulative noise increases due to cumulative increases in vessel, rail, and truck traffic.

*Marine Terminal and Railyard Operations*

Increased marine terminal operations (on-site truck traffic, container handling, and crane operations) would have an adverse but not significant cumulative noise impact since these noise sources would be located more than 2,200 feet from Alameda sensitive receptors and 3,000 feet away from West Oakland sensitive receptors (U.S. Navy and Port of Oakland 1997b).

Increased rail car coupling activity in the JIT would have an adverse but not significant noise impact because stacked truck containers and the new Cypress freeway act as noise barriers, helping to reduce railyard noise at West Oakland sensitive receptors (U.S. Navy and Port of Oakland 1997b).

*Secondary Traffic Increases*

VESSEL-RELATED NOISE INCREASES

Projected increases in the total number of vessel calls to the Port of Oakland by 2010 would be due to the completion of the proposed 50-foot dredging project, the above-listed Port projects, and regional economic growth. The projected 1-dBA noise increase from the estimated 18 percent increase in vessel calls overall by 2010 would have an adverse but not significant noise impact, based on the significance criteria outlined in section 5.8.

TRUCK TRAFFIC NOISE INCREASES

Cumulative increases in auto and truck traffic associated with Port operations (truck traffic increases, in particular) would have the potential to increase traffic noise levels in neighborhoods adjacent to area freeways and along major freeway access routes. Sound walls along the new

Cypress Freeway would reduce noise levels in adjacent neighborhoods, and this freeway would significantly improve freeway access for truck traffic to and from the Port, reducing the amount of Port-related truck traffic using local surface streets. Cumulative noise increases of 3 to 5 dBA are estimated to occur along freeway access routes (such as Maritime Street and 7th Street at I-880). However, this impact would be adverse but not significant because the affected land uses along these routes generally are not noise-sensitive. Cumulative increases in freeway traffic noise levels would be an adverse but not significant impact because of already high background traffic volumes and high existing truck traffic volumes along the freeway (U.S. Navy and Port of Oakland 1997b).

Although truck traffic increases would not result in any significant cumulative noise impacts along freeway access routes and freeways, there would be cumulative noise increases on local streets due to increased truck traffic between Port facilities and private facilities located near the Port. Although these increases in local traffic cannot be specifically estimated, the distribution of local truck traffic would be controlled by Sections 192 and 205 of the Oakland Traffic Code, which prohibits trucks from specific street segments and establishes truck routes on others. Section 192 of the Traffic Code (adopted December 1992) prohibits trucks from the following streets in West Oakland:

- Adeline Street (West Grand Avenue to 8th Street);
- Campbell Street (7th to 16th streets);
- Center Street (7th to Peralta streets);
- Chester Street (7th to 12th streets);
- Fitzgerald Street (Peralta to Haven streets);
- Peralta Street (7th to 16th streets);
- Willow Street (7th to 13th streets);
- Wood Street (7th to 12th streets);
- 8th Street (Nelson Mandela Parkway to Wood Street).

These restrictions help to reduce truck noise at many of the sensitive noise receptors in West Oakland.

The planned development of residential uses in the waterfront area south of Jack London Square could result in future noise compatibility problems between trucks and residential receptors. As future truck volumes increase on local roadways and new residential uses are developed, significant but mitigable noise compatibility problems could arise. If trucks create noise compatibility problems in either of these residential areas, any adversely affected street segments may be added in the future to Section 192 of the Oakland Traffic Code. Therefore, continued enforcement (and possibly augmentation) of Section 192 of the Traffic Code would mitigate potential future truck-related noise impacts on residential receptors to a level of insignificance.

#### Rail Traffic Noise Increases

Operation of the new Port facilities would result in increased rail traffic to the north of the Port. By 2010, the Vision 2000 EIS/R estimated that train traffic would increase to 27 trains per day along the rail line to the north (with Port-related trains increasing from the existing three trains per

day to 19). Cumulative noise increases of about 2 dBA within 750 feet of the tracks (with smaller noise increases at greater distances) would result from these increased train operations (U.S. Navy and Port of Oakland 1997b). Based on the 3-dBA significance criteria outlined in section 5.8, this increase would be adverse but not significant.

The traffic analysis in this EIS/R identifies five additional trains per day that would occur along the railroad line to the north of the Port (four of these would be generated by Port operations). Addition of five daily trains to the projected 27 daily trains along this track would result in an additional noise increase of less than 1 dBA. The maximum combined noise increase would be expected to approach but not exceed the 3-dBA significance criterion within 750 feet of the tracks. Therefore, combined railroad noise increases would be adverse but not significant.

#### 9.2.9 Human Health and Risk

Cumulative impacts on human health could accrue as a result of a longer period during which contaminated materials are handled, or a greater frequency of contact with contaminated material. However, because the cumulative projects would be more or less concurrent activities, the amount of time that any workers handling contaminated material would be involved in both the proposed project and any cumulative project(s) would be limited. Based on available information regarding construction schedules, the longest period any one worker is likely to be involved with these projects is 6 years.

The Port has also evaluated the sediments and fill material likely to be excavated and placed under the Berth 55-58 and JIT projects. Concentrations of chemical contaminants detected in the material likely to be generated by these projects are generally quite low. Occasional exceedances of screening levels in this material are not expected to result in a significant cumulative impact when considered in conjunction with the material expected to be generated by the 50-foot project.

#### 9.2.10 Hazardous Materials and Contaminated Wastes

Removal and reuse of contaminated wastes as part of this project would not result in significant cumulative hazardous materials/contaminated wastes impacts in combination with the other identified cumulative projects. Similarly, no significant cumulative impacts would occur from increased shipments of hazardous materials through the Port area. Existing regulations would continue to ensure that hazardous materials are managed and transported in a safe manner.

#### 9.2.11 Public Services

The Berth 55-58 project and the Joint Intermodal Terminal (JIT), are the only two cumulative projects that would be located inside the area analyzed for impacts on public services from the proposed project. The Berth 55-58 and JIT operations are expected to employ significantly fewer people than occupy the existing facility, causing decreased demands on public services, including sewage and potable water. Therefore, no significant cumulative public services impacts are expected.

#### 9.2.12 Land Use

Implementation of the proposed project in conjunction with other Port of Oakland projects, including the Vision 2000 program and other planned developments would cumulatively increase open space available to the public and substantially improve public access to the Inner Harbor

area. Reconfiguration and expansion of berthing facilities, enlargement of the turning basin, and improved land use efficiencies within the Port area would be consistent with adopted land use policies of the City of Oakland and the Port of Oakland and the adopted Seaport Plan. These are considered cumulative beneficial land use effects.

#### 9.2.13 Visual Resources

The combination of development of Vision 2000 projects, potential development at the closing Oakland Army Base, and implementation of the NAS Alameda/FISC Annex reuse plan would result in a moderate increase in cumulative visual impacts. Current views of warehousing facilities, military uses, heavy industrial uses, and waterways would be replaced with berthing facilities, open space, and pathways for increased public access to the area. Transfer of the "Spit Area" to East Bay Regional Park District as part of the implementation of the Oakland Army Base Reuse Plan, and the resultant public access, would significantly enhance visibility at a key location close to the Outer Harbor area and the Bay Bridge. Cumulative visual impacts are not considered significant and may potentially be beneficial after completion of proposed development activities in the project vicinity.

# 10.0 RECOMMENDATIONS

## 10.1 LOCALLY PREFERRED PLAN

The locally preferred plan (LPP) is dredging option F at -50 feet with the following reuse/disposal sites: Vision 2000 Upland area, MHEA, Hamilton Wetlands Restoration site, and Various Landfills. The LPP is equivalent to the National Economic Development (NED) plan.

The locally preferred plan is based largely on the set of reuse/disposal options that would be used for the project. The following selection criteria have been used to select the reuse/disposal options that best suit the Port's objectives: (1) Port or regulatory desire to beneficially reuse the greatest amount of dredged material practicable; and (2) proximity of reuse site compared to other reuse sites that already meet the screening criteria. The locally preferred plan would be Alternative F2, for the reasons explained below.

Maximizing beneficial reuse of the dredged material would eliminate from further consideration any alternative that involve the SF-DODS, where the sediment would be disposed as a waste; this thus eliminates alternatives B1, B4, B6, F1, F4, F6, F8, F9. Dredged material would not be beneficially reused at the Various Landfills option either, but that disposal option is common to all the alternatives so does not provide a basis for discriminating among the alternatives.

Reusing dredged material on Port property could be considered a beneficial reuse of the sediment although, arguably, this may not be as beneficial a reuse as habitat enhancement, which would occur under three reuse options.

The reuse options that involve the most beneficial reuse of the dredged material include the MHEA, Hamilton, and Montezuma. Under any alternative, 7.0 mcy would be used at the MHEA to enhance biological habitat in the Middle Harbor. Since this site is common to all alternatives, it does not provide a basis for discriminating among the alternatives. The Hamilton site is used in five alternatives, and the Montezuma site is used in two other alternatives. Alternatives F2 and F3, which would involve 5.2 mcy going to either Hamilton (F2) or Montezuma (F3), would beneficially reuse more material than alternatives B2, B3, B5, F5, and F7 which would involve less material (a range of 2.7 to 4.4 mcy) going to each site. Alternatives F2, and F3 would thus be preferred over alternatives B2, B3, B5, F5, and F7. Alternatives F2, and F3 would be considered equal in terms of the extent to which dredged material would be beneficially reused.

The Port's second selection criterion above – the proximity of the reuse site compared to other reuse sites that meet the screening criteria (section 2.2.3) – provides the basis for discriminating between alternatives F2 and F3. The Hamilton site is substantially closer (24 miles) to Oakland Harbor than the Montezuma site (52 miles). For this reason, Alternative F2 would be preferred over Alternative F3. Therefore, Alternative F2 is considered preferable to Alternative F3 in terms of the locally preferred plan.

## 10.2 ENVIRONMENTALLY PREFERRED PLAN

The identification of the environmentally preferred plan is based on the comparison of the alternatives in Chapter 8 which, in turn, is based on the impact analysis in Chapter 5. The environmentally preferred plan would be Alternative F2, followed closely by Alternative F3. The reasons for this determination are explained below.

While the no-project alternative would have fewer impacts than any of the dredging/disposal alternatives (Table 8.3-1), it would not achieve the objectives of the project, and thus is not considered in the determination of the environmentally preferred plan.

None of the alternatives would avoid two significant impacts and, in fact, significant unavoidable impacts would occur for all alternatives in two resources areas: air quality and noise (see Table 8.3-1). For air quality, ROG, $NO_x$, and $PM_{10}$ emissions from the increase in vessel calls, cargo handling, cargo transport, and employee commuting that would be allowed by the deeper channels would exceed the BAAQMD (Bay Area Air Quality Management District) significance thresholds of 80 pounds per day and 15 tons per year. These air quality impacts would therefore occur *after* the proposed navigation improvements are completed. For noise, the significant unavoidable impact would be that the proposed hours of dredging (24 hours per day) would not be consistent with time restrictions in the Alameda Noise Ordinance. There is no feasible mitigation for this impact.

For many of the resource areas analyzed, there would also be significant but mitigable impacts under any of the alternatives. This would be true for surface water resources, geology and groundwater, biological resources, vessel transportation, ground transportation, hazardous materials and contaminated wastes, and public services (see Table 8.3-1). The reason that there would be significant but mitigable impacts for all the alternatives for all of these resource areas is either because the impact in question is due to the dredging activity (which is common to all alternatives) and/or because the impact is due to a reuse/disposal option that is common to all alternatives (the Vision 2000 Upland area, the MHEA, and the Various Landfills are the reuse/disposal options that are common to all alternatives). Significant but mitigable impacts from the dredging activity would occur for the following resource areas: surface water resources, geology and groundwater, biological resources, vessel transportation, and public services (Table 8.2-1). Significant but mitigable impacts from the use the Vision 2000 Upland area would occur for both surface water resources and hazardous materials and contaminated wastes. Significant but mitigable impacts from the use of the MHEA would occur for surface water resources and vessel transportation (Table 8.2-1). The use of the Various Landfills disposal option would result in significant but mitigable impacts on ground transportation (Table 8.2-1). The nature of these impacts on each resource area is described in sections 8.2 and 8.3.

For some resource areas, the only significant impacts that would occur would be due to the dredging; this is true for groundwater and geology, and public services (Table 8.2-1). Three other resource areas would have significant impacts due to dredging and at only one or two of the reuse/disposal sites (Table 8.2-1): biological resources (significant impacts at New Berth 21 and NAS Alameda), vessel transportation (significant impacts at MHEA), and noise (significant impacts at NAS Alameda).

Judging from Table 8.3-1, there is no one alternative or set of alternatives that is clearly environmentally preferable when considering the negative (adverse) impacts. In fact, for each resource area shown in this table, the level of the impact would be essentially the same regardless of the alternative selected. Again, this is because the most significant impact on the resource is either due to the dredging (which is common to all alternatives) or to one of the three reuse/disposal options (Vision 2000 Upland area, MHEA, or Various Landfills) that are also common to all alternatives.

Table 8.3-1 also suggests no one alternative or set of alternatives would be environmentally preferable when considering just the beneficial impacts. For those resource areas that would

experience beneficial impacts from the project -- biological resources, socioeconomics, vessel transportation, hazardous materials and contaminated wastes, land use, and visual resources -- the same benefits would occur regardless of the alternative. The benefits of the project would be due to either the dredging or to the habitat enhancement components of the MHEA (Table 8.2-1). The proposed dredging would result in beneficial impacts on vessel transportation (improved efficiencies for the containerships); this would result in a secondary socioeconomic benefit for the Port of Oakland and the region. Removing contaminated sediments from Oakland Harbor channels would be a beneficial impact on hazardous materials and contaminated wastes.

Since no one alternative is clearly preferable based on the comparison in Chapter 8, consider the total volume of sediment that would be removed and require reuse/disposal under the different alternatives. Alternatives B1 through B6 would remove 14.5 mcy, while alternatives F1 through F9 would remove somewhat less sediment, 12.8 mcy (Table 8.1-1). The Port's navigation simulation studies have concluded that removing the additional 1.7 mcy from widening the western edge of the Outer Harbor under the "B" alternatives would not allow for two-way vessel traffic in the Outer Harbor and would thus not really "buy" the Port much added benefit in terms of improved ship operations. This being the case, it makes sense to focus on the "F" alternatives that would require less sediment to be removed and disposed. Reducing the total volume of dredged material would result in fewer barge trips transporting the material to the reuse/disposal sites. There would also be less emissions during construction from both dredging and transport to the reuse/disposal sites. The reduced dredging under the "F" alternatives would also reduce the period during which the significant noise impacts would occur on sensitive receptors. For all these reasons, the "F" alternatives would be environmentally preferable to the "B" alternatives.

The Marine Protection, Research, and Sanctuaries Act allows ocean disposal of dredged material under certain conditions when "There are no practicable alternative locations and methods of disposal or recycling available ... which have less adverse environmental impact or potential risk to other parts of the environment than ocean dumping" [40 CFR 227.16(a)(2)]. According to the San Francisco Bay Plan, "Disposal of dredged materials should be encouraged in non-tidal areas where the materials can be used beneficially, or in the ocean." The Hamilton Wetlands Restoration and the Montezuma Wetlands Restoration projects would each offer the opportunity for the sponsors of those projects to use the dredged material from the deepening project for wetland restoration. Therefore, if these options are available within the timeframe of the deepening project, and are practicable, they would be environmentally preferable to ocean disposal. The alternatives that include wetland restoration (in addition to the habitat enhancement at Middle Harbor, which is common to all alternatives) are F2, F3, F5, and F7. Alternatives F2 and F3 would direct the most material towards wetland restoration, so these alternatives are preferred assuming the options are available and practicable.

The Hamilton site (Alternative F2) is considerably closer (24 miles) to Oakland Harbor than is the Montezuma site (Alternative F3) (52 miles). As noted above, reducing the transport distance would result in a corresponding reduction in air pollution emissions from the tugs which accompany the barges. On this basis, the Hamilton site would be preferred over the Montezuma site. The environmentally preferable plan is thus Alternative F2, followed closely by Alternative F3.

## 10.3 THE SELECTED PLAN

A National Economic Development (NED) plan and a locally preferred plan (LPP) have been identified, with the LPP and the NED equivalent, consisting of a 50-foot project.

The preferred plan is a 50-foot project depth, and a set of disposal sites that includes dredged material reuse for habitat creation in Middle Harbor and Hamilton Wetlands Restoration assuming that site is available to accept dredged material within the timeframe of the deepening project. In the event that the Hamilton Wetlands Restoration project is not available to accept dredged material within the required timeframe, and/or the costs are not feasible, reuse of a portion of the dredged material at the Montezuma Wetlands Restoration project under Alternative F3 would be selected, as long as construction costs are feasible. In the event that neither the Hamilton nor Montezuma Wetlands project is able to meet these conditions, the material designated for either of those projects would be disposed of in the ocean under Alternative F1.

# 11.0 UNAVOIDABLE SIGNIFICANT IMPACTS

Unavoidable significant impacts from the project, or from the project in combination with cumulative projects, would occur only in the areas of air quality, ground transportation, and noise, as described below.

## 11.1 AIR QUALITY

Emission increases from new vessel, cargo handling, cargo transport, and employee vehicle sources allowed by the completion of the 50-foot deepening action would exceed the BAAQMD significance thresholds of 80 pounds per day and 15 tons per year for $NO_x$ and $SO_x$ in 2003. By 2010, these thresholds would be exceeded for ROG, $NO_x$, $SO_x$, and $PM_{10}$. Mitigation measures would be applied, as described in section 5.1.5. However, the mitigation measures would not be sufficient to reduce the project emissions and emissions from other cumulative projects in the area to below the significance thresholds. Operational emissions of ROG, $NO_x$, $SO_x$, and $PM_{10}$ are therefore considered to cause an unavoidable, significant air quality impact.

## 11.2 GROUND TRANSPORTATION

For cumulative conditions, significant impacts that cannot be mitigated would occur on some of the freeways south of the Port. In year 2000, significant impacts would occur on I-880 south of I-238, where the level of service would drop from LOS E to LOS F during the A.M. peak hour in both the northbound and southbound directions. In 2010, significant freeway impacts would occur in the peak commute directions on I-880 south of I-980 during both the A.M. and P.M. peak hours. Significant impacts would also occur on I-238, where the level of service would drop from LOS E to LOS F in the eastbound direction during the P.M. peak hour.

