Chapter 7
COMPARISON OF ALTERNATIVES

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The principal characteristics, adverse impacts, and benefits of the Proposed Project and each alternative are summarized below. Conclusions are drawn by comparing the major differences among the alternatives.

CEQA requires the identification of an environmentally superior alternative from among the range of alternatives considered, including the No-Project Alternative[1]. If the No-Project Alternative is environmentally superior, an environmentally superior alternative must be identified from among the other alternatives. An environmentally superior alternative should avoid or substantially lessen the significant effects of the project while feasibly attaining most of the basic objectives of the project.[2]

The Corps of Engineers permitting responsibilities under Section 404(b)(1)[3] of the Clean Water Act require that "no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse consequences." To be practicable, an alternative must be available or reasonably obtainable by the permit applicant; it must achieve the basic purpose of the project, taking into account the applicant's objectives; and it must be feasible considering cost, existing technology, and logistics. The Corps' permit decision is distinct from its identification of a preferred alternative under NEPA. As indicated by the foregoing and in the original Public Notice on the Project,[4] the NEPA determination may give greater weight to factors of public interest, i.e. environmental consequences, than to an applicant's purpose. Council on Environmental Quality (CEQ) regulations implementing NEPA specify that an EIS shall identify the federal lead agency's preferred alternative, whereas the record of decision following the EIS must specify which alternative or alternatives were considered to be environmentally preferable.[5]

The significant impacts after mitigation of the Proposed Project, the on-and off-site alternatives, and the No-Project Alternative are summarized in Table 7-1. The benefits and impacts of the Project and alternatives are compared in Table 7-2. Levels of impact significance are described in the table as Less than Significant (LS), Significant and Unavoidable (SU), or No Impact (—). The only substantive change in Table 7-1 from the Public Draft EIR/S is that all biological resource impacts for all alternatives are now considered less than significant after mitigation, whereas they were previously considered significant but not mitigable to less-than-significant levels. This change results from Project design modifications and additional mitigation measures that 1) effectively contain non-cover sediments and prevent significant impacts associated with contaminant releases; and 2) reduce temporary losses of

1 CEQA Guidelines: Title 14 California Code of Regulations, Chapter 3, Article 9, Section 15126(d)

2 *Ibid*

3 40 CFR Part 230 *et. seq.*; Corps of Engineers Regulatory Guidance Letter 93-02; reference has also been made to the Corps of Engineers' Regulatory II Training Course notes on Wetland Policies and Compliance with the 404(b)(1) Guidelines

4 US Army Corps of Engineers San Francisco District, Public Notice Number 19405E26 (21 November 1994)

5 40 CFR Sections 1502.14(e) and 1505.2(b), respectively

Table 7-1
The Montezuma Wetlands Project Alternatives:
Comparison of Adverse Impacts After Mitigation

Resource Area	Proposed Project: Tidal Wetland	On-Site Alternative 1: Managed Wetland	On-Site Alternative 2: Combined Wetland	Off-Site Alternative 3: Bel Marin Keys Site	Off-Site Alternative 4: Hamilton Site	The No-Project Alternative
Land Use	LS	LS	LS	LS	—	—
Policy	LS	LS	LS	LS	—	—
Geology and Seismicity	LS	LS	LS	LS	LS	—
Sediment Quality	LS	LS	LS	LS	LS	—
Hydrology and Water Quality	LS	LS	LS	LS	LS	—
Biological Resources	LS	LS	LS	LS	LS	—
Cultural Resources	LS	LS	LS	LS	LS	—
Traffic, Access, and Circulation	LS	LS	LS	LS	LS	—
Air Quality	SU	SU	SU	SU	SU	—
Noise	LS	LS	LS	LS	LS	—
Recreation	LS	LS	LS	—	—	—
Population, Housing, and Employment	—	—	—	SU*	—	—
Visual Resources	LS	LS	LS	LS	LS	—
Utilities and Public Services	LS	LS	LS	LS	LS	—
Economic and Fiscal Factors	LS	LS	LS	LS	LS	—

LS = Less Than Significant Impact
SU = Significant Unavoidable Impact
— = No Impact
* = Impact would be economic, not environmental.

Table 7-2
The Montezuma Wetlands Project Alternatives: Comparison of Major Project Benefits and Impacts

Factor for Comparison	Proposed Project: Tidal Wetland	On-Site Alternative 1: Managed Wetland	On-Site Alternative 2: Combined Wetland	Off-Site Alternative 3: Bel Marin Keys Site	Off-Site Alternative 4: Hamilton Site	No-Project Alternative
Project Benefits						
Capacity for Dredged Materials	17 million cubic yards	17 million cubic yards	17 million cubic yards	17 million cubic yards	8.4 million cubic yards	—
Restored Tidal Wetlands	1,762 acres	—	966 acres	1,500 acres	840 acres	—
Created Managed Wetlands	68 acres	1,822 acres	856 acres	—	—	—
Increase in Jurisdictional Wetlands[1]	Low: approx. 200 acres	Low: approx. 200 acres	Low: approx. 200 acres	High: approx. 1,400 acres	Moderate: approx. 700 acres	—
Potential to Improve Known Protected Species Habitat	Fish habitat: high Black rail habitat: high SMHM: moderate	Black rail habitat: low SMHM: high	Fish habitat: moderate Black rail habitat: moderate SMHM: high	California clapper & black rail habitat: high SMHM: high	California clapper & black rail habitat: high SMHM: high	None
	Mason's lilaeopsis, Suisun thistle and soft bird's beak: moderate		Mason's lilaeopsis, Suisun thistle and soft bird's beak: low			
Regional Economic Benefit	High; increased by rehandling facility	High; increased by rehandling facility	High; increased by rehandling facility	Low because of loss of revenue from ag, future housing	Moderate	No

1 Although Section 404 jurisdictional waters have been delineated at the Montezuma site, jurisdictional wetlands have only been delineated in the area impacted by the rehandling facility. A final jurisdictional delineation has not been completed for either off-site alternative. As such, these are unofficial estimates of the changes in jurisdictional wetland areas.

Table 7-2
The Montezuma Wetlands Project Alternatives:
Comparison of Major Project Benefits and Impacts

Factor for Comparison	Proposed Project: Tidal Wetland	On-Site Alternative 1: Managed Wetland	On-Site Alternative 2: Combined Wetland	Off-Site Alternative 3: Bel Marin Keys Site	Off-Site Alternative 4: Hamilton Site	No-Project Alternative
Local Economic Benefit	High	High	High	Low	Moderate	No
Project Impacts						
Potential for Release of Contaminants to Environment	Low	Low	Low	Low	Low	None
Predictability of Marsh Restoration:						
Physical	Moderate	High	High	High	High	None
Biological	Moderate	High	High	High	High	None
Impact on Known Protected Species Habitat	High: 524 acres of existing SMHM habitat; successful mitigation in phases I and II is required before larger areas are impacted in phases III and IV. Loss of vernal pool fairy shrimp habitat (to be mitigated). Small areas of potential impact on Mason's lilaeopsis.	High: 524 acres of existing SMHM habitat Loss of vernal pool fairy shrimp habitat (to be mitigated). Fish adversely affected by diversions	High: 524 acres of existing SMHM habitat Loss of vernal pool fairy shrimp habitat (to be mitigated). Fish adversely affected by diversions	Low: Fish entrained by pumps at off-loading facility, small area of potential SMHM, clapper & black rail habitat impacted by construction of inlet channels	Low: Fish entrained by pumps at off-loading facility, small area of potential SMHM, clapper & black rail habitat impacted by construction of inlet channels	None
Land Use Impacts	No major impacts	No major impacts	No major impacts	Loss of land otherwise available for housing and agriculture	None	None