It is not practical to mitigate cumulative traffic impacts to freeways to levels that are not significant. Increasing freeway capacity by adding lanes would not be feasible because of the high cost, the negative impacts to air quality, and other factors. Adding lanes is also inconsistent with the policies of the responsible regional agencies.

## 11.3 NOISE

Operation of the cutterhead dredge in the Inner Harbor channel would not comply with the hourly restrictions for construction that are specified in the Alameda Noise Ordinance and construction noise may exceed the nighttime noise limits specified in the Oakland Noise Ordinance. This would be an unavoidable significant impact.

# 12.0 GROWTH-INDUCING IMPACTS

An EIR must discuss the ways in which the proposed action and alternatives could foster economic or population growth or the construction of additional housing, either directly or indirectly, in the area surrounding the project. Analysis of growth-inducing effects includes those characteristics of the proposed action that may encourage and facilitate activities that, either individually or cumulatively, would affect the environment. Population increases, for example, may impose new burdens on existing community service facilities. Similarly, improvement of access routes may encourage growth in previously undeveloped areas. Growth may be considered beneficial, adverse, or of no significance environmentally, depending on its impacts to the environmental resources present.

During construction, the dredging activities would require an approximate maximum of 20 employees; reuse/disposal activities would require from 10 to 71 employees. Not all of these employees would be working at the same time. The very large labor force available in the greater Bay Area would easily provide for this relatively small number of employees; therefore no in-migration would occur. After the channels have been deepened, it is assumed that there would be no additional employees that would be attributable to the proposed project, although the Port's other planned improvements (e.g., the Berth 55-58 project and the Joint Intermodal Terminal) would result in additional employees.

The work force required for the project would thus not be growth-inducing. Since channel deepening involves only bay sediment dredging and disposal, relatively few construction-related materials would be required, and they would be able to be procured from existing manufacturers, vendors, and other suppliers. Based on these considerations, channel deepening would not induce growth.

The primary purpose of the project is to allow deep-draft ships transporting cargo into and out of the Port of Oakland to operate with greater safety and efficiency. Once the channels are deepened, deep-draft vessels would be able to enter and exit marine terminals at the Port fully loaded, eliminating the need to either light load or wait for favorable tides. This would result in more efficient shipping and cargo operations, so that fewer vessel calls would be necessary to transport the same amount of cargo. The proposed navigation improvements are expected to cause an increase in vessel calls by container ships at the Port from an existing (1996) total of 1,630 calls to 1,737 in the year 2003, and to 1,930 in the year 2010. Compared to the number of vessel calls in 1996, vessel calls at the Port would thus increase about 7 percent by the year 2003 and by about 18 percent by the year 2010. The proposed deepening would thus contribute to growth in the regional cargo throughput.

The proposed navigation improvements are not expected to result in any population or housing growth in the project area.

The proposed deepening is part of a larger redevelopment program at the Port which is called the Vision 2000 Program. Three of the Port's goals related to redevelopment under the Vision 2000 Program (including the FISCO site) are as follows:

- To provide for the growth of railroad intermodal capacity,
- To generate revenue to fund future growth and to ensure the viability of the Port, and

- To respond to continuing trends and requirements in maritime container shipping and overland transportation by constructing expanded intermodal rail facilities and marine terminals.

In the last few years, the Port has suffered a loss of loading capacity and business to other West Coast ports that have larger terminals and more efficient intermodal systems. Implementation of the 50-foot deepening project, in conjunction with the rest of the Vision 2000 Program, would help to return the Port to its previous competitive position with other West Coast ports.

The proposed deepening in combination with the other components of the Port's Vision 2000 Program, particularly the development of marine terminals and the Joint Intermodal Terminal, would induce economic growth in the region. However, any demands for additional employees resulting from this economic growth are expected to be met by the substantial local population. The Port would continue to promote and implement local hiring. The increased economic activity is expected to contribute to regional economic growth and would affect factors such as housing conditions and land development. The results of any growth inducement resulting from the project would be controlled by existing and undetermined future zoning requirements, off-site general plan designations, and specific environmental documentation for separate development projects.

Should the improvements provided by channel deepening result in growth in maritime trade that necessitates expansion or construction of major new facilities or infrastructure improvements beyond the currently planned capacity, additional environmental review would be required.

## 13.0 RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Implementation of the project would result in both short- and long-term impacts.

Dredging would temporarily increase air pollution emissions and noise in the immediate vicinity of the project site; the air quality impacts during construction would be adverse but not significant and would last for about 4 years. The transport of the dredged material and disposal of the material at the approved reuse/disposal sites would increase maritime traffic for the duration of the dredging period. Depending on the selected reuse/disposal sites, there could be over 2,250 total barge trips during this period. For the SF-DODS disposal site, which could require the most trips, up to 1,675 barge trips would be spread over a period of about 670 days. This level of additional traffic would have only minimal impacts on shipping lanes in the San Francisco, San Pablo, and Suisun bays relative to existing traffic, and any impacts would be short term.

While most of the noise impacts associated with dredging could be mitigated to insignificance, the operation of the cutterhead dredge in the Inner Harbor would exceed the time restriction of the Alameda Noise Ordinance. There is no feasible mitigation for this significant impact.

Placement of dredged sediments at the Hamilton Army Airfield would impact the runway, a part of the Hamilton Historic District deemed eligible for listing on the National Register. However, since the Hamilton site could receive dredged material from sources other than the 50-foot project, this impact would not be strictly attributable to the proposed project. This ong-term significant impact would be reduced to insignificance by development of a Memorandum of Agreement for the Hamilton site, including measures to protect the cultural resources and to mitigate any residual adverse effects.

Filling the New Berth 21 area would result in the permanent loss of 27 acres of deep-dredged marine habitat, which is considered a significant but mitigable impact.

Creation of the habitat enhancement area in Middle Harbor through implementation of the MHEA reuse option would result in a long-term benefit for biological resources, public access and recreation, and visual resources.

Upland disposal could potentially result in a long-term release of any contaminants contained within the sediments to groundwater and surface water resources. However, appropriate management and facility design would reduce impacts to surface water and groundwater to an insignificant level.

Upland disposal would be accompanied by long-term monitoring of water resources beneath and adjacent to the placement site, allowing for early detection of resource contamination. Contingency measures would be triggered at specific concentration levels should significant contamination of surface or groundwater resources occur. Contingency measures and the specific concentration levels triggering those mechanisms would be established by the facility's operating permits. In addition, control measures addressing potential exceedances of surface and groundwater standards would be incorporated into site management and design.

Placement of the sediments for restoration of wetland habitat would permanently modify land uses and topography at the Hamilton and Montezuma sites. Creation of tidal wetland habitat at these sites would be considered a long-term, beneficial impact although, since these sites could receive dredged material from other sources as well, this impact would not be strictly attributable to the proposed project.

The project would require the taking of upland and submerged land for the construction of the turning basin. Approximately 1.2 acres of "dry" land at the FISC Annex property and 0.3 acre of land owned by the City of Alameda (which it leases to Alameda Gateway) would have to be excavated to construct the proposed turning basin. Approximately 2.4 acres of pile supported marine structures (e.g., wharves and piers) on the FISC property, 0.2 acre of marine structures on City of Alameda owned property, and 0.8 acre on property owned by Alameda Gateway would also have to be removed. In addition, approximately 3.3 acres of uncovered submerged lands (i.e., not covered by marine structures) on FISC Annex property, 8.2 acres on property owned by Alameda Gateway, and 3 acres of property owned by the City of Alameda would be deepened. In addition, temporary work areas, including access to the site, would be necessary. The Port (or the Corps) would have to acquire access to use these temporary sites and would compensate the owners as required by law. The long-term loss of this land would not significantly affect existing or current proposed land uses in the area.

There would be significant but mitigable impacts on traffic congestion during the period that the more contaminated dredged material is hauled from the rehandling facility to area landfills.

Use of the Montezuma Wetlands disposal site would result in potentially significant, short-term noise levels affecting sensitive receptors in Collinsville, but would be reduced to an insignificant level with equipment silencers. This impact would not be attributable to the proposed project.

There would be a long-term significant and unavoidable impact on air quality after the proposed navigation improvements are completed. The deepened channels would allow for increased vessel calls, cargo handling, cargo transport, and employee commuting; emissions from these sources would exceed the BAAQMD significance thresholds of 80 pounds per day and 15 tons per year for $NO_x$ in 2003, and for ROG, $NO_x$, and $PM_{10}$ in 2010. Mitigation would be applied but this would not reduce emissions to below the significance thresholds. The operational emissions attributable to the project would be compounded by the emissions from the identified foreseeable projects, resulting in a significant and unavoidable cumulative air quality impact.

Cumulative impacts on traffic would also be significant and unavoidable. This is largely due to the anticipated population growth of the Bay Area. Cumulative growth in the project area, even without the proposed dredging project, would result in significant and unavoidable impacts to the region's freeway system.

The tradeoff for the potential environmental impacts that are not offset by environmental gains is the socioeconomic gain of maintaining the Port of Oakland and the San Francisco Bay Area as a major import and export center on the West Coast. The shipping activities in the Port of Oakland result in tens of thousands of jobs and billions of dollars of trade with Pacific Rim nations and across the United States. The project area is a natural harbor that has undergone successive development over the past 100 years to become one of the largest containership terminals in the world. Past and future maintenance and new dredging projects in the Bay Area are predicated on the current needs for safe navigation and for maintenance of the economic and social advantages of waterborne commerce.

The improvement and maintenance of dredging practices of the past have resulted in limited, largely short-term environmental consequences.

The long-term implications of the proposed project are significant in terms of economic viability. The long-term environmental consequences of the project are considered minimal on a regional level.

# 14.0 IRREVERSIBLE OR IRRETRIEVABLE COMMITMENTS OF RESOURCES

Resources that are committed irreversibly or irretrievably are those that cannot be recovered if the project is implemented. The proposed project would involve two types of resources: (1) general industrial resources including capital, labor, fuels, and construction materials; and (2) project-specific resources such as biotic resources, water resources, and land uses at the affected sites. The industrial resources would not be retrievable if the navigation improvements are constructed.

Irreversible environmental changes would occur both at the proposed dredging area and some of the approved reuse/disposal sites. Benthic organisms living in the Oakland Harbor dredge area would be destroyed by the dredging activities. Although evidence indicates that benthic recolonization does take place at sites that are dredged regularly, constant disturbance tends to result in colonization by more opportunistic species, thus changing the nature of the distribution and diversity of species. Since the project area is currently being dredged for the 42-foot project and is dredged periodically for maintenance purposes, the bottom materials are already occupied by hardy species.

A permanent loss of benthic species and marine habitat in general would occur from filling the New Berth 21 area.

Sediment placement at the MHEA and the subsequent creation of the enhanced habitat in Middle Harbor would result in the permanent loss of deep-water habitat in this area, but the creation of more biologically productive shallow-water habitat.

Similar disturbance of benthic communities as noted above for the dredge area would also occur at the SF-DODS. Continued disposal of dredged materials at an aquatic site modifies or precludes recolonization of the site to its previously undisturbed state, and changes sediment characteristics, including grain size, at the disposal site. However, the SF-DODS site is currently being used for dredged material disposal, so benthic community changes are already occurring there.

There would be no irreversible or irretrievable commitment of resources at either the Hamilton or Montezuma sites that would be attributable to the Oakland project. However, sediment disposal at either of these sites would permanently displace or eliminate existing uses; existing habitat would be modified to create aquatic environments and biotic communities similar to those occurring in natural wetland habitats, a beneficial impact on biological resources. The Hamilton airfield is currently abandoned, so there would be no loss of an existing use at this site.

A permanent loss of land would occur in the City of Alameda as a result of construction of the turning basin (see section 13.0).

# 15.0 PUBLIC INVOLVEMENT AND INTERAGENCY COORDINATION

## 15.1 PUBLIC INVOLVEMENT

Public comment on the proposed project was solicited pursuant to federal and state requirements. A state Notice of Preparation (NOP) was issued on July 18, 1997, and a federal Notice on Intent (NOI) was published in the *Federal Register* on the same day. A copy of the NOP and a copy of the NOI are provided in Appendix F. The release of the NOP and the publication of the NOI in the *Federal Register* initiated a 30-day public comment period that ended on August 18, 1997. During this period, a public scoping meeting was held in Oakland on August 5, 1997, to receive agency and public comments regarding the scope of the environmental analysis for the EIS/R/FS.

The NOP and NOI identified 17 potential reuse/disposal sites. Subsequent to the scoping meeting, three additional dredged material reuse/disposal options were identified:

- East Shore State Park;
- Oyster Bay Regional Shoreline; and
- Galbraith Golf Course Reconstruction Drainage Subbase.

These three additional reuse/disposal options were considered, and then eliminated from further study during the initial project screening process (as explained in section 2.2.3); a supplemental NOP and NOI were therefore not required.

Almost all the comments received indicate support for the planned reuse of dredged material. Public concerns identified during the NOP and NOI process and at the scoping meeting noted above focus on the reuse/disposal of the dredged material, cumulative impacts due to project construction, and potential real estate impacts. An overview of the comments received during the scoping period, as well as the transcript of the public scoping meeting, are provided in Appendix F. The concerns identified during the scoping period include the following:

**Dredging Activity**

- Impacts on nearby nesting areas of the California least tern, an endangered species.

**Dredged Material Disposal**

- Cumulative impacts of the proposed project with the projects encompassed by the interagency LTMS program (the Long-Term Management Strategy for dredged material disposal in the Bay Area over the next 50 years);
- Sediment suitability for various uses;
- The viability of the proposed concept for the Middle Harbor Enhancement Area;
- Protection of the public from the more contaminated "NUAD" material (dredged material considered unsuitable for unconfined aquatic disposal);

- Placement of dredged material on U.S. Navy or U.S. Army property.

**Cumulative Impacts**

- Impacts on air quality, noise, and truck traffic; and
- Potential regional impacts on the capacity of existing landfills.

**Real Estate Issues**

- Potential taking of property at the former Fleet and Industrial Supply Center Alameda Annex from the proposed widening of the Inner Harbor turning basin;
- Potential taking of private property; and
- Potential impacts on a proposed new vehicle crossing from Alameda Point to Oakland.

A 45-day public review/comment period on the Draft EIS/R/FS began on February 16, 1998, the day the document was filed with the EPA. This comment period ended on March 29, 1998. Approximately 1,700 Notices of Availability of the Draft EIS/R/FS and 300 copies of the draft document were mailed to federal, state, and local agencies, as well as other organizations, businesses, and individuals.

## 15.2 INTERAGENCY COORDINATION

### 15.2.1 Coordination with Environmental Agencies

The Corps and Port of Oakland have made numerous efforts to coordinate the development of this project with other agencies, including the U.S. Environmental Protection Agency (EPA), U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service, the state Resources Agency, the California Department of Fish and Game (CDFG), the Regional Water Quality Control Board (RWQCB), the San Francisco Bay Conservation and Development Commission (BCDC), the State Lands Commission, the Coastal Conservancy, and other agencies. These coordination efforts have involved discussions, meetings, and correspondence on primarily the following issues: air quality, biological resources, cultural resources, sediment testing and resulting suitability determinations for various disposal options and uses, and water quality.

Development of the air quality analysis in this document has been coordinated with staff of the Bay Area Air Quality Management District (BAAQMD). The analysis of the project's conformity with Section 176(c) of the Clean Air Act is being coordinated with staff of both the EPA and the BAAQMD.

A Planning Guidance Letter was received from the USFWS on December 8, 1997. The letter outlined the USFWS's concerns for the project (see Appendix N.1). A Draft Coordination Act Report (DCAR) for the project was released in March 1998 (see Appendix N.2). The DCAR, as well as the Corps' and the Port's response to the recommendations contained in the DCAR are incorporated into the Final EIS/R/FS (see Appendix N.3). The Final Coordination Act Report is expected from the USFWS in June 1998.

The Corps submitted a Biological Assessment (prepared by the Port's consultant) for threatened and endangered species for this project to the U.S. Fish and Wildlife Service pursuant to the

Endangered Species Act. The Service is expected to issue a Biological Opinion regarding any project impacts and suggested mitigation measures in June 1998.

### 15.2.2 Coordination with Other Agencies

In addition to coordinating with numerous environmental agencies, the Port and the Corps also coordinated with a wide range of local agencies and local and federal government entities. These have included the U.S. Navy, U.S. Army, U.S. Coast Guard, City of Oakland, City of Alameda, Oakland Landmarks Preservation Board, Oakland Base Reuse Authority, and the Alameda Reuse and Redevelopment Authority. In addition, the Port has convened a Habitat Technical Advisory Committee described below to guide the habitat design for the Middle Harbor Enhancement Area.

The Corps initiated coordination with the State Historic Preservation Officer (SHPO) with regard to cultural resources that may be present in the project area. By letter dated January 6, 1998, the SHPO concurs with the Corps' determination that there is one National Register-eligible property within the Area of Potential Effect (APE). The taking of this historic resource would occur under a related project, the Berth 55-58 project (see section 9.1.2).

## 15.3 COMMENTS FROM THE OAKLAND COMMUNITY, ENVIRONMENTAL ORGANIZATIONS AND PRIVATE CITIZENS

In addition to the scoping meeting, the Port of Oakland and the Corps have conducted other outreach efforts for this project. The Port convened a Habitat Technical Advisory Committee (TAC) to help guide the habitat design for the Middle Harbor Habitat Area. The TAC was composed of staff from the Corps, USFWS, CDFG, RWQCB, BCDC, East Bay Regional Park District, and representatives of the Golden Gate Audubon Society, Save San Francisco Bay Association, Sierra Club, and the West Oakland community. The TAC met periodically in 1997 to review the habitat and hydrodynamic sampling and analysis program and results, and to give the Port input regarding the preferred habitat design.

The following ongoing outreach is underway for other maritime projects at the Port of Oakland: public access workshops and discussion with the West Oakland Neighbors group.

## 16.0 REFERENCES


ABAG (Association of Bay Area Governments). 1992. *Projections '92: Forecasts for the San Francisco Bay Area to the Year 2010.* Oakland, California. July.

_____. 1993. *Projections '94.*

_____. 1995. *On Shaky Ground.* ABAG Publication No. P95001EQK.

ACFCWCD (Alameda County Flood Control and Water Conservation District). 1988. *Geohydrology and Groundwater Quality Overview of the East Bay Plain Area, Alameda County, California.* Report 205(J).

Ainley, D.G., and R.J. Brockelheide. 1990. Seabirds of the Farallon Islands: Ecology, Dynamics, and Structure of an Upwelling-System Community. Palo Alto: Stanford University Press.

Ainley, D.G., and S.G. Allen. 1992. *Abundance and Distribution of Seabirds and Marine Mammals in the Gulf of the Farallones: Final Report.* Prepared for the Environmental Protection Agency (Region IX) LTMS Study Group. Point Reyes Bird Observatory, Stinson Beach, California.

Alameda County CMA (Congestion Management Agency). 1995. Alameda County Congestion Management Program — 1995 Update. September 28.

_____. 1997. 1997 Alameda County Congestion Management Program Level of Service Monitoring. July.

Allen, M.A., and T.J. Hassler. 1986. Species Profiles: Life Histories and Environmental Requirements of Coastal Fishes and Invertebrates (Pacific Southwest) — Chinook Salmon. *U.S. Fish and Wildlife Service Biological Report* 82(11.49). U.S. Army Corps of Engineers, TR EL-82-4. 26 pp.

Alpine, A.E., and J.E. Cloern. 1988. Phytoplankton growth rates in a light-limited environment, San Francisco Bay. Mar. Ecol. Prog. Ser. Vol. 44: 167-173.ARB (California Air Resources Board). 1984. *Report to the California Legislature on Air Pollutant Emissions from Marine Vessels,* Volume I. Sacramento.

Alvarez, Lehman & Associates, Inc. 1985. *Final Report on Environmental Monitoring, Naval Submarine Base, Kings Bay, Georgia — October 1983 to September 1984.* Presented to the Department of the Navy.

American Lung Association. 1997. Fact Sheet: Particulate Matter Air Pollution.

Applied Geosciences. 1989. *Subsurface Investigation, 900 Doolittle Drive, San Leandro, California.* Prepared for Doolittle Associates, Oakland, California.

Aquascape. 1990. *Constraints and Opportunities for Wetlands; Case Study: Lew Galbraith Golf Course, Oakland, California.*

ARB (California Air Resources Board). 1984. *Report to the California Legislature on Air Pollutant Emissions from Marine Vessels, Volume I.* Sacramento.

_____. 1991. *Emission Inventory – 1989.* Technical Support Division, Emission Inventory Branch.

_____. 1993. EMFAC7 Computer Model, Technical Support Division.

_____. 1994, 1995, and 1996. *California Summary of 1993, 1994, and 1995 Air Quality Data, Volumes XXV, XXVI, and XXVII.* Technical Support Division.

_____. 1997a. *Maps and Tables of the Area Designations for State and National Ambient Air Quality Standards, and Expected Peak Day Concentrations and Designation Values.* Technical Support Division. January.

_____. 1997b. *Methodology for Estimating Emissions from On-Road Motor Vehicles.* Volume I and Volume II. Mobile Source Division.

ARRA (Alameda Reuse and Redevelopment Authority). 1995. *NAS Alameda Community Reuse Plan, Phase II: Conditions and Trends Report.* Prepared by EDAW, Inc.

_____. 1996. *NAS Alameda Community Reuse Plan.* Prepared by EDAW, Inc. January 31.

BAAQMD (Bay Area Air Quality Management District). 1996. *BAAQMD CEQA Guidelines Assessing the Air Quality Impacts of Projects and Plans.* Planning and Research Division. April.

Bache, A.D. 1855. Map [U.S. Coast Survey]. Bay of San Francisco, California. Angel Island to Point Avisadero. By the Hydrographic Party under the command of Lieut. James Alden, U.S. Navy, Asst U.S. Coast Survey. Facsimile on file, Basin Research Associates, San Leandro.

Barnard, W.D. 1978. *Prediction and Control of Dredged Material Dispersion around Dredging and Open-Water Pipeline Disposal Operations.* Technical Report DS-78-13. U.S. Army Corps of Engineers Waterways Experiment Station, Vicksburg, Mississippi.

Barnhart, R. A. 1986. Species Profiles: Life Histories and Environmental Requirements of Coastal Fishes and Invertebrates (Pacific Southwest) – Steelhead. *U.S. Fish and Wildlife Service Biological Report* 82(11.60). U.S. Army Corps of Engineers, TR EL-82-4. 21 pp.

_____. 1988. Species Profiles: Life Histories and Environmental Requirements of Coastal Fishes and Invertebrates (Pacific Southwest) –Pacific Herring. *U.S. Fish and Wildlife Service Biological Report* 82(11.79). U. S. Army Corps of Engineers, Technical Report EL-82-4. 14 pp.

Barns, R. S. K., and K. H. Mann, eds. 1991. *Fundamentals of Aquatic Ecology.* 2nd Ed. London: Blackwell Scientific Publishing.

BCDC (San Francisco Bay Conservation and Development Commission). 1969. *San Francisco Bay Plan,* as amended.

BCDC and MTC (Metropolitan Transportation Commission). 1996. *San Francisco Bay Area Seaport Plan.*

Beardsley, R.K. 1948. Culture Sequences in Central California Archaeology. *American Antiquity* 14:1-28.

_____. 1954. Temporal and Areal Relationships in Central California Archaeology. *Reports of the University of California Archaeological Survey 24 and 25.*

BEC (Baseline Environmental Consulting). 1991. *Report on Preliminary Groundwater Quality Investigation, Galbraith Golf Course, Oakland, California.*

Beck, W.A. and Y.D. Haase. 1974. *Historical Atlas of California.* (Third printing). Norman: University of Oklahoma Press.

Beers, J.R. 1986. *Plankton Dynamics of the Southern California Bight – Lecture notes on Coastal and Estuarine Studies: Chapter 4.* New York: Springer-Verlag.

Bence, J.R., D. Roberts, and W.H. Lenarz. 1992. *An Evaluation of the Spatial Distribution of Fishes and Invertebrates off Central California in relation to EPA Study Areas with Emphasis on Midwater Ichthyofauna.* Report to U.S. EPA Region IX. National Marine Fisheries Service, Tiburon Laboratory, Southwest Fisheries Science Center, Tiburon, California.

Bennyhoff, James A. 1977. Ethnogeography of the Plains Miwok. Center for Archaeological Research at Davis Publication 5.

Berg-Revoir Corp. 1987. *Hamilton Field Revised Master Plan Technical Appendix.* Novato, California.

Blake, J.A., B. Hecker, J.F. Grassle, B. Brown, M. Wade, P.D. Boehm, E. Baptiste, B. Hilbig, N. Maciolek, R. Petrecca, R.E. Ruff, V. Starczak, and L. Watling. 1987. *Study of Biological Processes on the U.S. South Atlantic Slope and Rise.* Phase 2. Final Report. Prepared for the U.S. Department of the Interior, Minerals Management Service, Washington, D.C. under Contract No. 14-12-0001-30064.

Booz-Allen & Hamilton, Inc. 1991, 1992, 1993. Support Document for the Control of Emissions from Marine Vessels entitled *Inventory of Air Pollutant Emissions from Marine Vessels,* and revisions. Prepared for the California Air Resources Board, Sacramento.

Borcherdt, R.D., and Glassmoyer, G. 1994. Influences of Local Geology on Strong and Weak Ground Motions Recorded in the San Francisco Bay Region and their Implications for Site-Specific Building Code Provisions. In: Borcherdt, R. D., (ed), *The Loma Prieta, California, Earthquake of October 17, 1989 – Strong Ground Motion.* U.S. Geological Survey Professional Paper 1551.

Brannon, J.M., R.M. Engler, J.R. Rose, P.G. Hunt, and I. Smith. 1976. *Selective Analytical Partitioning of Sediments to Evaluate Potential Mobility of Chemical Constituents during Dredging and Disposal Operations – Final Report.* U.S. Army Corps of Engineers Waterways Experiment Station, Vicksburg, Mississippi.

Bruland, K.W. 1980. Oceanographic Distributions of Cadmium, Zinc, Nickel, and Copper in the North Pacific. *Earth and Planetary Science Letters.* 47:176-198. (Cited in EPA 1993a).

Burks, S.L., and R.M. Engler. 1978. *Water Quality Impacts of Dredged Material Disposal: Laboratory Investigations.* Technical Report DS-78-04, U.S. Army Corps of Engineers Waterways Experiment Station, Vicksburg, Mississippi.

Busby, Colin I., Melody E. Tannam and Donna M. Garaventa. 1997. Historic Property Survey Report/Finding of Effect. 50-Foot Channel Navigation Improvements Project, Oakland Harbor, Alameda County. On file, Port of Oakland, City of Oakland and Science Applications International Corporation, Santa Barbara. October.

Cal-EPA (California Environmental Protection Agency). 1992a. Supplemental Guidance for Human Health Multimedia Risk Assessment of Hazardous Waste Sites and Permitted Facilities. Department of Toxic Substances Control.

_____ 1992b. Scientific and Technical Standards for Hazardous Waste Sites. Volume 6, Chapter 5, Assessment of Health Risks from Inorganic Lead in Soils. Review Draft. Department of Toxic Substances Control.

California Department of Finance. 1997. *Report E-5, Population and Housing Estimates, January 1, 1997.*

California Department of Parks and Recreation, Office of Historic Preservation. 1997a. Letter to Lt. Colonel Richard G. Thompson, Corps of Engineers, San Francisco District from Ms. Cherilyn Widell, State Historic Preservation Officer. Oakland Harbor Navigational Improvements; Determination of National Register Eligibility for Alameda and Oakland Harbor Jetties and for WPRR Oakland Mole. Dated October 15, 1997. On file, Basin Research Associates, San Leandro.

_____. 1997b. Computer Printout. Historic Properties Directory for Alameda County. Office of Historic Preservation, Department of Parks and Recreation, Sacramento. Dated April 25, 1997. On file, California Archaeological Site Inventory, Rohnert Park.

California Governor's Office of Planning and Research. 1990. *General Plan Guidelines.*

Cal-OSHA (8 CCR sec. 5155) General Industrial Safety Orders.

Caltrans (California Department of Transportation). 1991. *Final Environmental Impact Statement/Report I-880/Cypress Replacement.* September.

_____. 1993. *1992 Traffic Performance of Bay Area Freeway System.* Prepared by Caltrans District 4 Highway Operations Branch.

_____. 1996a. *Average Annual Daily Truck Traffic on the California State Highway System – 1995.*

_____. 1996b. 1995 Traffic Volumes on California State Highways.

Carlisle, H., and Rollins, K.M. 1994. Ground-Response Studies at the Alameda Naval Air Station. In: Borcherdt, R.D. (ed), *The Loma Prieta Earthquake of October 17, 1989 – Strong Ground Motion.* U.S. Geological Survey Professional Paper 1551-A.

Carlton, J.T. 1979. Introduced Invertebrates of San Francisco Bay. In: T.J. Conomos (ed.), *San Francisco Bay – The Urbanized Estuary*. Pacific Division, American Association for the Advancement of Science, San Francisco. pp. 427-444.

CDFG (California Department of Fish and Game). 1992. *Annual Report on the Status of California State-Listed Threatened and Endangered Animals and Plants*. Sacramento.

_____. 1996. Natural Diversity Data Base (information from the USGS 7.5 minute Novato and Petaluma Point Quadrangles). Natural Heritage Division, Sacramento.

CDHS (California Department of Health Services). 1993. Alameda County Census Tracts 4018, 4019, 4020, 4021, 4022, 4025 combined. The Incidence of Invasive Cancer, Selected Anatomic Sites, 1987-1993.

CDMG (California Division of Mines and Geology). 1972. Fault Rupture Hazard Zones in California: Alquist-Priolo Special Studies Zones Act of 1972.

CEDD (California Employment Development Department). 1992. *Annual Planning Information: Marin County*.

_____. 1997. *Labor Force Data for Sub-County Area 1996 Benchmark*. March.

Central Valley Regional Water Quality Control Board. See CV-RWQCB.

CEQ (Council on Environmental Quality). 1997. *Considering Cumulative Effects under the National Environmental Policy Act*. Prepared by the Executive Office of the President. January.

Children's Hospital of Oakland. 1994. Discharges by Zip by Age Group (Asthma), 1994 Datis Database.

_____. 1995. SB 697 Needs Assessment – Indicator Data Report, Alameda/Contra Costa Counties.

Chin, J.L., H.A. Karl, and N.M. Maher. 1992. Characterization of EPA Study Areas 3, 4, and 5 on the Farallon Slope using High Resolution Seismic Reflection Profiles. Chapter 4 in H.A. Karl, editor, *Comprehensive Geological and Geophysical Survey of the Gulf of Farallones Region*. Administrative Report of the U.S. Geological Survey, Menlo Park, California.

City of Alameda. 1984. 115-kV Cable Installation, Estuary Crossing, Plan and Profile, Map No. 653-E-207.3, 5-R-13. Bureau of Electricity, Department of Utilities.

_____. 1991. *City of Alameda General Plan*. Prepared by Blayney Dynett Greenberg. February.

_____. 1996. *Ordinance No. 2177 N.S., Alameda Noise Regulations*. April.

City of Novato. 1981. *City of Novato General Plan*.

City of Oakland. Undated. Amendments to the Zoning Regulations since June 13, 1989.

_____. 1974. *Noise, An Element of the Oakland Comprehensive Plan*.

_____. 1976. *Open Space, Conservation, and Recreation – An Element of the Oakland Comprehensive Plan.*

_____. 1980a. *Oakland City Plan.* Adopted October 24, 1972; amended through September 1980.

_____. 1980b. *Oakland Policy Plan – A Component of the Comprehensive Plan..* Adopted October 24, 1972; amended through September 1980.

_____. 1994. *Draft Historic Preservation Plan, an Element of the Oakland General Plan.*

_____. 1996a. *Ordinance No. 11895, Oakland Noise Ordinance.*

_____. 1996b. Traffic turning movement data.

_____. 1996c. *Open Space, Conservation and Recreation (OSCAR) – an Element of the Oakland General Plan.*

_____. 1997. *Envision Oakland – City of Oakland General Plan: Draft Land Use and Transportation Element.* October.

City of Vallejo. 1997. *Draft Mare Island Dredge Ponds Feasibility Study, Volume I (Summary Report).* Prepared by Gahagan & Bryant Associates, Inc.; Laurel Marcus & Associates; Entrix, Inc.; and Williams-Kuebelbeck & Associates, Inc. June 9.

Cloern, J.E., B.E. Cole, R.L.J. Wong, and A.E. Alpine. 1985. Temperal Dynamics of Estuarine Phytoplankton: A Case Study of San Francisco Bay. *Hydrobiologia* 129: 153-176.

COE (Corps of Engineers). 1976. Dredge Disposal Study, San Francisco Bay and Estuary, *Appendix C, Water Column.*

_____. 1979. *Final Environmental Statement and Feasibility Report, Oakland Outer Harbor Deep-Draft Navigation Improvements, Alameda County, California.*

_____. 1984. San Francisco Bay Tidal Stage vs. Frequency Study. San Francisco District.

_____. 1988a. *Oakland Harbor Deep-Draft Navigation Improvements Design Memorandum Number 1, General Design and Final Supplement 1 to the Environmental Impact Statement.*

_____. 1988b. *Confirmatory Sediment Analyses and Solid and Suspended Particulate Phase Bioassays on Sediment from Oakland Inner Harbor, San Francisco, California.* Report No. PNL-6794. Prepared by Pacific Northwest Laboratory, operated for the U.S. Department of Energy by Battelle Memorial Institute. December.

_____. 1989. *Hamilton Army Airfield [Novato, California], Final Report, Flood Control Study.* Sacramento District.

_____. 1990. *San Francisco Central Bay Suspended Sediment Movement. Report 1. Summer Condition Data Collection Program and Numerical Model Verification.*

_____. 1991. *Environmental Assessment for the Closure and Realignment of Hamilton Army Airfield (HAAF), California.* Prepared for Department of the Army Headquarters, Forces Command, Fort McPherson, Georgia.

_____. 1993. Hamilton Antenna Field Wetland Restoration Plan. File Information.

_____. 1994a. Engineering and Design for Civil Works Projects. COE document ID: ER 1110-2-1150. March 31.

_____. 1994b. *Environmental Assessment for Maintenance Dredging at Suisun Bay Channel and New York Slough, Jersey Island Demonstration Project, Contra Costa County, California, Fiscal Year 1994.* Prepared by the Corps San Francisco District.

_____. 1994c. *Demonstration Project Report and Environmental Assessment for Sonoma Baylands Wetland Demonstration Project.* Prepared by the Corps San Francisco District.

_____. 1995a. *Draft Environmental Impact Statement, Hamilton Army Airfield Disposal and Reuse.* Prepared by the Corps with technical assistance from Jones & Stokes Associates, Inc. (JSA 92-204). Sacramento District.

_____. 1995b. Environmental Assessment Remedial Work on BRAC Property, Hamilton Army Airfield, Marin County, CA. Sacramento District

_____. 1996a. *Final Environmental Impact Statement, Hamilton Army Airfield Disposal and Reuse.* Prepared by the Corps with technical assistance from Jones & Stokes Associates, Inc. (JSA 92-204). Sacramento District.

_____. 1996b. *Basewide Environmental Baseline Survey for the Oakland Army Base, Oakland, California.* Prepared by Foster Wheeler Environmental Corporation.

_____. 1997a. Draft Feasibility Study for Deep-Draft Improvements for the Oakland Inner and Outer Harbors.

_____. 1997b. Navigation Data Center: www.wrc-ndc.usace.army.mil/ndc/index.htm.

_____. 1997c. Biological Assesment to Support a Request for Concurrence with a Determination of "Unlikeley to Adversly Affect": Proposed Soil Disposal Activities at Hamilton Army Airfield Marin County, California. Sacramento District, June.

_____. 1997d. Environmental Assessment Soil Disposal Hamilton Army Airfield Marin County, California. Sacramento District. .

COE and Contra Costa County. 1997. *Draft Environmental Impact Report/Environmental Impact Statement – San Francisco Bay to Stockton Phase III (John F. Baldwin) Navigation Channel Project.* Prepared by Science Applications International Corporation. September.

COE and Jones & Stokes Associates, Inc. 1996. Flood and Drainage Baseline Study for Hamilton Army Airfield Disposal and Reuse. Prepared by the U.S. Army Corps of Engineers – Sacramento District. April.