Table 7-2
The Montezuma Wetlands Project Alternatives:
Comparison of Major Project Benefits and Impacts

Factor for Comparison	Proposed Project: Tidal Wetland	On-Site Alternative 1: Managed Wetland	On-Site Alternative 2: Combined Wetland	Off-Site Alternative 3: Bel Marin Keys Site	Off-Site Alternative 4: Hamilton Site	No-Project Alternative
Project Impacts (continued)						
Peak Day Operational Air Quality Impacts	Moderate: 135 lbs ROG 594 lbs CO 2,356 lbs NO_x 159 lbs SO_x 93 lbs PM_{10} (includes rehandling operations)	Moderate: 135 lbs ROG 594 lbs CO 2,356 lbs NO_x 159 lbs SO_x 93 lbs PM_{10} (includes rehandling operations)	Moderate: 135 lbs ROG 594 lbs CO 2,356 lbs NO_x 159 lbs SO_x 93 lbs PM_{10} (includes rehandling operations)	High: 102 lbs ROG 834 lbs CO 3,116 lbs NO_x 205 lbs SO_x 64 lbs PM_{10} (not including rehandling operations; emissions would be substantially higher if rehandling activities were added)	Low to Moderate: 76 lbs ROG 584 lbs CO 2,149 lbs NO_x 142 lbs SO_x 48 lbs PM_{10} (not including rehandling operations; emissions would be substantially higher if rehandling activities were added))	Unknown, but probably substantial as emissions due to sediment disposal would still occur, at other locations.

ecosystem functions and values that are associated with the conversion of existing non-tidal wetlands to tidal wetlands.

With respect to the DEIR/EIS, Table 7-2 contains several changes in impacts, based on new mitigation measures, public comments, and lead agency review. These are as follows:

- The potential to improve endangered fish species' habitat is rated high for the Proposed Project (change from moderate in the DEIR) because of design modifications lowering the marsh plain elevation and additional channel design and mitigation elements. To the same cell under Proposed Project is added a moderate potential to improve habitat for threatened and endangered tidal marsh plants.
- For the Proposed Project, additional regional economic benefits of the rehandling facility are recognized.
- For all alternatives, the potential for release of contaminants has been downgraded from moderate in the DEIR to low, based on design features and mitigation measures that minimize this possibility.
- For impacts on protected species habitat, the table cites mitigation requirements for the Proposed Project's successful creation of SMHM habitat during Phases I and II, prior to the Project's impact on extensive SMHM habitat in Phases III and IV. In addition, several relatively minor impacts have been recognized in the table, including: a small area of potential impact on Mason's lilaeopsis habitat at the Proposed Project site; small areas of potential impact on SMHM and clapper & black rail habitat at the off-site alternatives; and potential fish entrainment impacts for the off-site alternatives, based on recognition that sensitive fish species would probably be entrained in the offshore pumps needed for these sites.
- Air quality impacts have been recalculated based on clarification of equipment requirements, the exclusion of emissions associated with transport of sediments to the disposal sites, and the inclusion of emissions that would be associated with off-site sales from the rehandling facility. No emissions calculations have been made for rehandling operations at the alternative sites, but it should be recognized that factoring in such operations—consistent with a Montezuma-like project—would cause substantially increased emissions.

In addition, for the sake of comparisons, impacts have been assigned relative rankings of high, medium, or low where it is reasonable to do so.

7.1 Fulfillment of Purpose and Need

The purpose of the project, as stated in Chapter 1, is to combine the commercial use of cover and non-cover dredged materials with the restoration of a tidal wetland ecosystem. The Applicant would use the revenues generated by 1) a tariff on the disposal of sediments at the site, and 2) the sale of rehandled sediments for off-site uses such as levee rehabilitation, to support the infrastructure and labor necessary to construct, and monitor restored tidal wetlands in accordance with the permit conditions imposed by the lead agencies and other agencies with permit jurisdiction.

The Proposed Project and alternatives vary in the degree to which they would successfully achieve the purposes and needs of the project. The major questions regarding the project's technical feasibility are the extent to which the release of contaminants to the environment is avoided, successful mitigation of salt marsh harvest mouse (SMHM) habitat, and the adequacy of the marsh design in re-establishing tidal wetlands vegetation under site-specific conditions.

The Proposed Project site at Montezuma has a disposal capacity of about 17 million cubic yards (mcy); this amount of dredged material could be accommodated with the Proposed Project, Alternative 1, and Alternative 2. The Alternative 3 site at Bel Marin Keys has a similar disposal capacity whereas the Hamilton site would accommodate about half of that amount.

7.2 The Proposed Project

7.2.1 Principal Characteristics

As proposed in the revised design (Chapter 4), the Project would restore 1,782 acres of tidal shallow water and marsh habitats (including some features of seasonal wetlands) and 48 acres of diked pickleweed marsh on the 2,394-acre Montezuma site located in Solano County, adjacent to the Suisun Marsh. The acreages of diked marsh and the mix of high versus low marsh may be adjusted to mitigate salt marsh harvest mouse impacts (mitigation P-BIO-3a), depending on input from USFWS. The site is now diked seasonal wetlands and non-wetland grassland, used for grazing.

The Project would restore tidal wetlands by constructing cells, separated by engineered levees, grading channels in the cells, and connecting the four phase areas of the Project to tidal flows. Dredged materials from the San Francisco Bay region would be barged to the site, off-loaded, and placed in the cells until elevations suitable for self-sustaining marsh were reached. The dredged materials to be disposed at the site would be pre-approved for disposal at the Montezuma site, having met criteria established by the San Francisco Bay Regional Water Quality Control Board for disposal as cover or non-cover material in wetlands, based on detailed sediment characterization studies conducted during the environmental review and permitting of Bay Area dredging projects.

7.2.2 Major Adverse Impacts

Air quality impacts are considered significant and unmitigable for all alternatives. For the Proposed Project, air quality emissions calculations include the operation of the rehandling facility, which is included only qualitatively in the off-site alternatives (see sections 7.8.2 and 7.8.3 for additional discussion). Otherwise, all major adverse environmental impacts would be mitigated to less than significant levels as follows:

- The potential for significant impacts due to contaminant releases has been reduced to less-than-significant levels through the incorporation of measures to effectively contain non-cover sediment; to limit the buildup of contaminants in make-up water; and through contingency measures to be implemented if needed based on sediment, vegetation, and animal monitoring. Approximately 80% of the sediments received by the Project would have been classified as suitable for use as cover in wetland environments by the Regional Water Quality Control Board. This is based on the requirement to place the remaining non-cover sediments on relatively deep areas of the site where these sediments can then be covered by at least 3 feet of cover material.