COE and Port of Oakland. 1994. *Final Supplemental Environmental Impact Report/Environmental Impact Statement – Oakland Harbor Deep-Draft Navigation Improvements.* SCH No. 91073031. Prepared by Science Applications International Corporation. June.

COE and Port of Richmond. 1996. *Final Supplemental Environmental Impact Statement/ Environmental Impact Report – Richmond Harbor Navigation Improvements.* SCH No. 87051916; Richmond Harbor ID No. EID 95-4. Prepared by Science Applications International Corporation. April.

COE and Solano County. 1993. *Administrative Draft Environmental Impact Report/Environmental Impact Statement, Montezuma Wetlands Project.*

_____. 1994. *Draft Environmental Impact Report/Environmental Impact Statement, Montezuma Wetlands Project.* SCH No. 91113031.

Cogswell, H.L. 1977. *Water Birds of California.* Berkeley: University of California Press.

Connell, D.W., and G.J. Miller. 1984. *Chemistry and Ecotoxicology of Pollution.* New York: John Wiley & Sons, Inc.

Conomos, T.J. 1979. *Properties and Circulation of San Francisco Bay Waters.* Pages 47-84 in T.J. Conomos, Ed., *San Francisco Bay: The Urbanized Estuary.* San Francisco: Pacific Division, Amer. Assoc. Advance. Sci.

Conomos, T.J. and D.H. Peterson. 1976. Suspended Particle Transport and Circulation in San Francisco Bay: An Overview. *Estuarine Processes: Volume II. Circulation, Sediment and Transfer of Material in the Estuary.* San Francisco: Academic Press. pp 82-97.

Conomos, T.J., R.E. Smith, D.H. Peterson, S.W. Hager, and L.E. Schemel. 1985. *Processes Affecting Seasonal Distributions of Water Properties in the San Francisco Bay Estuarine System.* Pages 115-142 in T.J. Conomos, Ed., *San Francisco Bay: The Urbanized Estuary.* Pacific Division, Amer. Assoc. Advance. Sci., San Francisco, California.

Cook, Sherburne F. 1957. The Aboriginal Population of Alameda and Contra Costa Counties, California. *University of California Anthropological Records* 16(4).

Corbett, M. and M. Hardy. 1988a. Historic Resources Inventory Form: Todd Shipyard also known as the United Engineering Company Shipyard, and West Alameda Shops, Southern Pacific Company. Copy on file, City of Alameda Planning Department.

_____. 1988b. Historic Resources Inventory Form: Shop Building, Todd Shipyard or Shop Building, West Alameda Yard, Southern Pacific Co. Copy on file, City of Alameda Planning Department.

CV-RWQCB (Central Valley Regional Water Quality Control Board). 1995. *Sacramento-San Joaquin Delta Water Quality Control Plan.*

CWOR (Coalition for West Oakland Revitalization). 1994. Visions and Strategies Phase I Report – "A Community Plan", May 31.

_____. 1995. Visions to Action Mid-term Report. June 24.

deLappe, B.W., W.R. Sistek, E.F. Letterman, M. Firestone-Gillis, and R.W. Risebrough. 1980. *Pre-Discharge Studies, San Francisco South-West Ocean Outfall Project: the Distribution of Higher-Molecular Weight Hydrocarbons in the Coastal Environment.* Report to the Bodega Marine Laboratory and the Bodega Bay Institute of Pollution Ecology by the CH²M Hill Co., San Francisco. (Cited in EPA 1993a, U.S. Navy 1993a.)

del Nevo, A.J., and K.D. Malamma (eds.). 1997. *Biological Assessment for Berths 55-58 and Oakland Harbor Navigation Improvement (-50') Projects.* Prepared by Entrix, Inc., Walnut Creek, California, for the Port of Oakland. December 9.

Do, Tho X. 1997. Facsimilie from T.X. Do., Marin County Department of Public Works. October 6.

Dohl, T.P., R.C. Guess, M.L. Dunman, and R.C. Helm. 1983. *Cetaceans of Central and Northern California, 1980-83: Status, Abundance, and Distribution.* MMS Contract # 14-12-001-29090. University of California, Santa Cruz. (Cited in EPA 1993a, U.S. Navy 1993a.).

Dowling Associates. 1997. Unpublished data by Dowling Associates, Oakland, California.

DWR (California Department of Water Resources). 1981. *Preliminary Assessment of the Effect of Deepening of Oakland Inner Harbor on the Ground Water Resources* (USACE Contract DAC WO 7-81-E-1790).

EBCRC (East Bay Conversion and Reinvestment Commission). 1996. Early Reconnaissance Study for West Oakland Army Base.

EBMUD (East Bay Municipal Utilities District). 1954. Outfall- Subaqueous Section, Map No. VG155.

EIP Associates. 1993. Hamilton Field Project – Final Subsequent EIR. Volume 1: Revised SEIR Part 2 of 2. San Francisco, California. Prepared for the City of Novato Community Development Department, Novato, California.

Eldridge, M.B. and W.M. Kaill. 1973. San Francisco Bay's Herring Resource – A Colorful Past and a Controversial Future. *Mar. Fish. Rev.* 35(11): 25-31.

Elsasser, A.B. 1978. Development of Regional Prehistoric Cultures. In *California*, edited by R. F. Heizer, Volume 8. Handbook of North American Indians, W.G. Sturtevant, general editor, pp. 37-57. Smithsonian Institution, Washington, D.C.

Ellsworth, W.L. 1990. Earthquake history, 1769-1989. In Wallace, R.E. (ed.) *The San Andreas Fault System, California.* U.S. Geological Survey Professional Paper 1515, pp. 153-187.

EMCON. 1991. *Groundwater Monitoring Report, Fourth Quarter and Annual, 1990, Davis Street Sanitary Landfill, San Leandro, California.* Prepared for Waste Management, Inc.

Entrix. 1998. *Trip Report, Oakland Middle Harbor Shoal Eelgrass Survey.* Report prepared for the Port of Oakland. Walnut Creek, CA

_____. 1989. Benthic Communities Monitoring Program for Castro Cove and Areas Adjacent to the Deepwater Outfall – Final Report.

_____ 1995. Fish and Eelgrass Distribution Studies for the Harbor Bay Ferry Terminal Project.

_____ . 1997a. *Draft Interim Habitat Evaluation, Port of Oakland 50-Ft. Deepening Project.* Entrix Project No. 377301, prepared for the Port of Oakland. September 5.

_____ . 1997b. *Habitat Evaluation for Oakland's Harbor Navigation Improvement (-50') Project.* Prepared for the Port of Oakland. December 17.

Environmental Science Associates, Inc. 1992. *Draft Environmental Impact Report – Oakland Enterprise Zone.*

_____ . 1995. Conditional Use Permit C-5512 Altamont Landfill and Resource Recovery Facility Class II Expansion Environmental Impact Report.

Environmental Toxicology International, Inc. 1994. Calculation of Risk-Based Storage Durations for Dredged Sediment Piles at Berth 10 of the Bridge Terminal. Prepared for Port of Oakland.

EPA (Environmental Protection Agency). 1971. *Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances.* Prepared by Bolt, Beranek, and Newman.

_____ . 1974. *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety.*

_____ . 1989. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A). Interim Final. Office of Emergency and Remedial Response. EPA/540/1-89/002.

_____ . 1990. National Oil and Hazardous Substances Pollution Control Contingency Plan; Final Rule. *Federal Register* 55: 8666-8865.

_____ . 1991. *Technical Support Document on Lead.* Environmental Criteria and Assessment Office, Cincinnati, Ohio. ECAO-CIN-757.

_____. 1993a. *Final Environmental Impact Statement for Designation of a Deep Water Ocean Dredged Material Disposal Site Off San Francisco, California,* prepared by Science Applications International Corporation, August.

_____. 1993b. *Compilation of Air Pollutant Emission Factors,* Volume II (AP-42).

_____ . 1994a. Ocean Dumping; Proposed Designation of Site; Proposed Rule. In *Federal Register* dated February 17, 1994. 40 CFR Part 228. Volume 59, Number 33.

_____ . 1994b. Proposed Site Management and Monitoring Plan for an Ocean Dredged Material Disposal Site off San Francisco, California. Public Notice dated April 20, 1994. U.S. EPA Region IX.

_____. 1995. *Compilation of Air Pollutant Emission Factors,* Volume I (AP-42).

_____ . 1996a. *Guidance for Incorporating Environmental Justice Concerns in EPA's NEPA Compliance Analyses* (review draft). U.S. EPA, Office of Federal Activities, Washington, DC. July 12.

_____. 1996b. Final Rule for Ocean Dumping — Amendment of Site Designation, *Federal Register* Vol. 61, No. 251, page 68964, December 30.

_____. 1996c. *Region IX Preliminary Remediation Goals.* U.S. EPA, Region IX (Stanford J. Smucker, Ph.D., Regional Toxicologist), San Francisco, California. August 1.

_____. 1997a. Water Quality Standards, Establishment of Humeric Criteria for Priority Toxic Pollutants for the State of California; Proposed Rule. *Federal Register* 62(150): August 5.

_____. 1997b. *Serving a Diverse Society.* Pamphlet from the Office of Environmental Justice, EPA-300-K-97-0. November.

_____. 1998a. *San Francisco Deep Ocean Disposal Site (SF-DODS) – Monitoring Report for 1995 and 1996.* Prepared by EPA Region 9, February 6.

_____. 1998b. *San Francisco Deep Ocean Disposal Site (SF-DODS) – Site Management and Monitoring Plan Implementation Manual.* Public Review Draft. Prepared by EPA Region 9, February 6.

EPA and COE (U.S. Army Corps of Engineers). 1991. *Evaluation of Dredged Material for Ocean Disposal – Testing Manual [Green Book]).*

EVS Consultants. 1996. Sediment Profile Imaging Survey of San Diego Harbor. Final repost submitted to Arthur D, Little, Inc., under constract 572715. Seattle, WA. August.

_____. 1997a. *Development of Sediment Screening Criteria for Oakland Harbor Sediments* — White Paper.

_____. 1997b. *Release of Contaminants from Resuspended Particulate Matter* — White Paper.

_____. 1997c. *Tier I Evaluation of Dredged Material for the Port of Oakland 50-Foot Harbor Deepening Project.* Report prepared for the Port of Oakland.

_____. 1997d. *Evaluation of Sand vs. Silt/Clay as Capping Material for Contaminated Sediments.* December.

_____. 1998. Sediment Profile Imaging Report, *Sediment Profile Imaging Survey of Oakland Middle Harbor.* February.

Federal Register. Volume 62(150): August 5, 1997.

FEMA (Federal Emergency Management Agency). 1982. National Flood Insurance Rate Maps, City of Oakland.

FHWA/Caltrans (U.S. Department of Transportation, Federal Highway Administration and State of California Department of Transportation). 1991. *Proposed Route I-880 Replacement Project from I-980 Interchange to I-80/I-580/I-800 Distribution Structure in the Cities of Oakland and Emeryville, Alameda County, California.* Final Environmental Impact Statement/Report. Vols. I-II. FHWA-CA-EIS-90-05-F, SCH NO. 90030140, 4-ALA-800-32.6/34.2, 4-191-190270-3EQ16. Copy on file, Basin Research Associates, San Leandro.

Francinques, N.R., M.R. Palermo, C.R. Lee, and R.K. Peddicord. 1985. *Management Strategy for Disposal of Dredged Material: Test Protocols and Contaminant Control Measures.* Miscellaneous Paper D-85-1. U.S. Army Corps of Engineers, Waterways Experiment Station, Vicksburg, Mississippi.

Garcia, A.W., and J.R. Houston. 1975. *Type 16 Flood Insurance Study: Tsunami Predictions for Monterey and San Francisco Bays and Puget Sound.* U.S. Army Corps of Engineers, Waterways Experiment Station, Hydraulics Laboratory, Technical Report H-75-17.

Garvey, Ellen. 1997. "Benefits of Clean Air Standards." Opinion-Editorial article by the Executive Officer of the Bay Area Air Quality Management District published in the *Oakland Tribune*, December 4, pg. B-8.

Geier and Geier Consulting. 1997. Unpublished data by Geier and Geier Consulting, Oakland, California.

Geomatrix. 1997a. *Preliminary Geotechnical Study – Vision 2000 Maritime Development, Port of Oakland.* Prepared for the Port of Oakland by Geomatrix Consultants, Oakland, California, and Harza Engineering Company. August.

_____. 1997b. Existing Shoreline Slope Stability, Selected Marine Facilities, Port of Oakland: Preliminary letter report to Thomas F. Griswold, Liftech Consultants.

_____. 1997c. Estimated Pile Capacities and Shoreline Slope Stability, Proposed Dredging to Elevation -50 feet, Selected Maritime Facilities, Port of Oakland.

Goldman, H.B. 1969. Geology of San Francisco Bay. In: Goldman, H.B., *Geologic and Engineering Aspects of San Francisco Bay Fill.* California Division of Mines and Geology Special Report 97.

Gordon, R.B. 1973. *Turbidity due to Dredge Operations at the Coke Work Site, New Haven Harbor, Connecticut.* Prepared for United Illuminating Company, New Haven, Connecticut. (Cited in EPA 1993a.)

Grinnel, J. , and A.H. Miller. 1944. *The Distribution of the Birds in California.* Pacific Coast Avifauna No. 27. Cooper Ornithological Club, Berkeley, California.

Hart, J.D. 1978. *A Companion to California.* New York: Oxford University Press.

Hartman Consulting Group. 1997a. *Final Report Hydrodynamic Evaluation for Oakland Inner Harbor.* Prepared for the Port of Oakland.

_____. 1997b. *Results of Field Sampling Program for Habitat Enhancement Hydrodynamic Evaluation.* Draft report prepared for the Port of Oakland.

_____. 1997c. *Hydrodynamic Modeling Report for Middle Harbor Habitat Creation.* Draft report prepared for the Port of Oakland.

_____. 1997d. *Middle Harbor Enhancement Area Dredging and Disposal Plan.* Draft report prepared for the Port of Oakland.

_____. 1997e. *Final Report Hydrodynamic Evaluation for Oakland Inner Harbor Channel.* Report prepared for the Port of Oakland.

_____. 1998. Memorandum from Greg Hartman to Jody Zaitlin, Port of Oakland. February 2.

Hatfield, S.E. 1983. Distribution of Zooplankton in Association with Dungeness Crab, *Cancer magister,* Larvae in California. *California Fish and Game Fisheries Bulletin* 172:97-123.

Havis, R.N. 1988. A Preliminary Evaluation of Contaminant Release at the Point of Dredging. Environmental Effects of Dredging Technical Notes, EEDP-09-1. U.S. Army Corps of Engineers Waterways Experiment Station, Vicksburg, Mississippi.

Hazardous and Solid Waste Amendments of 1984 (HSWA). (42 USC sec. 6901 et seq.)

Hazardous Waste Control Health and Safety Law, Chapter 6.5 and the California Code of Regulations (CCR), Title 22.

Hendry, G.W. and J.N. Bowman. 1940. The Spanish and Mexican Adobe and Other Buildings in the Nine San Francisco Bay Counties, 1776 to about 1850. MS on file, Bancroft Library, University of California, Berkeley.

Herbold, B., A.D. Jassby, and P.B. Moyle. 1992. Status and Trends Report on Aquatic Resources in the San Francisco Estuary. San Francisco Estuary Project, Oakland, California.

Hirsch, N.D., L.J. DiSalvo, and R.K. Peddicord. 1978. *Effects of Dredging and Disposal on Aquatic Organisms.* Technical Report DS-78-5. U.S. Army Corps of Engineers Waterways Experiment Station, Vicksburg, Mississippi.

Hoffman, R. S. 1986. Fishery Utilization of Eelgrass (*Zostera marina*) Beds and Non-Vegetated Shallow Water Areas in San Diego Bay. Administrative Report SWR-86-4.

Huval, C. 1993. *Oakland Inner Harbor Turning Basin Navigation Design Study.* Prepared for the Department of the Army, Waterways Experiment Station, Corps of Engineers, by the Marine Safety International/Computer Aided Operations Research Facility, Kings Point, New York.

HWA (Health and Welfare Agency). 1988. *California Code of Regulations, Division 2, Chapter 3,* State of California Drinking Water and Toxic Enforcement Action of 1986, Article, Section 12711 et seq.

IEC (Interstate Electronics Corporation). 1982. *Appendices to San Francisco, California, Deep-Water Dumpsite Designation: Report of Field Survey, Loran-C Coordinates and Range and Bearing for All Casts.* (Cited in EPA 1993a.)

Institute of Transportation Engineers. 1985. *1985 Highway Capacity Manual.*

_____. 1994. *1994 Highway Capacity Manual.*

Jennings, C.W. 1994. Fault Activity Map of California and Adjacent Areas. California Division of Mines and Geology, Geologic Map No. 6.

Jennings, M.R., and M.P. Hayes. 1994. *Amphibian and Reptile Species of Special Concern in California.* Report submitted to the California Department of Fish and Game, Inland Fisheries Division.

Jones & Stokes Associates, Inc. 1991. *Wetland Delineation Office Report for Hamilton Army Airfield, Novato, California* (JSA #89-173). Prepared for U.S. Army Corps of Engineers, Air Force Project Management Office, Sacramento, California.

_____. 1993. *Draft Flood and Drainage Baseline Study for Hamilton Army Airfield Disposal and Reuse.* JSA 92-204. Sacramento, California. Prepared for U.S. Army Headquarters Forces Command, Fort McPherson, Georgia.

Jones, P.A., and I.D. Szczepaniak. 1992. *Report on the Seabird and Marine Mammal Censuses Conducted for the Long-Term Management Strategy (LTMS) August 1990 through November 1991.* Submitted to the U.S. EPA, Region IX, San Francisco, California.

JRP Historical Consulting Services. 1996. *Historical and Architectural Evaluation, Alameda Facility and Alameda Annex Fleet and Industrial Supply Center (FISC), Oakland, Alameda, Alameda County, California.* Copy on file, Department of the Navy, EFA West, Naval Facilities Engineering Command, San Bruno, California.

JWD. 1997. *Container Movement Growth Scenario – Vision 2000 Developments through 2010.* Prepared by Jordan, Woodman, and Dobson for the Port of Oakland. October 14.