- Losses of existing wetland habitat values associated with seasonal ponding would be offset in the short-term by the habitat values provided by newly constructed shallow ponded areas that are part of the project design, and by the enhancement of existing seasonal wetlands. In the long term there would be a substantial net gain in wetland habitat, for the most part benefiting the same species, especially shore- and waterbirds, that currently use seasonal wetlands. Losses of SMHM habitat would for the most part be mitigated in advance, as successful habitat creation in the earlier phases is required before later phases can be implemented, reducing residual impacts to less than significant levels.
- The physical design of the Project has been modified by lowering elevations to improve the likelihood of successful marsh establishment and the evolution of channel networks.
- The Project, with policy amendments as proposed, would not significantly impact water-dependent industrial development or other land uses in Solano County.

7.2.3 Project Benefits

To the degree that the tidal marsh restoration is successful, the primary benefit of the Project would be the restoration of 1,762 acres of historic tidal marsh. The probability of success of the Project must be qualified by uncertainties in the availability of dredged material, the commercial competitveness of Montezuma as opposed to other disposal options available to dredging projects, and the rate of marsh development through sedimentation.

Within the Suisun Bay system there are abundant seasonal wetlands, whereas tidal marsh wetlands have become relatively scarce, due to diking and filling over the last century. Tidal marsh is generally recognized as a highly productive system. The replacement of existing seasonal wetlands and grasslands with tidal marsh in the Suisun Bay is therefore considered to be a net ecological benefit in the long term.

In addition, the Project would provide the following specific benefits:

- Historic habitat could be restored for wildlife species, especially migratory waterfowl and shorebirds, plus one endangered fish species, the winter-run chinook salmon (FE, SE); one threatened species, the Delta smelt (FT, CSC); one federally proposed threatened species, the Sacramento splittail (CSC); and two state special concern fish species, the longfin smelt and the green sturgeon. In the long term, successful restoration of tidal marsh could create habitat for state- or federally listed brackish marsh plants, including Mason's lilaeopsis (SR), Suisun thistle (FE), and soft bird's beak (FE), and the state-listed (ST) California black rail.
- The need for upland sites suitable for beneficial reuse of dredged material from the Bay has been established by the LTMS. The Project would provide an upland site for disposal of 17 million cubic yards of cover and non-cover dredged material from the San Francisco Bay. The rehandling facility would have regional economic benefits by providing sediment for uses such as levee strengthening in the Suisun Marsh/Delta region.
- The Project would improve existing public access facilities and add new public access, in fulfillment of BCDC's public access requirements. Increased public access to the Suisun Marsh and shoreline would be a public benefit.
- If tipping fees were provided to Solano County, the net revenues to the County from the Project would benefit the public.

- The Project would provide the opportunity for monitoring the effects of using dredged materials for tidal wetlands restoration. Data from monitoring activities would benefit other efforts at wetland restoration, and would help to set standards for sediment quality.

7.3 On-Site Alternative 1: Managed Wetland

7.3.1 Principal Characteristics

Alternative 1 is similar to the Proposed Project, but differs in that it would restore 1,822 acres of managed wetlands instead of tidal wetlands on the 2,394-acre Montezuma site. The managed wetlands would be similar in function and configuration to those that now exist throughout the Suisun Marsh. Vegetation within the restored wetlands would be managed according to four different water regimes or "schedules," each schedule designed to promote specific vegetation types. The project would require continuing maintenance. The managed wetlands would be connected by channels to the Montezuma Slough. At high tide the wetlands would be inundated, and at low tide the wetlands would drain. Tidal flow into the site would be controlled by tide gates and pumps.

7.3.2 Major Adverse Impacts

The impacts for this alternative would be the same as those for the Proposed Project, with the following differences:

- Tidal-dependent plant and wildlife species would not be accommodated in this alternative.
- This alternative would have impacts on special status fish species through diversion of water from Montezuma Slough, which is used by these species.

7.3.3 Project Benefits

This alternative would have benefits similar to those of the Proposed Project, with the following major differences:

- Greater acreages of seasonal wetlands habitat could be restored to the site following placement of dredged materials and restoration.
- Managed wetlands afford greater control of hydroperiods and hence the types of habitats that develop. There are many similar managed wetlands in the Suisun Marsh, and appropriate vegetation establishment in those wetlands is predictable. Those wetlands, however, are not recently constructed from dredged sediments, as Alternative 1 would be; hence the managed wetland alternative has a level of uncertainty similar to that of the Proposed Project with respect to attainment of natural wetland functions and values.

7.4 On-Site Alternative 2: Combined Tidal and Managed Wetland

7.4.1 Principal Characteristics

Alternative 2 is similar to the Proposed Project and Alternative 1, but differs in that it would restore both managed wetlands and tidal wetlands on the 2,394-acre Montezuma site. Tidal wetlands would be restored in Phases II and IV, at the southern part of the site. Managed wetlands would be restored in Phases I and III, in the northern part of the site. This alternative would combine the benefits and impacts of both Alternative 1 and the Proposed Project.

7.4.2 Major Adverse Impacts

Alternative 2 would combine impacts identified for the Proposed Project and for Alternative 1. However, the impacts of each would be less in magnitude due to the reduced size of the fully tidal and managed wetland components of the alternative.

7.4.3 Project Benefits

The major difference in benefits between Alternative 2 and the Proposed Project is that this alternative would restore both tidal marsh and managed wetlands to the site. Alternative 2 would provide the benefits of both the Proposed Project and Alternative 1. The total acreage of tidal marsh, the most productive habitat, would be 966 acres, compared with the 1,822 acres of tidal marsh in the Proposed Project. In terms of value of habitat restored, Alternative 2 would be more beneficial than Alternative 1 but less than the Proposed Project, due to the relative scarcity of tidal marsh wetlands in the Suisun Marsh System.

7.5 Off-Site Alternative 3: The Bel Marin Keys Site

7.5.1 Principal Characteristics

Alternative 3 is similar in purpose and operational characteristics to the Proposed Project, but it would be located on a different site in a more saline area of the San Francisco Bay estuary. The site is 1,610 acres of diked grasslands and seasonal wetlands, used for oat hay production, in Marin County adjacent to San Pablo Bay. The site would be restored to tidal marsh in two phases. The off-loading facility would be constructed about 3.6 miles off-shore in San Pablo Bay. The conceptual design for this alternative has a target elevation of +2.0 feet NGVD, compared to the Proposed Project's target fill elevation of +1.9 feet NGVD for low marsh and +2.9 feet NGVD for high marsh. For both the Proposed and Alternative site, these elevations were lowered, relative to the DEIR, in order to enhance the development of channel networks and marsh communities through natural sedimentation on a lowered template.

7.5.2 Major Adverse Impacts

As for the Proposed Project, significant adverse impacts other than air quality would be mitigable to less-than-significant levels, with the possible exception of an economic impact on housing that has been proposed for the site. This conclusion depends on the successful adaptation of all the Montezuma-type design, mitigation, and monitoring features to the Bel Marin Keys site.

- As for the Proposed Project, short-term loss of seasonal wetland habitat values between site preparation and wetland restoration would be mitigated by the enhancement of existing wetlands and by the interim habitat values provided by recently constructed, shallowly ponded areas that would be used by wildlife.
- A major adverse impact could be the potential for release of contaminants to the environment from sediments, pond water, and decant water, with subsequent transfer of contaminants to higher trophic organisms and the food chain. Like the Proposed Project, this impact is mitigable.
- This alternative would replace an undetermined acreage (most likely on the order of 100 acres) of existing jurisdictional waters of the U.S. that provide seasonal wetland habitat values, and roughly 1,300 acres of non-jurisdictional grassland habitat, with tidal wetlands. Several acres of existing tidal marsh habitat on the bayside of the levee would be

replaced by inlet channels for the restored wetland. Fish entrainment could occur during pumping San Pablo Bay water to make a slurry of the dredged material.

- As at all sites, there remains some potential for failure due to seismic hazards and geotechnical failures, such as subsidence, and mudwaves. In case of failure, the potential for release of contaminants to the environment would increase, and remediation or restoration of the site would require a significant commitment of resources and long-term loss of ecological value and function. Mitigations similar to those identified for the Project would minimize this impact.
- This alternative would displace 784 acres of viable agricultural use.
- Traffic generation from this alternative, although very low, would reduce the level of service (LOS) at two nearby intersections.

7.5.3 Project Benefits

The following specific benefits would result from the Bel Marin Keys alternative:

- The primary benefit of this alternative would be the restoration of 1,500 acres of historic tidal marsh.
- A major benefit of this alternative, if successful, would be the likelihood of restoration of habitat for the endangered California clapper rail and SMHM and the state-listed threatened black rail populations, and a significant contribution to the recovery of these species.
- The salinity levels and sedimentation rates are higher at this Bay site than at the Montezuma site, and would result in greater predictability of vegetation type and, in turn, greater predictability of habitats for the endangered California clapper rail and SMHM.
- This alternative has significantly less potential to impact existing wetland resources when compared to the Proposed Project; no rare, threatened, or endangered species have been documented within the boundary levees. This alternative would not result in loss of known SMHM habitat.
- The need for upland sites suitable for beneficial reuse of dredged material from the Bay has been established by the LTMS Program. Alternative 3 would provide an upland site for disposal of about 17 mcy of cover and non-cover dredged material from the San Francisco Bay.
- This alternative would have the advantage of being closer to the dredging sites in San Francisco Bay and, assuming most dredging sites are in the Bay, would reduce the distance traveled by tug boats transporting dredged materials. Any air quality advantage would, however, be negatated by the emissions associated with pumping slurried sediments from the offshore off-loading facility.
- This alternative would add new public access, in fulfillment of BCDC's public access requirements. Increased public access to the San Pablo Bay and shoreline would be a public benefit.
- If tipping fees were charged by Marin County, as required mitigation for fiscal impacts on the County, the net revenues to the County from this alternative would benefit the public.

7.6 Off-Site Alternative 4: The Hamilton Site

7.6.1 Principal Characteristics

Alternative 4 is similar in purpose and operational characteristics to the Proposed Project and Alternative 3. Once marshland, the site is now diked grasslands and paved areas; areas of wetlands are confined to ditches and small, isolated patches of wet grassland, and to the outboard side of the levee. No agricultural uses occur on the site. The site would be restored to tidal marsh in two phases, with a design similar to that of Alternative 3. The off-loading facility would be constructed in the same location as in Alternative 3, about 3.6 miles off-shore in San Pablo Bay.

7.6.2 Major Adverse Impacts

The major impacts are described below.

- A major adverse impact would be the potential for release of contaminants to the environment from sediments, holding pond water, and decant water, with subsequent transfer of contaminants to higher trophic organisms and the food chain. This impact is mitigable as for the Proposed Project. It should, however, be noted that the lack of deep water adjacent to the site makes this impact more difficult to mitigate than for the Proposed Project as either a) more stringent, shallow water discharge requirements would have to be met, possibly resulting in modifications to project design or operations; or b) a return-water discharge pipeline would have to be constructed several miles out into San Pablo Bay to reach deep water.
- The project would remove tens of acres of seasonal wetlands within the jurisdiction of the Corps. The remainder of the site is grassland or developed land, with the exception of the tidal marsh on the outboard side of the levee.
- Fish entrainment could occur from pumping San Pablo Bay water to make a slurry of the dredged material.
- The potential for failure due to seismic hazards and technical failures, such as subsidence and mudwaves, would be the same as for Alternative 3 and the Project, and these impacts at all three sites are mitigable.

7.6.3 Project Benefits

The following specific benefits are associated with the Hamilton alternative:

- The primary benefit of Alternative 4 would be the restoration of about 800 acres of historic tidal marsh on the site, which would replace existing seasonal wetlands, grasslands, and disturbed land associated with the abandoned runway.
- The placement of dredged materials and tidal restoration would remediate low-level contamination of the site.
- A major benefit of this alternative would be the likelihood of restoration of habitat for the endangered California clapper rail and SMHM, and threatened black rail populations, and a significant contribution to the recovery of these species.

- The salinity levels and sedimentation rates are higher at this Bay site than at the Montezuma site, and would result in greater predictability of vegetation type, and in turn greater predictability of habitats for the endangered California clapper rail and SMHM.
- This alternative has less potential to conflict with existing wetland resources when compared to the Proposed Project; no rare, threatened, or endangered species have been documented within the boundary levees. However, the site does provide habitat for the burrowing owl, a special status species, and could support other special status species. This alternative would not result in loss of known SMHM habitat.
- This alternative would have the benefit of being closer to the dredging sites in San Francisco Bay and, assuming most dredging sites are in the Bay, would reduce the distance traveled by tug boats transporting dredged materials.
- This alternative would add new public access, in fulfillment of BCDC's public access requirements. Increased public access to the San Pablo Bay and shoreline would be a public benefit.
- If tipping fees were charged by the City of Novato, as required mitigation for fiscal impacts on the City, the net revenues to the City from this alternative would benefit the public.

7.7 No-Project Alternative

7.7.1 Principal Characteristics

With this alternative, wetlands would not be restored at the Montezuma site. The site would continue in existing use (as seasonal wetlands and uplands), subject to use changes in the future consistent with applicable land use and zoning regulations and policies of the local jurisdictions. Other sites identified in the LTMS studies (e.g., LTMS 1995) would continue to be candidates for disposal of dredged materials.

7.7.2 Major Adverse Impacts

All adverse project-related and site-specific impacts, including construction and operation impacts, would be avoided or deferred to a future date.

Without the Project, the existing perimeter levee could fail, resulting in a large tract of shallow water habitat. This would be a major adverse impact in terms of the endangered SMHM, local populations of which would probably be extirpated by the sudden flooding of low-lying areas that support the species. Such a levee failure would not require the land owner to mitigate for the loss of existing wetland habitat that would result. Natural sedimentation could eventually re-establish intertidal elevations, although the rate at which this might occur is unknown.

It should be recognized that the No-Project Alternative would not affect future implementation of wetland restoration or other actions by the current owners of the Bel Marin Keys or Hamilton properties.