Kennedy/Jenks. 1985. *Supplemental Report, 425 Hester Street Site Assessment, San Leandro, California.*

King, C. 1978a. Protohistoric and Historic Archeology. In *California*, edited by R.F. Heizer, Volume 8. Handbook of North American Indians, W.G. Sturtevant, general editor, pp. 58-68. Smithsonian Institution, Washington D.C.

_____. 1978b. Historical Indian Settlements in the Vicinity of the Holiday Inn Site. In Archaeological Investigations at CA-SCl-128, the Holiday Inn Site, edited by J.C. Winter. MS on file, E-756/S-5281, California Archaeological Site Inventory, Rohnert Park.

Kitting, C.L. 1994. Shallow Populations of Small Fishes in Local Eelgrass Meadow Food Webs. In: Alameda Naval Air Station Natural Resources and Base Closure.

Kroeber, A.L. 1925. *Handbook of the Indians of California.* Bureau of American Ethnology Bulletin 78. Washington, D.C.: Government Printing Office.

Krone, R. B. 1979. Sedimentation in the San Francisco Bay System. Pages 85-96 in T.J. Conomos, ed. *San Francisco Bay: The Urbanized Estuary.* Pacific Division, Amer. Assoc. Advance. Sci., San Francisco, California.

LaSalle, M. 1984. Physical and Chemical Alterations Associated with Dredging: An Overview. In: *Effects of Dredging on Anadromous Pacific Coast Fishes.* C.A. Simenstad, Ed. Seattle: University of Washington Press.

Lawson, A.C. et al. 1908. *The California Earthquake of April 18, 1906: Report of the State Earthquake Investigation Commission.* Washington, D.C.: Carnegie Institution.

Lee, C.H., and Praszker. 1969. Bay Mud Developments and Related Structural Foundations. In Goldman, H.B., (ed): *Geological and Engineering Aspects of San Francisco Bay Fill.* California Division of Mines and Geology Special Report 97.

Lee, G.F., M.D. Piwoni, J.M. Lopez, G.M. Mariani, J.S. Richardson, D.H. Homer, and F. Salch. 1975. *Research Study for the Development of Dredged Material Disposal Criteria.* Technical Report D-75-4, U.S. Army Corps of Engineers, Waterways Experiment Station, Dredged Material Research Program, Vicksburg, Mississippi.

Lerner, Richard N. 1988. Historic Properties Assessment – Turning Basin, Oakland Inner Harbor, Alameda County, California. MS on file, S-9991, California Archaeological Site Inventory, Rohnert Park

Levine-Fricke. 1992. *Technical Report, The Montezuma Wetlands Project.* Prepared for Solano County Department of Environmental Management, the Regional Water Quality Control Board, and the U.S. Army Corps of Engineers Impact Analysis Section.

Levy, Richard. 1978. Costanoan. In *California*, edited by R.F. Heizer, Volume 8, Handbook of North American Indians, W.G. Sturtevant, general editor, pp. 485-497. Washington, D.C.: Smithsonian Institution.

Liftech. 1994. Port of Oakland Wharf and Container Crane Wheel Load Analysis.

_____. 1997. Wharf and Crane Study Data for EIR/EIS Report. (This is a report prepared for the proposed 50-foot deepening project.)

Lillard, J.B., Robert F. Heizer and Franklin Fenenga. 1939. An Introduction to the Archaeology of Central California. Sacramento Junior College, Department of Anthropology, Bulletin 2.

Long, E.R., and R. Markel. 1992. *An Evaluation of the Extent and Magnitude of Biological Effects Associated with Chemical Contaminants in San Francisco Bay, California.* National Ocean Service, National Oceanographic and Atmospheric Administration.

LSA Associates. 1997. *Red Legged Frog Survey: Hamilton Army Airfield.* In Appendix A of *Environmental Assessment, Soil Disposal, Hamilton Army Airfield, Marin County, California.* COE Sacramento District.

LTMS. 1996. *Long-Term Management Strategy (LTMS) for the Placement of Dredged Material in the San Francisco Bay Region – Draft Policy Environmental Impact Statement/Programmatic Environmental Impact Report.* Prepared by the U.S. EPA – Region IX, U.S. Army Corps of Engineers – San Francisco District, San Francisco Bay Conservation and Development Commission, San Francisco Bay Regional Water Quality Control Board, and the California State Water Resources Control Board, with the assistance of Science Applications International Corporation. April.

Lunz, J.D., D.G. Clarke, and T.S. Fredette. 1984. Seasonal Restrictions on Bucket Dredging Operations. In *Dredging and Dredged Material Disposal.* R.L. Montgomery and J.W. Leach, Eds. New York: American Society of Civil Engineers.

Maniery, Mary L., Cindy Baker, and Keith Syda. 1996. *An Archeological Investigation of the Fleet Industrial Supply Center – Alameda Annex/Facility, and Naval Air Station, Alameda Family Housing (East and North), Alameda County, California.*

Manolis, T.D. 1978. *California Black Rail Breeding Season Survey in Central California.* California Department of Fish and Game, Sacramento.

Marin County Planning Department. 1993. *Redwood Sanitary Landfill Draft Environmental Impact Report.* Prepared by Woodward-Clyde Consultants.

Martin Associates. 1995. *The Local and Regional Economic Impacts of Maritime Activity at the Port of Oakland.*

_____. 1996. *The Local and Regional Economic Impacts of Maritime Activity at the Port of Oakland, 1995.* Prepared for the Port of Oakland, September 25.

Martin O'Connell Associates. 1992. *The Economic Impact of the Port of Oakland's Commercial Real Estate Tenants.*

Maurer, D.L., R.T. Keck, J.C. Tinsman, W.A. Leathern, C.A. Wethe, M. Huntzinger, C. Lord, T.M. Church. 1978. *Vertical Migration of Benthos in Simulated Dredged Material Overburdens.* Volume I: Marine Benthos Technical Report D-78-35. U.S. Army Corps of Engineers, Washington D.C. 42 pp.

McCarthy, Celia. 1997. Record Form, DPR 523 for Marine Facilities Associated with Western Pacific Railroad Mole, Port of Oakland. Celia McCarthy, Environmental Planning Department, Port of Oakland. On file, Basin Research Associates, San Leandro.

McCarthy, Celia, and Richard Lerner. 1997. National Register of Historic Places Registration Form. Oakland Harbor Training Walls/Jetties and Federal Channel (also known as Oakland Inner Harbor Jetties and Federal Channel). On file, Basin Research Associates, San Leandro.

McGrath, James. 1997. Letter to Mr. Andrew Carpentier, Chair and Board Members, Oakland Landmarks Preservation Advisory Board, dated October 8, 1997. Suggestion to Consider Moving 50-Foot Channel South and Demolish South (Alameda) Training Wall Instead of North (Oakland) Training Wall. On file, Basin Research Associates, San Leandro.

MEC Analytical Systems. 1997. *An Investigation into the Turbidity Plume Associates with Dredge Activities in the Port of Oakland Estuary.* Report prepared for the Port of Oakland.

Merkel and Associates, Inc. 1997. *50-Foot Harbor Deepening Project, Middle Harbor Dredged Material Reuse Conceptual Habitat Design Plan.* Report prepared for the Port of Oakland.

Merlin, Imelda. 1977. *Alameda: A Geographical History.* Friends of the Alameda Free Library, Alameda, California: David Printing Company.

Milliken, Randall T. 1995. A Time of Little Choice: The Disintegration of Tribal Culture in the San Francisco Bay Area 1769-1810. *Ballena Press Anthropological Papers* No. 43.

Mikesell, Stephen D. 1996. Primary Record and Building, Structure, and Object Record Forms for Alameda Training Wall (also known as the Oakland Inner Harbor South Training Wall/Jetty which is associated with the Federal Channel). Attached to Wall, February 4, 1977 letter to Cherilyn Widell, State Historic Preservation Officer. (Note this does not include the North Training Wall/Jetty.) Copy on file, Basin Research Associates, Inc., San Leandro, California.

Mitsch, W.J. and J.G. Gosselink. 1992. *Wetlands*. 2nd ed. New York: Van Nostrand Reinhold.

Montgomery, R.L., and R.M. Engler. 1986. Fate of Dredged Material during Open-Water Disposal. In: *Environmental Effects of Dredging – Technical Notes*. EEDP-01-2.

Moratto, Michael J. with D.A. Fredrickson, C. Raven, and Claude N. Warren. 1984. *California Archaeology*. New York: Academic Press.

Morgan, R.P. II, V.J. Rasin, and L.A. Noe. 1973. *Effects of Suspended Sediments on the Development of Eggs and Larvae of Striped Bass and White Perch*. Ref. No. 73-110. College Park: University of Maryland Natural Research Institute. (Cited in O'Connor 1991.)

Moyle, P.B., R.M. Yoshiyama, J.E. Williams, and E.D. Wikramanayake. 1995. *Fish Species of Special Concern in California, Second Edition*. Prepared by the Department of Wildlife and Fisheries Biology, University of California, Davis for the California Resources Agency, Department of Fish and Game Inland Fisheries Division, Rancho Cordova.

Nadel, Nancy. 1997. City Council Agenda Report from District 4 Councilmember Nancy Nadel on Air Pollution and Human Health in West Oakland. November 4.

Nichols, F.H., and J.K. Thompson. 1985. Time Scales of Change in the San Francisco Bay Benthos. *Hydrobiologia* 129: 121-138.

Nichols, J.A., G.T. Rowe, C.H.H. Clifford, and R.A. Young. 1978. In Situ Experiments on the Burial of Marine Invertebrates. *J. Sed. Petrol.* 48(2):419-425.

NMFS (National Marine Fisheries Service). 1997a. *NMFS Proposed Recovery Plan for the Sacramento River Winter-Run Chinook Salmon*. NMFS, Southwest Region, Long Beach, California.

_____. 1997b. Endangered and Threatened Species: Listing of Several Evolutionary Significant Units (ESUs) of West Coast Steelhead – Final Rule. WAIS Document Retrieval.

NOAA (National Oceanic and Atmospheric Administration). 1980. *Local Climatological Data*. National Climatic Center, Asheville, North Carolina.

Nowak, R. M. 1991. *Walker's Mammals of the World*: Volume II. Baltimore: The Johns Hopkins University Press.

Nybakken, J., L. Beasley, A. Summers, S. Craig, and L. Weetman. 1992. *Invertebrate Megafauna Collected from the Proposed U.S. Navy Ocean Disposal Site as Determined from Beam and Otter Trawls and Camera Sled Samples*. Final Report. Submitted to PRC Environmental Management, Inc. Honolulu, Hawaii, under Navy CLEAN Contract No. N62474-88-D-1991. (Cited in EPA 1993a.)

O'Connor, J.M. 1991. *Evaluation of Turbidity and Turbidity-Relaied Effects on the Biota of the San Francisco Bay-Delta Estuary.* Submitted to U.S. Army Corps of Engineers, San Francisco District.

OEDE (Office of Economic Development and Employment). 1994. Agenda Report on the West Oakland Visions and Strategies Phase I Report to the Office of the City Manager and Economic Development, Community Development and Housing Committee. Prepared by the City of Oakland's Office of Economic Development and Employment. September 20.

Ogden Beeman & Associates. 1991. *Survey of the Bay Farm Borrow Areas, San Francisco, Final Report.* Submitted to the U.S. Army Corps of Engineers, San Francisco District.

_____. 1992. *Sediment Budget Study for San Francisco Bay.* Submitted to the U.S. Army Corps of Engineers, San Francisco District.

Orion (Orion Environmental Associates). 1997. West Oakland Particulate Air Quality Monitoring Program, Progress Report #2. Prepared for Port of Oakland. December.

Parker, Patricia L. and Thomas F. King. n.d. *Guidelines for Evaluating and Documenting Traditional Cultural Properties.* National Register Bulletin 38. U.S. Department of the Interior, National Park Service, Interagency Resources Division, Washington, D.C.

Parsons Engineering Science. 1997. *Port of Oakland Air Quality Mitigation Measures White Paper.* December 12.

Pastron, Allen G., Jack Prichett, and Marilyn Ziebarth (editors). 1981. *Behind the Sea Wall: Historical Archaeology along the San Francisco Waterfront.* 3 Vols. San Francisco Clean Water Program, San Francisco. MS on file, S-5381, California Archaeological Site Inventory, Rohnert Park.

Peddicord, R., V. McFarland, D. Belfiori, and T. Byrd. 1975. *Dredge Disposal Study, San Francisco Bay and Estuary.* Appendix C. Effects of Suspended Solids on San Francisco Bay Organisms. U.S. Army Corps of Engineers, San Francisco District.

Pequegnat, W.E. 1983. Some Aspects of Deep Ocean Disposal of Dredged Material. In: *Wastes in the Ocean,* Vol. 2. D.R. Kester, B.H. Ketchum, I.W. Duedall, and P.K. Park, Eds. New York: John Wiley & Sons.

Pequegnat, W.E., D.D. Smith, R.M. Darnell, B.J. Presley, and R.O. Reid. 1978. *An Assessment of the Potential Impact of Dredged Material Disposal in the Open Ocean.* Technical Report D-78-2. Prepared for U.S. Army Chief of Engineers Office.

Port of Oakland. 1980. *Port of Oakland Public Access Plan -- Public Access Fact Sheet Supplement.*

_____. 1988 (and later). *Tariff No. 2-A -- Naming Rates, Charges, Rules, and Regulations at Maritime Facilities of the City of Oakland, California.* Prepared by the Board of Port Commissioners of the Port of Oakland. (Various sections of this tariff have been adopted on different dates.)

_____. 1988. *Oakland Inner and Outer Harbors Deep Draft Navigation Improvement Project, Alameda County, Final Summary Environmental Impact Report.*

_____. 1989. *Phase I: Oakland Inner Harbor Deep-Draft Navigation Improvements Project, Alameda, Sacramento, San Joaquin Counties, Final Supplemental Environmental Impact Report.*

_____. 1990. Port of Oakland Maritime Economic Impact Study.

_____. 1992a. *Port of Oakland Group Stormwater Monitoring Program.*

_____. 1992b. *Site Investigation, Berths 8 and 9.* Prepared by ERM Environmental Consultants.

_____. 1993. Truck Survey - Marine Terminals and Railroad Intermodal Yards. March/April.

_____. 1994a. *Draft Environmental Impact Report – Charles P. Howard Terminal Extension, Port of Oakland.* Prepared by Brady and Associates. June.

_____. 1994b. *Final Environmental Impact Report – Charles P. Howard Terminal Extension, Port of Oakland.* Prepared by Brady and Associates. October.

_____. 1996a. *Phase I Site Assessment, Shippers Imperial Property, Oakland, California.* Shawnee Company, Inc.

_____. 1996b. *Phase I Site Assessment, Union Pacific Railroad Property, Oakland, California.* Shawnee Company, Inc.

_____. 1996c. *Phase I Site Assessment, Southern Pacific Transportation Company Property, Oakland, California.* Shawnee Company, Inc.

_____. 1996d. *The Local and Regional Economic Impacts of Maritime Activity at the Port of Oakland, 1995.* September.

_____. 1996e. Board of Commissions of the Port of Oakland Tariff No. 2-A. Effective November 1, 1988.

_____. 1997a. *Preliminary Geotechnical Study, Vision 2000 Maritime Development, Port of Oakland.*

_____. 1997b. *Inner Harbor Bank Sampling and Analysis Plan, Port of Oakland 50-foot Harbor Deepening Project.* EVS Project No. 2/749-01.4.

_____. 1997c. *Tier I Evaluation of Dredged Material for the Port of Oakland 50-foot Harbor Deepening Project.* EVS Project No. 2/749-01.2.

_____. 1997d. *Draft Report, Port of Oakland Group Stormwater Program.* Prepared by Uribe & Associates, Inc.

_____. 1997e. *Port of Oakland Group Stormwater Program 1996/1997 Monitoring Reports.* Prepared by Uribe & Associates, Inc.

_____. 1997f. Letter from Anne Whittington, Port Office of Strategic and Policy Planning, on employment and hiring issues. September 3.

_____. 1997g. San Francisco Oakland Bay Bridge Utility Plan for Design Study (compilation of utilities provided by the Port of Oakland).

_____. 1997h. CADD Map of Transbay Container Terminal.

_____. 1997i. CADD Map of the Inner Harbor Area at Alameda Naval Air Station.

_____. 1997j. CADD Drawing of the Ferry Dock Area.

_____. 1997k. *Maritime Division Business Plan, Fiscal Years 1998 - 2002, Port of Oakland, California.* August.

_____. 1997l. Port of Oakland Harbor Navigation Improvement (-50') Project Constraints Map, File AA.

_____. 1997m. Letter from Gay Joseph, Maritime, Captial Programs and Budgeting to Gail Staba, Environmental Department. Projections of percentages of vessels calling at the Port and their respective drafts. October 28.

PRBO (Point Reyes Bird Observatory). 1991. Investigations of Top Trophic Level Invertebrates in the Farallon Munitions Disposal Area. Unpublished data.

PTI. 1989. *Central San Francisco Bay Projects – Dredged Material Disposal Site Investigation.* Prepared by PTI Environmental Services. Submitted to U.S. Army Corps of Engineers, San Francisco District.

Purcell, J.E., T.D. Siferd, and J.B. Marliave. 1987. Vulnerability of Larval Herring (*Clupea harengus pallasi*) to Capture by the Jellyfish *Aequorea victoria. Mar. Biol.* 94:157-162.

Quaternary Research Group. 1976. *Archaeology in Alameda County: A Handbook for Planners* [Written and designed by D.P. Miller]. Alameda County Planning Department, Hayward.

Radbruch, D.H. 1957. Area and Engineering Geology of the Oakland West Quadrangle, California. U.S. Geological Survey, Miscellaneous Geologic Investigations Map I-239. Scale 1:24,000.

Ramp, S.R., N. Garfield, C.A. Collins, L.K. Rosenfeld, and F.B. Schwing. 1992. *Circulation Studies over the Continental Shelf and Slope near the Farallon Islands, California. Executive Summary.* EPA Report.

Rantz, S.E. 1971. *Mean Annual Precipitation and Precipitation Depth-Duration-Frequency Data for the San Francisco Bay Region, California.* Basic Data Contribution #32. U.S. Geological Survey, Menlo Park, California.

Recht-Hausrath. 1991. *The Cost of Growth.* Prepared for the County of Solano.