Under this alternative, there would also continue to be a serious shortage of appropriate and cost-effective disposal sites for non-cover sediments. This shortage of appropriate disposal sites would mean, at a minimum, that many of the relatively more contaminated sediments disapproved for unconfined disposal at ocean or in-Bay sites would not be dredged and would instead remain as in-place surface sediments to which organisms are exposed. Without the proposed site for dredged material, this alternative could also

make some future dredging projects less economic. This could limit Bay Area ports' ability to maintain deep and shallow draft navigation channels, thereby limiting Port activity, which could affect the regional economy.

7.7.3 Project Benefits

- The No-Project Alternative has no benefits; avoiding impacts is not considered a benefit.

7.7.4 Fulfillment of Purpose and Need

The No-Project Alternative would not meet the project purpose and need to use cover and non-cover dredged materials to restore wetlands in the San Francisco Bay Area.

7.8 The Environmentally Preferred Alternative(s)

As discussed at the beginning of this chapter, NEPA and CEQA require the identification of an environmentally preferred alternative. Under NEPA, the environmentally preferable alternative is the one that best promotes the national environmental policy expressed in NEPA, and generally the alternative that causes the least damage to the environment and best protects natural and cultural resources. Under CEQA, the environmentally preferred alternative is described as the "environmentally superior alternative." The conclusions of the NEPA/CEQA alternatives analysis in this chapter are based on what is reasonable for the type of project proposed by the Applicant. The review presented at the beginning of this chapter indicates that fair, not overriding, consideration should be given to the Applicant's purposes and needs The environmentally preferable alternative (under NEPA) or the environmentally superior alternative (under CEQA) are distinct from the least environmentally damaging practical alternative, which is determined through the Section 404(b)(1) evaluation done as part of the Corps' permit process.

7.8.1 Comparison of the Proposed Project and On-Site Alternatives

The Proposed Project and the two on-site alternatives are similar in the level of impact for most resource areas. The major differences between these two alternatives and the Proposed Project are in their effects on biological resources.

Alternatives 1 and 2 would have the same impact on existing vegetation, wildlife habitats, and species as the Project, because they would all place dredged materials in the same areas on the site. They would differ, however, in the type of vegetation that would result during the restoration phase of the project, and the level of predictability and control of vegetation types that would establish. Alternatives 1 and 2 would not have a clear benefit over the Proposed Project, given the revised design's greater emphasis on low marsh, and the inclusion of elements that allow for hydrologic control to achieve specific goals.

Alternatives 1 and 2 would have the following disadvantages compared to the Proposed Project:

- Alternatives 1 and 2 would not provide the substantial benefits to fish species that the Proposed Project would, and could impact fish species through diversion of surface water from Montezuma Slough.
- Alternative 1 would not provide for tidal-dependent species, such as the black rail and Suisun song sparrow; Alternative 2 would not provide for them to the degree that the Proposed Project would.

- Alternative 1 and, to a lesser degree, Alternative 2, would not be expected to restore the tidal wildlife habitat types which probably occurred historically prior to levee construction, and that may reoccur with the Proposed Project.

Alternatives 1 and 2 could be managed intensively to maximize habitat for certain species or types of species, e.g., SMHM or dabbling ducks. However, these species or types of species are also likely to utilize the habitats associated with restored tidal brackish marsh, along with a great variety of plants and wildlife that are unlikely to inhabit managed wetlands. The alternatives' creation of managed areas that provide concentrated habitat resources for a smaller subset of the native Suisun Marsh biota does not confer clear advantages when compared to wider benefits associated with the Proposed Project.

The revised Project, is thus preferable to either Alternative 1 or 2.

7.8.2 Comparison of the Proposed Project and Off-Site Alternatives

Table 7-1 indicates that the Proposed Project and off-site alternatives are qualitatively similar in terms of environmental (not economic) impacts after mitigation. Quantitative differences are discussed below.

Alternative 3: The Bel Marin Keys Site

The level of impact is greater for Alternative 3 than for the Proposed Project for land use, flooding impacts, air quality and traffic. Impacts would be less in some but not all respects for biology.

Major differences between the Proposed Project and Alternative 3 would be as follows:

- Biological Resources. Alternative 3 would convert fewer acres of non-tidal jurisdictional waters of the U.S., including seasonal wetlands, and greater areas of non-jurisdictional grasslands, to tidal wetlands. The seasonally wet grasslands of the Bel Marin Keys site are, however, valuable wildlife habitat, as shown by the USFWS Diked Baylands study. The Bel Marin Keys site would impact a smaller acreage of existing endangered species (SMHM) habitat, and is likely to result in greater net benefit to the SMHM and California clapper rail in the long term. Both sites are likely to create extensive habitat for the state-listed threatened California black rail. The Bel Marin Keys site would have greater adverse impacts on sensitive fishes due to entrainment in the pumps located offshore in San Pablo Bay whereas the Proposed Project is more likely to benefit endangered and other sensitive fish species through the provision of spawning and rearing habitat. The Proposed Project in the long term may also provide habitat for threatened and endangered tidal marsh plants that occur in the Suisun Marsh. Finally, there is less uncertainty regarding sedimentation rates and the long-term development of a productive tidal marsh community in San Pablo Bay than at the Proposed Project site at Montezuma..
- Land Use. Alternative 3 would remove 1,310 acres of agricultural land used for oat hay farming, and would preclude proposed residential development; this alternative would be inconsistent with local land use policy. The Proposed Project would restore wetlands on 1,822 acres of land used for grazing but it would not be inconsistent with local land use policy..
- Traffic. Although the traffic generation would be about the same for all alternatives, the impact of traffic on the local street system would be greater for Alternative 3 than for the Proposed Project. Alternative 3 would reduce level of service (LOS) at two intersections.

- Air Quality. This alternative would result in greater pollutant emissions than the Proposed Project in 3/5 categories (Table 7-2) because of the longer distance that slurried sediments would have to be pumped from the offshore off-loading facility. This is despite the fact that the Proposed Project has additional emissions associated with the operation of a rehandling facility. If rehandling facility operational emissions comparable to those predicted for Montezuma were added to the total for Bel Marin Keys, the total emissions would be substantially higher in all categories.
- Flooding. Wetlands restoration on the Bel Marin Keys site has the potential to reduce the flood storage capacity of the site.

Alternative 4: The Hamilton Site

Except possibly in the case of air quality, the severity of adverse impacts would be less for Alternative 4 than for the Proposed Project or Alternative 3, because the site is the smallest of the three sites, and it has the fewest sensitive resources. If emissions due to rehandling facility operations were added, total emissions for the Hamilton site would be similar to those of Montezuma.

The advantages of the Hamilton site over the Bel Marin Keys site are the following:

- Wetlands restoration on the Hamilton site would not conflict with local land use policy regarding agricultural use, whereas Alternative 3 would eliminate 1,310 acres of oat hay farming.
- There would be no significant noise impacts on surrounding uses at the Hamilton site.
- There would be no reduction in the level of service on local roadways for Alternative 4, in contrast to Alternative 3 which would result in a reduction in the level of service at two local intersections.

7.8.3 Conclusion Regarding the Environmentally Preferred Alternative(s)

The No-Project Alternative would have no project-related or site-specific impacts; however, it would not fulfill the purpose and need for the project, and would have none of the associated beneficial impacts. The apparent absence of air quality impacts for the No-Project alternative is an artifact of the analysis: there would still be (unquantified) emissions associated with sediment disposal at other sites. Given in addition that for the other alternatives, all other adverse environmental impacts are considered to be less than significant after mitigation, the No-Project Alternative is not environmentally preferred.

The Proposed Project is preferred over Alternatives 1 and 2 for the reasons noted in section 7.8.1.

Compared to Alternative 3, the Proposed Project has greater environmental impacts in some respects, but lesser in others. Most differences relate to impacts that are mitigable to less than significant levels, the exception being air quality impacts which, in most respects, would be greater at Alternative 3. Alternative 4 has lesser adverse environmental impacts than either Alternative 3 or the Proposed Project, but again, the differences are in areas already found mitigable to less than significant levels.

With the redesigned project and Final EIR/S mitigations, the most severe adverse impacts of the original Project have been effectively reduced to less-than-significant (though still non-zero) levels. A key aspect of the redesigned Project is that successful habitat restoration and containment of contaminants must be demonstrated in phases I and II before additional, more valuable habitats are impacted in phases III and

IV. Tidal wetland restoration at any of the three locations offers significant though different benefits in terms of the restoration of historic tidal landscapes and endangered species habitats.

Differences in size and capacity among the three sites are not significant in terms of distinguishing an environmentally preferred alternative. Both positive and negative impacts correlate with the size of the site, and any alternative should be developed in a phased manner based on a confirmed supply of sediment..

The risks of significant impacts due to contaminant releases are equally mitigable at all sites. Uncertainties associated with wetland restoration using dredged materials are less at Bel Marin Keys or Hamilton than at Montezuma.

In terms of endangered species, the Bel Marin Keys and Hamilton sites provide fairly clear potential benefits for the salt marsh harvest mouse, California clapper rail, and black rail. In contrast, the Proposed Project has greater potential adverse impacts on the salt marsh harvest mouse, although Final EIR/S mitigation measures would minimize and offset these impacts to the point that the end result may be a benefit to the species. The Proposed Project's potential benefits to the California black rail are similar to those of the San Pablo Bay alternative sites. The Proposed Project also provides greater potential beneficial impacts for rare and endangered fishes and tidal marsh plants.

As noted previously, Alternative 4 (Hamilton) can be considered environmentally superior to Alternative 3 (Bel Marin Keys). In most respects, resource by resource, the two off-site alternatives are comparable to each other, and Hamilton has lesser adverse impacts, and similar-to-greater benefits.

Between Hamilton and the Proposed Project site, however, advantages and disadvantages differ, and neither is clearly environmentally preferred. To find one site preferable to the other, given the mitigation of adverse impacts for both, would require value judgements on beneficial impacts that the EIR/S is not prepared to make, e.g., in terms of the overall values of tidal marsh restoration in Suisun Marsh versus San Pablo Bay, or in the values of restored tidal brackish marsh habitat for federally listed plants and fishes, versus restored tidal salt marsh habitat for the federally listed California clapper rail and the SMHM.

Chapter 8
MAJOR CONCLUSIONS

■ ■ ■

8.1 Local Short-Term Use vs. Long-Term Productivity

The Proposed Project, if successful, would provide for greater long-term ecological productivity than would maintenance of the site in its existing seasonal wetlands and uplands condition. Restoration of tidal wetlands in the Suisun Marsh, where many tidal wetlands have been diked and converted to seasonal and managed wetlands, would replace a valuable and increasingly scarce resource. Restoration of tidal wetlands would further the goals and policies of federal, state, and local agencies regarding protection and restoration of wetlands.

Short-term losses of productivity would be less-than-significant for several reasons. The project design involves construction on ecologically less valuable areas first, and restoration on these phases must be initially successful before the more valuable areas of the project site in phases III and IV are filled. As the filling of each sediment placement cell is completed, it would provide shallow ponded habitat for wildlife, offsetting losses of seasonal wetlands and ponded areas that have been filled. In addition, mitigation measures P-BIO-2a and P-BIO-3a require interim habitat enhancement in unfilled areas of the site while other areas are being constructed, further offsetting losses of existing habitat values.

The Proposed Project represents a major regional investment of land and resources, and would preclude other uses for the site over the long term. The future land use option for the site that would be precluded would be mainly livestock grazing. Hunting would also be curtailed once Phase III is developed. While development of the site would preclude future water-dependent industrial use in the Phase IV area, that potential future use is considered very unlikely during the life of the Project.

There would be significant impacts on air quality resulting from site preparation and sediment placement and rehandling activities.

A worst-case scenario for the Proposed Project would involve its economic failure, leaving the site partially constructed but requiring additional costly restoration and maintenance work, as well as the continuing implementation of various project design elements and mitigation measures to prevent water quality impacts. The Project's financial failure would result in delays in wetland restoration on partially completed areas. Mitigation measure P-ECON-4 is intended to ensure that sufficient funding is available to complete restoration and remediate potential contamination in such an event.

The redesigned Project has reduced the likelihood and consequences of contaminant releases from non-cover material and, with the mitigation measures in the EIR/EIS, the risks to public health and safety would be minimal.

8.2 Significant Irreversible Changes

This section describes the extent to which the Proposed Project would result in committing nonrenewable resources to uses that future generations may be unable to reverse. For the sake of continuity with the Draft EIR/S, discussions of Land Use and Biological Resources are included below, although potentially significant irreversible impacts on these resources have now been mitigated.

8.2.1 Land Use

Land use on the site would change from grasslands and non-tidal wetlands that are subject to grazing and hunting, to tidal wetlands, a small area of managed marsh, and bordering upland-transition buffer habitat. The rehandling facility is subject to future permitting if the Applicant were to propose it as a permanent facility and so would not be an irreversible commitment of resources to that use. In other respects, land use changes would likely be irreversible once tidal restoration is completed, but are considered less-than-significant because of the greater overall benefits associated with the Project than with existing land use.

8.2.2 Biological Resources

The re-designed Project, with EIR/S mitigation measures, is likely to be successful, in which case it would result in a net benefit by providing tidal habitats of equal or greater value than the existing non-tidal habitats, while minimizing short-term net losses of ecological functions and values. Once tidal restoration occurs, these changes are likely to be irreversible, but they would not be significantly adverse. The phased design of the project, in conjunction with EIR/S mitigation measures, provides contingencies that would enable project implementation to be modified or halted, and corrected, in the event that engineering and ecological requirements are not being met.

As noted above, potential impacts associated with contaminant releases from non-cover material are considered mitigated to less than significance.

8.2.3 Air Quality

Air quality impacts during operation of the Project from sediment placement activities would be significant and unavoidable, and would contribute incrementally to regional air quality problems.

8.3 Growth-Inducing Effects

The Proposed Project would not induce local growth. Although a road would be improved for access to the off-loading facility during construction, it would not be designed or maintained for other uses. The project would not create additional railroad infrastructure that would induce development. The off-loading facility would be a floating dock, not a port facility. No sewer or water lines would be extended to the site, and the Project would not require expansion of existing service and utility capacities.

If the site provides an economically feasible disposal site for cover and non-cover dredged material, the Project would contribute to continued (not necessarily expanded) use of Bay Area ports and, in turn, continued commercial shipping use of Bay and Delta waterways. The Project would thus not induce growth at the regional level.