Reed, R.B. 1988. *National List of Plant Species that Occur in Wetlands: California (Region O).* Biological Report 88 (26.10). Washington, D.C.: U.S. Fish and Wildlife Service.

Remsen, J.V. 1978. *Bird Species of Special Concern in California.* California Department of Fish and Game, Sacramento.

Resource Conservation and Recovery Act (RCRA). (42 USC sec. 6901 et. seq.)

Rhoads, D.C., and J.D. Germano. 1988. "The Use of REMOTS Imaging Technology for Disposal Site Selection and Monitoring." In *Geotechnical Engineering of Ocean Waste Disposal*, K.R. Demars and R.C. Chaney (eds.), pp. 50-64. ASTM, Philadelphia, Pennsylvania.

Rice, S.J. 1974. *Geology of the Eastern Part of the Novato Area, Marin County, California*, California Division of Mines and Geology.

Rogers, J.D., and S.H. Figuers. 1991. *Engineering Geologic Site Characterization of the Greater Oakland-Alameda Area, Alameda and San Francisco Counties, California*. Final Report to National Science Foundation, Grant No. 9003785.

Rubin, D. M., and D. S. McCulloch. 1979. *The Movement and Equilibrium of Bedforms in Central San Francisco Bay*. Pages 97-113 in T.J. Conomos, ed. *San Francisco Bay: The Urbanized Estuary*. Pacific Division, Amer. Assoc. Advance. Sci., San Francisco, California.

SAIC (Science Applications International Corporation). 1991. *Biological and Sedimentological Investigations of the Sea Floor at the Proposed U.S. Navy 103 Ocean Disposal Site*. Submitted to PRC Environmental Management, Inc. San Francisco, California. Submitted by Science Applications International Corporation, Woods Hole, Massachusetts, and Bothell, Washington.

_____. 1992a. *Survey of the Bay Farm Borrow Area, San Francisco Bay, August 1991, Final Report*. Submitted to the U.S. Army Corps of Engineers, San Francisco District.

_____. 1992b. *Survey of the Bay Farm Borrow Area, San Francisco Bay, December 1991, Final Report*. Submitted to the U.S. Army Corps of Engineers, San Francisco District.

_____. 1992c. *Survey of the Bay Farm Borrow Area, San Francisco Bay, February 1992, Final Report*. Submitted to the U.S. Army Corps of Engineers, San Francisco District.

_____. 1992d. *Survey of the Bay Farm Borrow Area, San Francisco Bay, May 1992, Final Report*. In press. Submitted to the U.S. Army Corps of Engineers, San Francisco District.

_____. 1992e. *Benthic Ecology and Sediment Characterization Ocean Studies Report for Detailed Physical and Biological Oceanographic Studies for an Ocean Site Designation Effort Under the Marine Protection, Research, and Sanctuaries Act of 1972*. Submitted to the U.S. EPA under Contract No. 68-C8-0062.

_____. 1992f. *Biological and Sedimentological Investigations of the Sea Floor at the Proposed U.S. Navy 103 Ocean Disposal Site*. July 1991 Survey (R/V Wecoma). Submitted to PRC Environmental Management, Inc. Honolulu, Hawaii. Submitted by Science Applications International Corporation, Woods Hole, Massachusetts. January 1992.

_____. 1993a. *Survey of the Bay Farm Borrow Area, San Francisco Bay, August 1992, Final Report*. Submitted to the U.S. Army Corps of Engineers, San Francisco District.

_____. 1996. San Francisco Deep Ocean Dredged Material Disposal Site (SF-DODS) Monitoring Program. Physical, Chemical, and Benthic Community Monitoring, January 1996. Final Report. Submitted to U.S. Army Corps of Engineers, San Francisco District. Submitted by Science Applications International Corporation, Bothell, Washington. October 9.

_____. 1997. San Francisco Deep Ocean Dredged Material Disposal Site (SF-DODS) Monitoring Program. Physical, Chemical, and Benthic Community Monitoring, December 1996. Draft Report. Submitted to U.S. Army Corps of Engineers, San Francisco District. Submitted by Science Applications International Corporation, Bothell, Washington. March 12.

San Francisco Bay Area Rapid Transit. 1997a. Transbay Tube-East End Tube Protection, General Plan and Profile, Contract 09DH-170, Sheet No. R2, Pg. 04.

_____. 1997b. Transbay Tube-East End Tube Protection, Cross Section, Tube 45 Excavation, Contract 09DH-170, Sheet No. R3, Pg. 05.

_____. 1997c. Transbay Tube-East End Tube Protection, Cross Section, Tube 47 Excavation, Contract 09DH-170, Sheet No. R4, Pg. 06.

SCAQMD (South Coast Air Quality Management District). 1993. *CEQA Air Quality Handbook.*

Schwartz, D.P. 1994. New Knowledge of Northern California Earthquake Potential. In *Proceedings of Seminar on New Developments in Earthquake Ground Motion Estimation and Implications for Engineering Design and Practice, Applied Technology Council (ATC), Publication* 35-1, pp. 4-1 – 4-9.

SCI (Subsurface Consultants, Inc.). 1997. Hydrogeologic Investigation, 50-foot Navigation Improvement Project, Port of Oakland, Oakland and Alameda, California.

SFEI (San Francisco Estuary Institute). 1996. *Regional Monitoring Program for Trace Substances – 1995 Annual Report.* San Francisco Estuary Institute, Richmond, California.

_____. 1997. *Regional Monitoring Program for Trace Substances – 1996 Annual Report.* San Francisco Estuary Institute, Richmond, California.

SF-RWQCB (San Francisco Regional Water Quality Control Board). 1995a. San Francisco Bay Water Quality Control Plan.

_____. 1995b. Order No. 95-037 – Waste Discharge Requirements for Charles P. Howard Terminal Wharf Expansion; Sediment Rehandling Facility; Deepening Dredging of Berths 22 through 26, 67, and 68; and Maintenance Dredging and Extension of Berth 68, Oakland, Alameda County. February 16.

Shaub, D.B. 1971. *Salt Marsh Harvest Mouse Survey.* Special Wildlife Investigations Project. W-54-R. California Department of Fish and Game, Sacramento.

Shuford, W.D. 1993. *The Marin County Breeding Bird Atlas: A Distributional and Natural History of Coastal California Birds.* California Avifauna Series 1. Bolinas: Bushtit Books.

Skinner, M.W. and B.M. Pavlik, eds. 1994. *Inventory of Rare and Endangered Vascular Plants of California.* California Native Plant Society Special Publications No. 1 (Fifth Edition).

Small, A. 1994. *California Birds, Their Status and Distribution.* Vista, California: Ibis Publishing Co.

Smith, B.J. 1963. *Sedimentation in the San Francisco Bay System.* In Proceedings of the Federal Inter-Agency Sedimentation Conference. U.S. Department of Agriculture Miscellaneous Publication 970, pp 675-708. (Cited in COE 1988.)

Smith, D. 1997. Facsimile from D. Smith, City of Livermore Engineering. October 1.

Solano County, Private Industry Council. 1992. *Strategic Plan for Solano County Economic Development.*

Southwest Research Institute. 1991. *Application of On-Highway Emissions Reduction Technology to an Off-Highway Engine, Final Report.* Prepared for the Santa Barbara County Air Pollution Control District. SwRI Project No. 03-3354-200, San Antonio, Texas.

SPRR (Southern Pacific Railroad). 1986. Northern Region Timetable 3.

Stern, E.M., and W.B. Stickle. 1978. *Effects of Turbidity and Suspended Material in Aquatic Environments: Literature Review.* Technical Report D-78-21. Prepared by the University of Wisconsin and Louisiana State University, for the U.S. Army Corps of Engineers, Waterways Experiment Station, Vicksburg, Mississippi.

Stewart, S.B. 1981. Archaeological Overview of Alameda, Contra Costa, and Marin Counties. In Overview of Prehistoric Archaeology for the Northwest Region California Archaeological Sites Survey, Del Norte, Humboldt Mendocino, Lake, Sonoma, Napa, Marin, Contra Costa, Alameda, pp. 4.0-4.75. MS on file, California Archaeological Site Inventory, Rohnert Park.

_____. 1982. Prehistoric Overview Northwest Region: California Archaeological Inventory. Volume 4, Alameda, Contra Costa and Marin, D.A. Fredrickson, general editor. Anthropological Studies Center, Sonoma State University, Rohnert Park.

Summit/Lynch Consulting Engineers, Inc. 1995a. *Joint Intermodal Terminal Operating Analysis Report.*

_____. 1995b. *Joint Intermodal Terminal Operating Plan.*

Sverdrup, H.U., M.W. Johnson, and R.H. Fleming. 1964. *The Oceans: Their Physics, Chemistry, and General Biology.* New York: Prentice-Hall, Inc.

SWRCB (State Water Resources Control Board). 1990a. Pollutant Policy Document. San Francisco Bay/Sacramento-San Joaquin Delta Estuary. Prepared by the State Water Resources Control Board. June 21, 1990.

_____. 1990b. Water Quality Control Plan for Salinity, San Francisco Bay/Sacramento-San Joaquin Delta Estuary.

_____. 1991. *Draft Statewide Water Quality Control Plans for Inland Surface Waters of California and Enclosed Bays and Estuaries of California.*

Tasto, R.N., D.D. Mogelberg, S.E. Hatfield, and R. Muller. 1981. *A Checklist of Zooplankters from the Gulf of the Farallones and off Northern California.* Calif. Fish and Game Mar. Res. Tech. Rep. 47.

Thayer, G. W., and W. J. Kenworthy, and M.S. Fonseca. 1984. The Ecology of Eelgrass Meadows of the Atlantic Coast: A Community Profile. U.S. Fish and Wildlife Service. FWS/OBS-84/02. 147 pp.

Thompson and West. 1878. *Official Historical Atlas Map of Alameda County, California.* Oakland: Thompson and West (reprinted by Valley Publishers, Fresno, 1976).

Toppozada, T.R., C.R. Real, and D.L. Parke. 1978. Earthquake catalog of California, January 1, 1900-December 31, 1974. California Division of Mines and Geology, Special Publication 52.

Toppozada, T.R., C.R. Real, S.P. Bezore, and D.L. Parke. 1979. Compilation of pre-1900 California Earthquake History: Annual Technical Report — Fiscal Year 1978-79. California Division of Mines and Geology, Open File Report OFP 79-6 SAC.

TRB (Transportation Research Board). 1985. *Highway Capacity Manual.*

_____ . 1994. *Highway Capacity Manual.*

Truitt, C.L. 1988. Dredged Material Behavior during Open-Water Disposal. *Journal of Coastal Research* 4(3): 489-497. (Cited in U.S. Navy 1993a).

U.S. Army Corps of Engineers. See COE.

U.S. Census. 1980 and 1990.

USDA (U.S. Department of Agriculture). 1977. Soil Survey of Solano County, California. Available at USDA Soil Conservation Service, Solano County, California.

_____ . 1985. Soil Survey of Marin County, California. Prepared by the Soil Conservation Service.

U.S. DHHS (Department of Health and Human Services). 1997. Health Consultation. West Oakland/Cypress Reconstruction Corridor. Prepared by California Department of Health Services under cooperative agreement with the Agency for Toxic Substances and Disease Registry, Division of Health Assessment and Consultation, Atlanta, Georgia. December 2, pg. 5.

U.S. Department of Housing and Urban Development. 1985. *The Noise Guidebook.* Washington, D.C.: General Printing Office.

U.S. Department of the Interior, National Park Service, Historic American Buildings Survey/ Historic American Engineering Record Cultural Resources Program (US/HABS/HAER). 1990. Secretary of the Interior's Standards and Guidelines for Architectural and Engineering Documentation: HABS/HAER Standards. Originally published *Federal Register* 48(190):44730-34.

U.S. Department of Transportation, Federal Highway Administration, and California Department of Transportation. 1990. *Draft Environmental Impact Statement — Proposed Route I-880 Replacement Project from I-980 Interchange to I-80/I-580/I-880 Distribution Structure in the City of Oakland, Alameda County, California.* SCH No. 90030140.

U.S. Environmental Protection Agency. See EPA.

USFWS (U.S. Fish and Wildlife Service). 1993. *Richmond Harbor Phase I Dredging Project: Planning Aid Report.* Prepared by the USFWS, Sacramento, California for the U.S. Army Corps of Engineers.

_____. 1995. *Fish and Wildlife Coordination Act Report for the Richmond Harbor Phase I Deepening Project.* Draft Report. Prepared by U.S. Fish and Wildlife Service for the U.S. Army Corps of Engineers, San Francisco District, California.

_____. 1997a. *Revised Draft Coordination Act Report for the San Francisco Bay to Stockton Deepwater Ship Channel Phase III (John F. Baldwin) Project.* Prepared by the Ecological Services group of the Sacramento Field Office.

_____. 1997b. *Endangered and Threatened Species that May Occur in or be Affected by Projects.* Reference File No. 1-1-97-SP-903. In Appendix A of *Environmental Assessment, Soil Disposal, Hamilton Army Airfield, Marin County, California.* COE Sacramento District.

_____. 1998. *Draft Fish and Wildlife Coordination Act Report for the Oakland Harbor 50-Foot Navigation Project.* Prepared for the U.S. Army Corps of Engineers – San Francisco District by the Sacramento Fish and Wildlife Office. March.

U.S. General Services Administration. 1980. *Final Environmental Impact Statement on Disposition and Use of Federal Surplus Property at Hamilton Air Force Base, Novato, California.*

USGS (U.S. Geological Survey). 1899. San Francisco, California [Quadrangle]. Topographic Scale 1:62,5000. USGS, n.p (reprinted 1904, 1906, 1908, 1911, 1913).

_____. 1915. San Francisco, Calif. [Quadrangle]. Topographic. Scale 1:62,500. USGS, n.p. (reprinted 1929, 1932, 1947).

_____. 1949. Oakland West, Calif. [Quadrangle] Topographic. Scale 1:24,000 [7.5' minute]. USGS, Washington, D.C.

_____. 1968. Oakland West, Calif. [Quadrangle]. Topographic, Scale 1:24,000. USGS, Menlo Park (1959 photorevised).

_____. 1973. Oakland West, Calif. [Quadrangle]. Topographic, Scale 1:24,000. USGS, Menlo Park (1959 and 1968 photorevised).

_____. 1980. Oakland West, Calif. [Quadrangle]. Topographic, Scale 1:24,000. USGS, Menlo Park (1959 photorevised).

_____. 1984. *Tides, Tidal and Residual Currents in San Francisco Bay California. Results of Measurements, 1979 - 1980. Part I. Description of Data.*

U.S. Navy. 1987. Report on Soil Erosion and Expansion Joint Failure at North Marginal Wharf, Naval Supply Center (NSC), Oakland, California. Prepared by Western Division Naval Facilities Engineering Command, San Bruno, California, Report No. 19AX.

_____ . 1988. Master Plan for the Naval Supply Center, Oakland, California. Prepared by Western Division Naval Facilities Engineering Command, San Bruno, California, January, 1988.

_____ . 1990. Final Environmental Impact Statement for Proposed New Dredging. U.S. Naval Military construction projects: P-082 Naval Supply Center, Oakland, San Francisco Bay, California.

_____ . 1992. Final Data Summary Report RI/FS Phases 2B and 3, Naval Air Station, Alameda. Prepared by PRC Environmental Management.

_____. 1993a. *Disposal of Dredged Material from NAS Alameda and NSC Oakland, California at the Navy Ocean Disposal Site, Final Supplement I, Environmental Impact Statement.*

_____. 1993b. Cruise Report for Midpoint Monitoring of Sediment Dispersion and Deposition at the Navy's Ocean Dredged Material Disposal Site West of the Farallon Islands, California. Report by Dutra Construction Company, Inc., San Rafael, California.

_____. 1993c. *Final Supplement I, Environmental Impact Statement for Disposal of Dredged Material from NAS Alameda and NSC Oakland, California at the Navy Ocean Disposal Site.*

_____ . 1993d. Solid Waste Water Quality Assessment Test (SWAT) and Data Summary Report for RI/FS Phases 5 and 6, Volume I, prepared by PRC Environmental Management, Inc.

_____ . 1995a. Final Expanded Site Investigation Report, Fleet Industrial Supply Center Oakland, PRC Environmental Management, Inc., PRC Contract No. N62474-88-D-5086-0279.

_____ . 1995b. UST Investigation and Corrective Measures Study -- Phase I for Former Underground Storage Tank Sites, Fleet Industrial Supply Center Oakland, PRC Environmental Management, Inc., PRC Contract No. N62474-92-D-3608-0006.

_____ . 1995c. Draft UST Investigation and Corrective Measures Study for Former Underground Storage Tank Sites 331-North and 334, Fleet Industrial Supply Center Oakland, PRC Environmental Management, Inc., PRC Contract No. N62474-92-D-3608-0015.

_____ . 1995d. Data Summary Report Background and Tidal Influence Studies and Additional Work at Sites 4 and 5, Naval Air Station Alameda, Alameda, California, prepared by PRC Management Inc.

_____ . 1995e. Final Phase I Remedial Investigation Characterization Report, Fleet Industrial Supply Center Oakland, PRC Contract No. N62474-88-D-5086-0294.

_____ . 1995f. California Base Realignment and Closure Cleanup Plan, Naval Complex, Alameda.

_____ . 1995g. Draft Final UST Investigation and Corrective Measures Study- Phase I for Former Underground Storage Tank Sites 211, 331E, 331S, 332, and 511D, Fleet Industrial Supply Center Oakland, PRC Contract No. N62474-92-D-3608-0006.

_____. 1995h. *Final Report for the Midpoint Monitoring of Sediment Dispersion and Deposition at the Navy's Ocean Dredged Material Disposal Site West of the Farallon Islands, California – Volume I of II.* Prepared by PRC Environmental Management, Evans-Hamilton Inc., Environmental Analysis and Modeling, and SAIC for Dutra Construction Company, Inc., under contract to U.S. Naval Facilities Engineering Command, Engineering Field Activity West, Contract No. N62474-90-C-1147.

_____. 1996a. Environmental Baseline Survey Report, Fleet Industrial Supply Canter, Oakland.

_____. 1996b. 1995-1996 Annual Report for Stormwater Discharges Associated with Industrial Activities, Fleet Industrial Supply Center, Oakland Main Site, Oakland, California. Facility WDID No. 201S003110.

_____. 1996c. Addendum to Stormwater Pollution Prevention Plan (SWPPP) for Naval Air Station, Alameda. Prepared by Radian Corporation.

_____. 1996d. 1995-1996 Draft Annual [Stormwater] Report for Naval Air Station, Alameda. Prepared by Radian Corporation.

_____. 1997a. Environmental Baseline Survey, Zones 1, 2, 3, 4, 5 ,7, 8, 9, 10, 12, 15, 16, 20, 21, and 23, Naval Air Station Alameda, prepared by PRC Environmental Management, Inc.

_____. 1997b. Final Sector II Finding of Suitability to Lease, Zones 1, 2, 3, 4, 5 ,7, 8, 9, 10, 12, 15, 16, 20, 21, and 23, Naval Air Station Alameda, prepared by PRC Environmental Management, Inc.

_____. 1997c. Draft Groundwater Monitoring Plan, Naval Air Station Alameda, California: Comprehensive Long-Term Environmental Action Navy (CLEAN II), PRC contract No. N62474-94-D-7609-0108.

U.S. Navy and Port of Oakland. 1997a. *Draft Environmental Impact Statement/ Environmental Impact Report – Disposal and Reuse of Fleet and Industrial Supply Center, Oakland/Vision 2000 Maritime Development.* March.

_____. 1997b. *Final Environmental Impact Statement/Environmental Impact Report – Disposal and Reuse of Fleet and Industrial Supply Center, Oakland/Vision 2000 Maritime Development.* July.

Valentine, R. M., D.C. Rhoads, J. D. Germano, and V.J. Cabelli. 1992. Mapping of benthic enrichment patterns in Narragansett Bay, RI. Estuaries 15:1-17.

Wagner, D.L. and E.J. Burtugno. 1982. *Geologic Map of the Santa Rosa Quadrangle.* Regional Geologic Map Series, Map #24. California Division of Mines and Geology. Sacramento.

Wakeman, T.H. 1977. Release of Trace Constituents from Sediments Resuspended during Dredging Operations. T.F. Yen, Ed., *Chemistry of Marine Sediments.* Michigan: Ann Arbor Science.

Wall, L.S. 1996. Letter to Cherilyn Widell, State Historic Preservation Officer, Department of Parks and Recreation, Sacramento. Regarding: Fleet and Industrial Supply Center, Oakland (FISCO), California. Dated July 11, 1996. On file, Department of the Navy, EFA West, Naval Facilities Engineering Command, San Bruno.

Wall, L. S. and J. P. Delgado. 1985. *Assessment of Eligibility for National Register of Historic Places, Deteriorated Marine Facilities.* Western Pacific Railroad, Oakland and San Francisco. California Historic Preservation Planning Montera.

Wang, J.C.S. 1986. *Fishes of the Sacramento-San Joaquin Estuary and Adjacent Waters, California: a Guide to the Early Life Histories.* Technical Report 9. Interagency Ecological Study Program.

Wang, X.Q., L.J. Thibodeaux, K.T. Valsaraj, and D.D. Reible. 1991. Efficiency of Capping Contaminated Bed Sediments in-situ -- Laboratory Scale Experiments on Diffusion-Adsorption in the Capping Layer. In: *Environmental Science Technology* 25:1578-1584.

Ward, J.A., J.Q. Word, M.R. Pinza, H.L. Mayhew, E.S. Barrows, N.P. Kohn, L.K. Lefkovitz. 1992a. Ecological evaluation of proposed discharge of dredged material from Oakland Harbor into ocean waters (Phase III, -38 ft Project). PNL-7890. Prepared for the U.S. Army Corps of Engineers, San Francisco District, by Battelle/Marine Sciences Laboratory, Sequim, WA. Published by Pacific Northwest Laboratories, Richland, WA.

_____. 1992b. Ecological evaluation of proposed discharge of dredged material from Oakland Harbor into ocean waters (Phase IIIA, -42 ft Project). PNL-8302. Prepared for the U.S. Army Corps of Engineers, San Francisco District, by Battelle/Marine Sciences Laboratory, Sequim, WA. Published by Pacific Northwest Laboratories, Richland, WA.

WGCEP (Working Group on California Earthquake Probabilities). 1988. Probabilities of Large Earthquakes Occurring in California on the San Andreas fault. U.S. Geological Survey, Open File Report 88-398, 62p.

_____. 1990. Probabilities of Large Earthquakes in the San Francisco Bay Region, California. U.S. Geological Survey, Circular 1053, 51p.

Widell, Cherilyn. 1996. Letter to Mr. Louis S. Wall, Coordinator, Cultural Resources Program, Environmental Planning Branch, Department of the Navy, EFA West, Naval Facilities Engineering Command, San Bruno. Re: National Register Evaluation of FISCO Alameda Annex and Facility and Adjacent Navy Family Housing, Alameda, CA. Dated July 31, 1996. On file, State Historic Preservation Officer, Department of Parks and Recreation, Sacramento.

Wiltec. 1996. Unpublished data.

_____. 1997. Traffic turning movement data and 24-hour vehicle classification counts.

Winzler and Kelly. 1985. *Oceanographic Investigation at the Alcatraz Disposal Site, San Francisco Bay, California.* Prepared by Winzler and Kelly, Consulting Engineers, San Francisco. Submitted to U.S. Army Corps of Engineers, San Francisco District.

Wolfenden, J.D., and M.P. Carlin. 1992. *Interim Sediment Screening Criteria and Testing Requirements for Wetland Creation and Upland Beneficial Reuse. RWQCB, San Francisco Bay Region, Oakland, CA.*

Woodbridge, Sally B. 1992. Historic Architectural Resources Inventory for the Naval Air Station , Alameda. Copy on file, U.S. Navy, Engineering Field Activity, West, Naval Facilities Engineering Command, San Bruno.

Woodward-Clyde Associates. 1985. *Hamilton Air Force Base GSA Sale Area Confirmation Study for Surface and Subsurface Hazardous Materials Contamination.* Final Report. Omaha, Nebraska.

_____. 1996. Additional Environmental Investigation Report, BRAC Property, Hamilton Army Airfield. Prepared for the U.S. Army Corps of Engineers Sacramento District. Oakland, CA. October 31.

Word, J.Q., J.A. Ward, J.A. Strand, N.P. Kohn, and A.L. Squires. 1990a. Ecological evaluation of proposed discharge of dredged material from Oakland Harbor into ocean waters (Phase II, -42 ft Project). Prepared for the U.S. Army Corps of Engineers, San Francisco District, by Battelle/Marine Sciences Laboratory, Sequim, WA. Published by Pacific Northwest Laboratories, Richland, WA.

Word, J.Q., J.A. Ward, and D.L. Woodruff. 1990b. Results of bulk sediment analysis and bioassay testing on selected sediments from Oakland Inner Harbor and Alcatraz disposal site, San Francisco, California. Prepared for the U.S. Army Corps of Engineers, San Francisco District, by Battelle/Marine Sciences Laboratory, Sequim, WA. Published by Pacific Northwest Laboratories, Richland, WA.

Zeiner, et. al. 1990. California's Wildlife: Volume II Birds. California Statewide Wildlife Habitat Relationship System. The Resources Agency, California Department of Fish and Game.

## 17.0 PERSONS AND AGENCIES CONTACTED

Andrews, Rob. 1997. Port of Oakland, Engineering Department.

Browning, Jim. 1997. U.S. Fish and Wildlife Service, Region 1 Sacramento Field Office.

Cardoza, Len. 1998. Port of Oakland, Engineering Department.

Chew, Rodney. 1997. Pacific Gas & Electric.

Crawford, Shawn. 1997. Pacific Gas & Electric.

Doll, John, 1997. City of Alameda, Community Development Department.

Downey, Pat. 1997. Lieutenant, U.S. Coast Guard. San Francisco Vessel Transportation Service.

Duke, Barry. 1997. U.S. Coast Guard, Marine Safety Office, Port Operations, Waterways Management.

Duey, Dave. 1997. Port of Oakland, Engineering Department.

Edminister. D. 1997. Planning Director, Alameda County Waste Management Authority.

Eliason, Cynthia. 1998. City of Alameda, Planning Department.

Floyd, Mike. 1997. California Department of Water Resources.

Francis, Dave. 1997. Pacific Gas & Electric.

Frost. M. 1997. Marin County Public Works Department.

Furtney, M. 1996 and 1997. Southern Pacific Transportation Company.

Gandesbery, Tom. 1995. San Francisco Regional Water Quality Control Board.

Granholm, Steve. 1997. LSA Associates.

Gregg, Jack. 1997. Regional Water Quality Control Board.

Griswold, Thomas. 1997. Liftech.

Herrala, Chris. 1997. Entrix.

Hom, Hansen, 1997. City of Alameda, Planning Department

Hunt, James R. 1997. Professor at University of California Berkeley, Civil and Environmental Engineering Department.

Johnson, Elizabeth. 1997. Alameda Reuse and Redevelopment Authority.

Joseph, Gay. 1997. Port of Oakland, Capital Programs and Budgeting.

Juhnke, Leonard. 1997. Dredge Manager, Manson Construction Co., Seattle.

LeBlanc, Kelley. 1997. Port of Oakland, Environmental Department

Lipton, Doug. 1997. Levine-Fricke-Recon, applicant for the Montezuma Wetlands Project.

McCarthy, Celia. 1997. Port of Oakland, Environmental Department.

Monroe, Mike. 1997. U.S. Environmental Protection Agency, Region IX.

Olejniczak, Rick. 1997. Gahagan & Bryant Associates.

Pollistrini, Dave. 1997. U.S. Navy, Public Works.

Robinson, Thomas. 1997. Pacific Gas & Electric.

Selfridge, Thomas. 1997. Novato Sanitary District.

Staba, Gail. 1997. Port of Oakland, Environmental Department.

Tasto, Robert. 1998. California Department of Fish and Game.

Todd, Peter. 1997. Bay Area Rapid Transit.

Wilcox, Carl. 1997. California Department of Fish and Game, Region 2.

Zaitlin, Jody. 1997. Port of Oakland, Environmental Department.

## 18.0 LIST OF PREPARERS AND CONTRIBUTORS

| *Name* | *Title or Expertise* | *Experience* | *Role in Preparing EIS/R/FS* |
|---|---|---|---|
| **Port of Oakland** | | | |
| J. McGrath | Manager, Environmental Department | 23 years | Quality Assurance |
| G. Staba | Environmental Planner, Environmental Department | 13 years | EIS/R/FS Manager |
| J. Amdur | Associate Scientist, Environmental Department | 15 years | Biology/Chemical Analysis |
| R. Andrews | Engineering Project Manager | 8 years | Engineering Analysis |
| M. Beritzhoff | Maritime Administrator | 20 years | Coordination with Vision 2000 Plan |
| G. Joseph | Manager, Capital Programs and Budgeting | 14 years | Economics Financing |
| K. LeBlanc | Environmental Planner | 2 years | Technical Assistant |
| C. McCarthy | Cultural Resources Anthropologist, Environmental Department | 3 years | Cultural Resources |
| G. Putz | Planning Assistant | 1 year | Technical Assistant |
| J. Zaitlin | Environmental Planner, Environmental Department | 20 years | Biology |
| **Corps of Engineers** | | | |
| E. Jolliffe | Environmental Planner, Planning Branch | 3 years | EIS/R/FS Manager |
| H. Cheong | Project Manager, Programs and Project Management Branch | 7 years | Project Manager |
| K. Knight | Regional Economist, Economics Branch | 3 years | Economic Analysis of Alternatives |
| R. Nielson | Technical Manager, Planning Branch | 32 years | Technical Manager |
| R. Stradford | Archaeologist, Planning Branch | 18 years | Cultural Resources Coordinator |
| S. Miller | Realty Specialist | 17 years | Preparer of Real Estate Appendix for the Feasibility Study |

| *Name* | *Title or Expertise* | *Experience* | *Role in Preparing EIS/R/FS* |
|---|---|---|---|
| **SAIC** | | | |
| S. Fusco | Senior Program Manager | 24 years | Program Manager |
| D. Pontifex | Senior Scientist | 16 years | EIS/R/FS Project Manager |
| M. Dungan | Senior Biologist | 19 years | Terrestrial Biology/Wetlands |
| M. Herrenkohl | Marine Geochemist | 12 years | Marine Sediments |
| M. Lipshutz | Planning Assistant | 1 year | Technical Assistant |
| J. Lunz | Senior Marine Scientist | 26 years | Marine Resources Principal |
| L. Roach | Marine Scientist | 7 years | Marine Biology |
| T. Turk | Senior Scientist | 17 years | Marine Resources Manager |
| L. Woodman | Senior Scientist | 16 years | Consistency with Plans/ Policies; Vessel Transportation; Land Use; Visual Resources |
| S. Ziemer | Senior Air Quality Specialist | 20 years | Air Quality |
| **Subcontractors to SAIC** | | | |
| Ackland International | W. Ward | 20 years | Land Use; Visual Resources |
| Basin Research Associates | C. Busby | 23 years | Cultural/Historic Resources |
| Dowling Associates | M. Bowman | 20 years | Ground Transportation |
| GAIA Consulting, Inc. | S. von Rosenberg | 5 years | Deputy Project Manager; Coordinator of the Feasibility Study; Human Health & Risk; Hazardous Materials & Waste |
| GAIA Consulting, Inc. | S. Gates | 18 years | Marine Water Issues; Regulatory Compliance |

| *Firm Name* | *Individual Name* | *Experience* | *Role in Preparing EIS/R/FS* |
|---|---|---|---|
| **Subcontractors to SAIC** | | | |
| Geier & Geier Consulting, Inc. | V. Chew Geier | 20 years | Noise |
| Geier & Geier Consulting, Inc. | F. Geier | 20 years | Socioeconomics |
| H & H Ecoprises | S. Harris | 4 years | Environmental Justice Manager |
| H & H Ecoprises | K. Christensen | 3 years | Environmental Justice Coordinator |
| Uribe & Associates | B. Erskine | 13 years | Upland Water Issues; Geology and Hydrogeology |
| Uribe & Associates | G. Goodemote | 8 years | Flooding and Stormwater |
| Uribe & Associates | T. Meichtry | 28 years | Public Services |
| Uribe & Associates | M. Waller | 20 years | Quality Assurance |
| **Subcontractors to the Port of Oakland** | | | |
| EVS Sediment Evaluation Team | J. Germano, EVS Consultants | 23 years | Project Manager for Sediment Evaluation Team |
| EVS Sediment Evaluation Team | D. Hanzlick, EVS Consultants | 23 years | Deputy Project Manager for Sediment Evaluation Team |
| EVS Sediment Evaluation Team | C. Boudreau, EVS Consultants | 6 years | Oakland Liaison for Sediment Evaluation Team |
| EVS Sediment Evaluation Team | P. Krause, MEC Analystical Systems | 11 years | Field Operations Coordinator for Sediment Evaluation Team |
| EVS Sediment Evaluation Team | R. Sterbentz, Aquifer Sciences, Inc. | 20 years | Upland Sampling for Sediment Evaluation Team |
| EVS Sediment Evaluation Team | J. Word, Battelle Marine Sciences Laboratory | 25 years | Analytical Coordinator for Sediment Evaluation Team |

| *Firm Name* | *Individual Name* | *Experience* | *Role in Preparing EIS/R/FS* |
|---|---|---|---|
| **Subcontractors to the Port of Oakland** | | | |
| Hartman Habitat Development Team | J. Jordan, Hartman Consulting Group | 28 years | Project Manager for Habitat Development Team |
| Hartman Habitat Development Team | C. Robinson, ENTRIX | 11 years | Assistant Project Manager for Habitat Development Team |
| Hartman Habitat Development Team | G. Hartman, Hartman Consulting Group | 29 years | Hydrodynamic Modeling Task Leader for Habitat Development Team |
| Hartman Habitat Development Team | C. Herrala, ENTRIX | 5 years | Aquatic Biologist and Team Leader, Special Status Species Documentation |
| Hartman Habitat Development Team | A. Jahn, ENTRIX | 21 years | Aquatic Biology Task Leader for Habitat Development Team |
| Hartman Habitat Development Team | L. Marcus, Laurel Marcus & Associates | 17 years | Public Involvement Task Leader for Habitat Development Team |
| Hartman Habitat Development Team | K. Merkel, Merkel & Associates | 13 years | Habitat Design Task Leader for Habitat Development Team |
| **BCDC Staff** | | | |
| BCDC | S. Goldbeck | 13 years | Hamilton Wetlands Restoration |
| BCDC | E. Larson | 11 years | Hamilton Wetlands Restoration |
| BCDC | J. Michaels | 5 years | Hamilton Wetlands Restoration |

## 19.0 GLOSSARY OF TERMS

*Alluvial fan:* A body of soil and rock deposited by streams at the base of a highland.

*Anchorage area:* An area designated by the U.S. Coast Guard for the anchoring of ships in the harbor.

*Antiform:* A concave flexure of rock strata.

*Ambient air:* The surrounding local air.

*Anticyclone:* A system of winds that rotates about a center of high atmospheric pressure clockwise in the northern hemisphere and counterclockwise in the southern, that usually advances at 20 to 30 miles per hour, and that usually has a diameter of 1,500 to 2,500 miles.

*Aquitard:* An impermeable layer above a water-bearing rock unit.

*Atlatl:* A throwing board.

*Azoic:* Having no life; of or relating to the part of geologic time that antedates life.

*Berth:* The water area at the waterfront edge of a wharf, reserved for a vessel. The term is sometimes used to refer to the dock or wharf structure.

*Bioassay:* The use of living organisms to determine the effect of some substance, factor, or condition.

*Breakwater:* An engineering structure to provide shelter from wave action.

*Cation:* The positive-charged ion in a molecule.

*Channel:* The buoyed, dredged, and policed fairway through which ships proceed from the sea to their berth or from one berth to another within the harbor.

*Community:* As in "plant community" or other type of biological community; a distinctive collection of species occurring together in a particular habitat.

*Construction staging area:* An area where construction equipment, supplies, and construction offices are located.

*Cretaceous:* The final period of the Mesozoic Era of the geologic time scale; dating between 135 and 65 million years ago.

*DDE:* A product of degradation of DDT by loss of one molecule of hydrochloric acid (dehydrohalogenation). DDE further degrades to DDA by loss of two more molecules of hydrochloric acid (HCl).

*Decibel:* A unit of sound measurement.