8.4 Cumulative Impacts

Cumulative impacts occur when two or more individual effects together create a considerable environmental impact, or if they compound or increase other environmental impacts. There are several other projects that could use or are using dredged material to restore marshes in the Bay Area, including Bair Island, Cullinan Ranch, Sonoma Baylands, Bel Marin Keys Unit 5, and the Hamilton Wetland Restoration project. Some of these projects have been proposed to provide a disposal alternative for dredged sediments from the San Francisco Bay.

8.4.1 Land Use

Allowing tidal wetlands to be restored in diked Bayland areas has little impact on the potential for water-related industrial development in these areas because of the strong constraints posed by existing non-tidal wetland functions and values, and the associated regulatory constraints on development. For example, based on numerous constraints to the development of the Project site, including existing biological resources and lack of infrastructure, it is not reasonably foreseeable that the site would be developed as a port and water-related industrial use. The potential cumulative impact on agriculture associated with restoring tidal wetlands on diked Baylands is considered less than significant because of the abundance of agricultural land in the region and the fact that the areas best suited for tidal restoration are unlikely to support highly productive agriculture, and vice versa.

8.4.2 Biological Resources

Use of dredged material for wetland restoration projects throughout the Bay Area will have net beneficial cumulative impacts by reducing the extent of aquatic disposal of dredged sediments. To the extent that site-specific project implementation is successful, regional wetland resources would benefit.

Allowing wetlands to be restored in shoreline areas could cumulatively increase and enhance the existing wildlife and wetland habitat areas of the San Francisco Bay. The development of wetland restoration projects throughout the San Francisco Bay Area has the potential to increase significantly tidal wetland habitat that has been substantially diminished over the last 100 years. If successful, tidal marsh restoration projects would provide habitat for numerous threatened and endangered and special status plant, fish, and wildlife species. In many diked baylands, there are ecologically valuable seasonal wetlands that could be converted to tidal wetlands. The significance of replacing these seasonal wetlands with tidal and seasonal wetlands is subject to analysis and, where appropriate, mitigation, on a site- and project-specific basis. Adverse cumulative impacts on seasonal wetlands are unlikely given agencies' permitting responsibilities recognition of the importance of seasonal wetlands (e.g., LTMS 1998).

Assuming that project approvals for the use of cover and non-cover sediment in wetland restoration are, like Montezuma, conditional upon the effective containment of pollutants, there is little potential for wetland restoration projects to cause a cumulative increase in pollutant levels to which biota of the estuary are exposed. Contaminants that are associated with dredged channel sediments would be re-distributed into wetland restoration sites, but the level of containment associated with these types of projects is probably at least as good as what exists in unconfined channel sediments. As sediment testing data and results from regional monitoring and wetland restoration projects accumulate, the behavior and effects of contaminants in the estuary will become better understood. As a result, cumulative impacts are more likely to be beneficial than adverse.

8.4.3 Air Quality

The Project would generate reactive organic gases (ROG) and oxides of nitrogen (NO_x) during operation (sediment placement), exceeding local and federal air quality standards. These impacts could be even more significant if combined with other dredging and filling operations around the San Francisco Bay.

8.4.4 Recreation and Visual Resources

Although several other marsh restoration projects are proposed in the San Francisco Bay Area, they are not expected to affect significantly recreation or visual resources. Infrequent recreational fishing and bird

watching occurs in these areas, but most of the sites are not used or leased for recreational hunting. The cumulative development of wetland restoration and dredged material disposal projects in the Bay Area would increase the amount of associated industrial equipment adjacent to the Bay. These visual elements would generally alter the natural setting of the restoration sites during project implementation and wetland restoration. However, the long-term visual quality of the shoreline environment could be improved, if the restoration projects are successful, by providing significant wildlife viewing opportunities.

8.4.5 Population, Housing, and Employment

The relatively small number of construction and operation personnel who would be employed by wetland restoration projects would be a very small percentage of the total population of the Bay Area. Although several dredged material disposal projects have been proposed around the Bay, the number of employees is so small in each project and the projects are so dispersed that no significant regional or local City or County impacts on population, housing, or employment are anticipated. If wetlands restoration projects are located in areas designated for housing development, however, the removal of this land for housing could have regional impacts on housing supply and the jobs/housing balance of local jurisdictions.

If Bay dredging projects are facilitated by upland disposal and marsh restoration opportunities, port development and expansion projects could increase and result in increased employment at the local and regional level.

8.5 Conclusion Regarding Alternatives to the Proposed Project

In Chapter 7, comparisons were made among the alternatives to the Proposed Project, leading to the conclusion that (1) the Proposed Project and Alternative 4 (Hamilton) are environmentally preferable to the other alternatives; and that (2) between the Montezuma site and the Hamilton site, neither is a clearcut Environmentally Preferred Alternative. Each site offers different intrinsic environmental advantages and disadvantages. The latter, however, can be largely overcome by EIR/S mitigation measures, resulting in a fully mitigated, beneficial project at either location.

Chapter 7 did not consider the logistical or "practicability" issues for the Applicant that would be associated with an alternative project location at Hamilton. In particular, the Proposed Montezuma Wetlands Project is a commercial venture that would be supported in part by sales from its rehandling facility. Without this commercial element of the project, the Applicant would have to raise the tariff for sediment disposal in order to support the costs of tidal restoration, including the investment in lead agency reviews, permitting, mitigation, and monitoring requirements. Without commercial rehandling, a higher tariff would make the project a less competitive alternative disposal site for dredging projects.

The bulk of the demand for rehandled sediments is in the Delta, for levee rehabilitation. The Hamilton site has significant constraints to the development of a commercially viable sediment rehandling facility that would serve this demand. The first is that the site does not have access to an abundant supply of low-salinity ground- or surface water that would enable the sediments to be rinsed to reduce salinity prior to transport and use in the Delta. The second is the lack of deepwater access to the site, which would prevent barges from picking up and transporting sediment from the site to the Delta. Assuming the demand for sediments would justify the costs of transport, sediments would have to be transported from the site by truck, which would have substantial effects on air quality and traffic.

The above considerations support the selection of the Proposed Project, including all EIR/S mitigation measures, as the lead agencies' preferred alternative that would best achieve the Project's purpose and need.

Chapter 9
REPORT PREPARATION

■ ■ ■

9.1 Report Preparers

This Final EIR/EIS has been prepared by Science Applications International Corporation and its subcontractors. The Draft EIR/EIS was prepared by Brady and Associates, Inc. and its subcontractors. The report preparers for the Final and the Draft EIR/EIS are listed separately below; subcontractors are listed in alphabetical order.