*Dissolved oxygen (DO):* A measure of the amount of oxygen available for biochemical activity in a given amount of water. Adequate levels of DO are needed to support aquatic life.

*Dredging*: The removal of bottom sediments in order to deepen or widen a waterway.

*Ecotone*. A transition area between two adjacent ecological communities, usually exhibiting competition between organisms common to both.

*Fastland:* New land that has been created by filling an aquatic area.

*Filter feeding*: Obtaining food by passing water through a filtering mechanism.

*Flexed*: Folded in a fetal position (as in a burial).

*Fluvial*: Geologic units deposited by streams or rivers.

*Free face*: The surface face of a cut or fill slope.

*Holocene (Recent)*: The post-Pleistocene geological epoch characterized by fluctuating but generally moderate climates, rising sea levels, and modern animal species; dating to approximately 11,000 years before present, to the present.

*Hydrodynamics:* The motion and action of water and other liquids, i.e., the dynamics of liquids, and the study thereof.

*Insolation:* Solar radiation that has been received; the rate of delivery of all direct solar energy per unit of horizontal surface.

*Installation Restoration site*. A site subject to assessment of contaminants and remediation under the U.S. Navy's Installation Restoration Program; such contamination is typically from past hazardous waste spills or disposal activities.

*Inversion*: A condition where a layer of cool air or water is trapped under a layer of warm air or water so that it cannot rise.

*Isobath*: A line on a map connecting places of equal depth.

*Iteroparous*: Capable of spawning more than once (usually twice) in a lifetime (e.g., steelhead salmon).

*Lacustrine*: Geologic units deposited in a lake.

*$LC_{50}$*: Mortality of 50 percent of most sensitive organisms in the suspended particulate phase bioassay.

*Lead agency*: The public agency that has the principal responsibility for carrying out or approving a project.

*Mean lower low water*: The average height of the lower of the daily low tides.

*Meroplanktonic forms:* Species that are planktonic for only part of their life cycle.

*Midden*: Soil affected by human use and waste disposal.

*Monocyclic aromatic hydrocarbons (MAHs):* The class of aromatic hydrocarbons which contain a single benzene ring ($C_6H_6$).

*Nephelometer*: A device for measuring the size and concentration of particles in a liquid by an analysis of the light transmitted through or reflected by the liquid.

*Nutrient*: A substance that promotes growth or provides energy for biological processes; common nutrients are phosphate, nitrate, calcium, and potassium.

*One-hundred year floodplain*: The area that has a 1 percent chance of inundation in a given year or has a probability of inundation once every 100 years.

*Paleochannel:* Ancient or fossil stream channel preserved in the geologic record.

*Phytoplankton*: Microscopic, usually one-celled plants that drift in the surface waters of the ocean.

*Pier*: The location in a seaport at which cargo arrives or departs. A dock for loading or unloading ships or vessels.

*Pleistocene*: A late Cenozoic geologic epoch characterized by fluctuating, generally cool climates -- often accompanied by glaciation -- and distinctive animal species, dating from 3 million years ago until approximately 11,000 years ago.

*Pliocene*: The late Cenozoic geologic epoch following the Miocene and preceding the Pleistocene; dating from approximately 5 million until 3 million years ago.

*Pull-apart basin*: A down-dropped area caused by the tectonic "pulling apart" of a region, such as the San Francisco Bay between the Hayward and San Andreas faults.

*Quaternary*: Consisting of the Pleistocene and Holocene of the geologic time scale, this period makes up the second portion of the Cenozoic Era and dates from 3 million years ago to the present.

*Racon:* A device that enhances the return from a vessel's radar to allow the center of the channel to be easily detected.

*Redox potential.* The reduction-oxidation potential is a measure of the availability and activity of oxygen to enter into and control chemical reactions.

*Responsible agency*: A public agency other than the lead agency that has responsibility for carrying out or approving a project.

*Salinian block*: The structural block, composed of metamorphic and igneous rocks, that overlies basement material underlying the Coast Ranges west of the San Andreas Fault.

*Sediment*: Particles and fine matter heavy enough to settle to the bottom of a water column.

*Self mitigating*: In a biological context, creating as much beneficial habitat as would be destroyed.

*Sleeper*: A 1- to 2-foot-high concrete pipe support.

*Spud*: An extendible pile mounted on the side of a dredge or barge which can be driven into bottom sediments under its own weight to anchor the dredge or barge into position.

*Synform*: A concave-down flexure of rock strata.

*Syntectonic deposition*: Deposition of sediments that occur with mountain formation processes.

*Tectonic process*: The regional geologic processes such as faulting and folding that build mountain belts and other geologic features.

*Tertiary*: The first period of the Cenozoic Era, covering the time span between 65 and 3 million years ago.

*Trace elements*: Those elements (metals or organics) generally present in natural water samples at concentrations of less than 1 milligram per liter.

*Tsunami*: A large sea wave created by local or distant undersea fault movement.

*Turbidity*: A cloudy, hazy condition in the water due to the presence of suspended particles, reducing the transmission of light.

*Unconformity*: A break in the geologic record where a time period is missing.

*Unconsolidated sediments*: Those sediments that have not been compressed into a firm consistency; mud.

# 20.0 ACRONYMS

| | |
|---|---|
| ABAG | Association of Bay Area Governments |
| ADT | Average Daily Traffic |
| AHPA | Archaeological and Historic Preservation Act |
| APE | Area of Potential Effects |
| APL | American President Lines |
| ARB | California Air Resources Board |
| ARRA | Alameda Reuse and Redevelopment Authority |
| ASTM | American Standards for Testing and Materials |
| BAAQMD | Bay Area Air Quality Management District |
| BACT | Best Available Control Technology |
| BARCT | Best Available Retrofit Control Technology |
| BART | Bay Area Rapid Transit |
| BCDC | Bay Conservation and Development Commission |
| bgs | below ground surface |
| BHC | Bulls Head Channel |
| BMP | Best Management Practices |
| BNSF | Burlington Northern-Santa Fe Railroad |
| BOD | biochemical oxygen demand |
| B.P. | years before present |
| BTEX | benzene, toluene, ethylbenzene, xylenes |
| CAA | Clean Air Act |
| CAAQS | California Ambient Air Quality Standards |
| CAC | California Administrative Code |
| CalCOFI | California Cooperative Oceanic Fisheries Investigations |
| CalEPA | California Environmental Protection Agency |
| CalPUC | California Public Utilities Commission |
| Caltrans | California Department of Transportation |
| CAP | Clean Air Plan |
| CAR | Coordination Act Report |
| CCAA | California Clean Air Act |
| CCC | California Coastal Commission |
| CCR | California Code of Regulations |
| CDFG | California Department of Fish and Game |
| CDMG | California Division of Mines and Geology |
| CEQ | Council on Environmental Quality |
| CEQA | California Environmental Quality Act |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| CESA | California Endangered Species Act |
| CFP | California Fully Protected Species |
| CFR | Code of Federal Regulations |
| cfs | cubic feet per second |
| CMA | Congestion Management Agency |
| CNDDB | California Natural Diversity Data Base |
| CNEL | community noise equivalent level |
| CNPPA | California Native Plant Protection Act |
| CNPS | California Native Plant Society |
| CO | carbon monoxide |
| COE | U.S. Army Corps of Engineers |
| Corps | U.S. Army Corps of Engineers |
| CPCN | Certificate of Public Convenience and Necessity |

| | |
|---|---|
| CSC | California Species of Special Concern |
| CSFM | California State Fire Marshal |
| CTD | conductivity-temperature-density |
| CV-RWQCB | Central Valley Regional Water Quality Control Board |
| CWA | Clean Water Act |
| cy | cubic yards |
| CZMA | Coastal Zone Management Act |
| CZMP | Coastal Zone Management Plan |
| dB | decibel |
| dBA | A-weighted decibel |
| DDD | dichlorodiphenyldichloroethane |
| DDE | dichlorodiphenyldichloroethylene |
| DDT | dichlorodiphenyltrichloroethane |
| DMMO | Dredged Material Management Office |
| DO | dissolved oxygen |
| DOD | Department of Defense |
| DOHS | California Department of Health Services |
| DOT | Department of Transportation |
| DTSC | California Department of Toxic Substances Control |
| DU | dredging unit |
| DWR | California Department of Water Resources |
| DWT | deadweight ton |
| DWTL | Deep Water Traffic Lane |
| EA | environmental assessment |
| EBMUD | East Bay Municipal Utilities District |
| EBRPD | East Bay Regional Park District |
| EHS | Environmental Health Services |
| EI | environmental investigation |
| EIR | Environmental Impact Report |
| EIS | Environmental Impact Statement |
| EPA | U.S. Environmental Protection Agency |
| ER | COE Engineering Regulation |
| ESA | Endangered Species Act |
| ESU | evolutionarily significant unit |
| FDA | Federal Food and Drug Administration |
| FEMA | Federal Emergency Management Administration |
| FISC | Fleet and Industrial Supply Center |
| FISCO | Fleet and Industrial Supply Center — Oakland |
| FOE | Finding of Effect |
| FONSI | Finding of No Significant Impact |
| FPP | Fire Protection Plan |
| FY | fiscal year |
| HABS/HAER | Historic American Buildings Survey/Historic American Engineering Record |
| HAAF | Hamilton Army Airfield |
| HCH | hexachlorocyclohexane |
| HCM | Highway Capacity Manual |
| HOV | high occupancy vehicle |
| hp | horsepower |
| HPAH | high molecular weight PAH |
| HPSR | Historic Property Survey Report |
| HSWA | Hazardous and Solid Waste Amendments |
| IMO | International Maritime Organization |
| ITM | Inland Testing Manual |
| km | kilometer |

| | |
|---|---|
| $LC_{50}$ | mortality of 50 percent of most sensitive organisms in the suspended particulate phase bioassays |
| LDC | London Dumping Convention |
| $L_{dn}$ | day-night equivalent noise level |
| $L_{eq}$ | energy equivalent noise level |
| LLC | Limited Liability Corporation |
| LOS | level of service |
| LPAH | low molecular weight PAH |
| LPC | Limiting Permissible Concentration |
| LTMS | Long-Term Management Strategy |
| MCE | maximum credible earthquake |
| MCL | maximum contaminant level |
| mcy | million cubic yards |
| $\mu g/m^3$ | micrograms per cubic meter |
| mg/L | milligrams per liter |
| MHEA | Middle Harbor Enhancement Area |
| MHHW | mean higher high water |
| MHW | mean high water |
| MLLW | mean lower low water |
| MO | motor oil |
| MOA | Memorandum of Agreement |
| MP | milepost |
| mph | miles per hour |
| MPRSA | Marine Protection, Research, and Sanctuaries Act |
| MS | Merritt Sands |
| msl | mean sea level |
| MSRC | Marine Spill Response Corporation |
| MTC | Metropolitan Transportation Commission |
| MTMCWA | Military Traffic Management Command Western Area |
| MWP | Montezuma Wetlands Project |
| NAAQS | National Ambient Air Quality Standards |
| NAS | Naval Air Station |
| NDO | net Delta outflow |
| NED | National Economic Development |
| NEPA | National Environmental Policy Act |
| NFPA | National Fire Protection Association |
| ng/L | nanograms per liter |
| NGVD | 1929 National Geodetic Vertical Datum (mean sea level in 1929) |
| NHPA | National Historical Preservation Act |
| NMFS | National Marine Fisheries Service |
| NM | nautical mile |
| NO | nitric oxide |
| NOAA | National Oceanic and Atmospheric Administration |
| NODS | Navy Ocean Disposal Site (same site as SF-DODS) |
| NOI | Notice of Intent |
| NOP | Notice of Preparation |
| $NO_2$ | nitrogen dioxide |
| $NO_x$ | nitrogen oxides |
| NPDES | National Pollutant Discharge Elimination System |
| NRHP | National Register of Historic Places |
| NSCO | Naval Supply Center Oakland |
| NSRL | no-significant-risk level |
| NUAD | not suitable for unconfined aquatic disposal |
| NWS | Naval Weapons Station |

| | |
|---|---|
| OAB | Oakland Army Base |
| OBM | Older Bay mud |
| OBRA | Oakland Base Realignment Authority |
| ODMDS | ocean dredged material disposal site |
| OMZ | oxygen minimum zone |
| $O_3$ | ozone |
| OTR | Oakland Terminal Railroad |
| PAH | polynuclear aromatic hydrocarbon |
| PCB | polychlorinated biphenyl |
| PG&E | Pacific Gas & Electric Company |
| $PM_{2.5}$ | particulate matter smaller than 2.5 microns in diameter |
| $PM_{10}$ | particulate matter smaller than 10 microns in diameter |
| PN | Public Notice |
| POL | Petroleum Oil and Lubricant parcel (at Hamilton Army Airfield) |
| ppb | parts per billion |
| PPD | Pollution Policy Document |
| ppm | parts per million |
| ppt | parts per thousand |
| PRBO | Point Reyes Bird Observatory |
| psi | pounds per square inch |
| psig | pounds per square inch gauge |
| R-AM | Alcatraz reference area |
| R-BF | Bay Farm Borrow Pit |
| RBDD | Red Bluff Diversion Dam |
| RCRA | Resource Conservation and Recovery Act |
| RMP | Regional Monitoring Plan |
| RNA | regulated navigation area |
| ROG | reactive organic gas |
| ROI | region of influence |
| ROW | right-of-way |
| RSPA | Research and Special Programs Administration (USDOT) |
| RVP | Reid vapor pressure |
| RWQCB | Regional Water Quality Control Board |
| § | symbol for "Section" |
| SAP | Sampling and Analysis Plan |
| SCADA | Supervisory Control And Data Acquisition |
| SCS | Soil Conservation Service |
| SFBAAB | San Francisco Bay Area Air Basin |
| SF-DODS | San Francisco Deep Ocean Disposal Site |
| SFEI | San Francisco Estuary Institute |
| SFEP | San Francisco Estuary Plan |
| SF-RWQCB | San Francisco Bay Regional Water Quality Control Board |
| SHPO | State Historic Preservation Officer |
| SIP | State Implementation Plan |
| SLC | State Lands Commission |
| SMMP | Site Management and Monitoring Plan (for SF-DODS) |
| $SO_2$ | sulfur dioxide |
| SP | solid phase |
| SPEA | Supplemental Proponent's Environmental Assessment |
| SPP | suspended particulate phase |
| SPRR | Southern Pacific Railroad |
| SRA | shaded riverine aquatic (habitat) |
| SSC | sediment screening criteria |
| STLC | soluble threshold limit concentration |

| | |
|---|---|
| SUAD | suitable for unconfined aquatic disposal |
| SWAT | Solid Wastewater Quality Assessment Test (U.S. Navy) |
| SWPPP | Storm Water Pollution Prevention Plan |
| SWRCB | State Water Resources Control Board |
| TBT | tributyltin |
| TCE | trichloroethylene |
| TCLP | toxicity characteristic leaching procedure |
| TDS | total dissolved solids |
| TEU | 20-foot equivalent unit |
| TOC | total organic carbon; total organic compounds |
| TOG | total organic gases |
| TPH | total petroleum hydrocarbons |
| TSS | total suspended solids |
| TTLC | total threshold limit concentration |
| TVS | total volatile solids |
| UPRR | Union Pacific Railroad |
| USBR | U.S. Bureau of Reclamation |
| USC | United States Code |
| USCG | U.S. Coast Guard |
| USDOT | U.S. Department of Transportation |
| USEPA | U.S. Environmental Protection Agency |
| USFWS | U.S. Fish and Wildlife Service |
| VOC | volatile organic compounds |
| VSS | Vessel Separation Scheme |
| VTS | Vessel Traffic Service |
| WES | U.S. Army Corps of Engineers Waterways Experiment Station |
| WET | waste extraction test |
| WQC | water quality criteria |
| WQOL | water quality objective limits |
| WQS | water quality standards |
| WRDA | Water Resources Development Act |
| WWII | World War II |
| YB | Younger Bay Mud – Deep (> 8 feet below mudline) |
| YBM | Younger Bay Mud |
| YM | Younger Bay Mud – Mid-Depth (4 to 8 feet below mudline) |
| YS | Younger Bay Mud – Surface (0 to 4 feet below mudline) |

## 21.0 LIST OF MEASUREMENTS

| English Units | Multiply By | Metric Units | Multiply By | English Units |
|---|---|---|---|---|
| acres | 0.4047 | hectares | 2.471 | acres |
| acres | 0.00405 | sq km | 247.105 | acres |
| acres | 0.0001 | hectares | 10,000 | sq m |
| sq mi | 258.99 | hectares | 0.00386 | sq mi |
| sq ft | 0.0929 | sq m | 10.7639 | sq ft |
| sq yds | 0.00020661 | acres | 4840 | sq yds |
| sq yds | 0.0000836 | hectares | 11,962 | sq yds |
| sq yds | 0.8361 | sq m | 1.196 | sq yds |
| acre-feet | 1233.5 | cubic meters | 0.0008 | acre-feet |
| acre-feet | 325850.6 | gallons | 0.0000030689 | acre-feet |
| cubic yards | 0.76455 | cubic meters | 1.3079 | cubic yards |
| cubic feet | 0.283168 | cubic meters | | |
| inch | 2.54 | cm | 0.3937 | inch |
| inch | 25.4 | mm | 0.0394 | inches |
| feet | 30.48 | cm | 0.0328 | feet |
| feet | 0.3048 | m | 3.280 | feet |
| feet | 0.0003048 | km | 3280.83 | feet |
| yards | 0.9144 | m | 1.0936 | yards |
| mile | 1.609 | km | 0.6214 | mi |
| nautical mile | 1.8522 | km | 0.5399 | nmi |
| knots | 51.28 | cm/sec | | |
| psf | 4.88243 | $kg/m^2$ | | |
| pounds | 0.45359 | kg | 2.205 | pounds |
| pounds | 0.00044643 | long ton | 2240 | pounds |
| pounds | 0.0004536 | metric ton | 2204.6 | pounds |
| pounds | 0.0005 | short ton | 2000 | pounds |
| long tons | 1016.05 | kg | 0.0009842 | long ton |
| short tons | 907.185 | kg | 0.00110231 | short ton |
| gallons | 0.003785 | $m^3$ | | |
| barrels (oil) | 42 gal x 0.003785 | $m^3$ | | |
| °F | 9/5 (°F) + 32 | °C | 5/9 (°C - 32) | °F |