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Chapter 10
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Chapter 11
GLOSSARY

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11.1 Terms

alkaline: Of or containing any of the various bases that neutralize acids to form salts. Alkali soil is soil that has either a high degree of alkalinity or a high percentage of sodium.

anaerobic: Pertaining to or caused by the absence of oxygen. Applies to organisms for whose life processes a complete or nearly complete absence of oxygen is essential.

anaerobic decomposition: The incomplete breakdown of organic material in the absence of oxygen.

annual: For plants, growing anew from seed each year.

basin: In hydrology, an area which drains through a single point (synonym: watershed).

benthic: The adjective form of *benthos*, a collective term referring to the sedentary animal and plant life living on the sea bottom.

bioassay: Determination of the biological activity or potency of a substance, such as a vitamin or hormone, by testing its effect on the growth of an organism.

brackish water: A mixture of fresh and salt water.

buffer: A strip of land intended to protect one type of land use from another with which it is incompatible.

carbon monoxide: Carbon monoxide is an odorless, invisible gas usually formed as the result of incomplete combustion of organic substances. About 78 percent of the carbon monoxide emitted in the San Francisco Bay area comes from motor vehicles. High levels of carbon monoxide can impair the transport of oxygen in the bloodstream, thereby aggravating cardiovascular disease and causing fatigue, headaches, and dizziness.

cation: A positively charged ion, atom, or particle.

cation exchange: A measure of the soil or sediment capability to absorb cations (positively charged particles) such as iron or copper.

colloid: A substance that when dissolved in a liquid will not diffuse readily through vegetative or animal membranes. Suspensions in which the particles of suspended liquid or solid are present in very finely divided form. Unlike ordinary suspensions, colloids do not settle because of their exceedingly high ratio of surface area to volume.

contaminants: A material that renders something inpure, unsuitable, or unclean. Can be related to chemicals or waste products (synonym: pollutant).

decant water: The residual water from *decanting* water, or from gently pouring or separating water from sediments.

dBA: Decibel scale that has been adjusted for sensitivity of the human ear.

decibel: Unit of measurement for the loudness of sound based on the pressure produced in air by a noise; denoted dB.

desiccation: The drying or disappearance of water from land areas.

draft: The depth to which a vessel is immersed when bearing a given load.

dredged materials: The silt-like deposits removed by a dredge from the bottom of water bodies.

ecotone: The transition zone between two different plant communities, as that between a forest and a prairie.

erosion: The process by which material is removed from the earth's surface, generally through the force of water or wind.

elutriation: A process of washing, decantation and settling which separates a suspension of a finely divided solid into parts according to their weight.

emergent vegetation: Vegetation which grows above the level of the water.

entrapment zone: The area in which freshwater mixes with salt water to form brackish water. Also referred to as *null zone*.

estuary: The part of the mouth or lower course of a river in which the river's current meets the sea's tide. An arm or inlet of the sea at the lower end of a river.

expansive: Having the inclination to expand. Soils are considered to be expansive if they increase in volume as a result of saturation with water.

extreme high water: Extreme high water (EHW) is the highest level that tides reach during the year and marks the upper edge of the intertidal zone. EHW occurs during spring tides at full and new moons.

extreme low water: Extreme low water (ELW) is the lowest tide level that occurs during the year. ELW occurs during spring tides at full and new moons. ELW marks the lowest extent of surface exposure and can be used to distinguish the intertidal zone from the subtidal zone.

flood plain: The channel and the adjoining area of a natural stream or river which is susceptible to flooding.

flow: A liquid-like landslide which conforms to the ground surface.

geotextile: Any permeable textile used with foundations, soil, rock or any other geotechnical materials as an integral part of a man-made structure or system.

groundwater: The supply of freshwater which is under the earth's surface in an aquifer or soil and which forms the natural reservoir for potable water.

habitat: The environment with which an organism interacts and from which it gains its resources; habitat is often variable in size, content, and location, changing with the phases in an organism's life cycle.

halophytic; halophyte: A plant that grows in salty or alkaline soil.

hydric: Characterized by or requiring a large amount of water.

hydroperiod: The time period during which marshland is inundated by tidal water or rain.

hydrophyte: A plant or organism which requires a large amount of water, growing directly in the water or in very moist ground.

infiltration: The flow of a fluid into a substance through pores or small openings.

ion exchange: A reversible chemical reaction between a solid (ion exchanger) and an aqueous solution by which ions are interchanged. *Cation exchange* is sometimes used as the measure of a soil or sediment to absorb positively charged ions (cations) such as those of iron or copper.

lead agency: The public agency which has principal responsibility for carrying out or approving a project. The lead agency is also responsible for preparing and certifying an adequate EIR/EIS.

lift: For the particular project, layers of sediment placed within project cells.

liquefaction: The process of becoming liquid or acting like a liquid. Some soils can liquify during earthquakes and move as though they were liquids, causing failure of structures built on them.

managed wetlands: Wetlands that are "managed" through the use of dikes, levees, and tidal gates. Tidal waters are controlled and allowed to enter and flood the wetland areas on a specific schedule. These management practices are controlled to encourage specific types of vegetation. A managed wetland can generate very specific food production for waterfowl, while maintaining diverse marsh flora.

mean high water: Mean high water (MHW) is the average level of all high tides. MHW is approximately the position given for shorelines on USGS maps.

mean higher high water: Mean higher water (MHHW) is the average level of the higher of the two daily high tides.

mean low water: Mean low water (MLW) is the average level of all low tides.

mean lower low water: Mean lower low water (MLLW) is the average level of the lower of the two daily low tides. MLLW is often used as the reference datum for measuring tide levels and is also the datum from which depths are measured on USGS topographic maps.

mean tide level: Mean tide level (MTL) is the elevation halfway between MLW and MHW. MTL is similar in elevation, but not identical to mean sea level (MSL). MSL is the average level of water for all tide stages determined from hourly readings. MTL and MSL should not be confused with the NGVD, the standard land elevation reference datum used on USGS topographic maps and based on 1983 data from across North America.

metal: Any element yielding positively charged ions in aqueous solutions of its salts; an alloy or mixture composed wholly or partly of such substances. A common water quality pollutant.

metalloid: A chemical element having both metallic and nonmetallic properties. This term is sometimes using to describe a non-metal.

mitigation: Actions, improvements, features, modifications or requirements intended to eliminate or reduce the adverse environmental effects.

moor: To secure a ship or barge in a particular place.

mooring dolphins: Facilities used to secure a ship or barge in a particular place.

mudwaves: Boils of material which are raised as a result of placement of heavy material in an adjacent location.

nitrogen dioxide: Nitrogen dioxide is the "whiskey brown" colored gas readily visible during periods of heavy air pollution. The major sources of nitrogen dioxide are vehicular, residential, and industrial combustion.

null zone: The area in which freshwater mixes with salt water to form brackish water. Also referred to as *entrapment zone*.

osmoregulation: The physiological control of water and salt balance in an organism.

ozone: Ozone is the most prevalent class of photochemical oxidants formed in the urban atmosphere. Ozone is not emitted directly into the atmosphere, but is a secondary air pollutant produced in a stable atmosphere with strong sunlight, through a complex series of photochemical reactions involving hydrocarbons and nitrogen oxides. Motor vehicles are the major source of ozone precursors in the San Francisco Bay Area. Ozone causes eye and respiratory irritation, reduces resistance to lung infection, and may aggravate pulmonary conditions in persons with lung disease. Ozone also damaged some materials such as rubber, and may damage plants and crops.

outboard: Located on the exterior of a given object; for the particular project, located on the exterior of a levee.

outcrop: A place where bedrock or an unconsolidated deposit is exposed at the surface of the ground.

palustrine (paludal): Pertaining to marshes.

particulate matter: Very small particles of certain substances, such as sulfates and nitrates, can cause lung damage directly, or can contain absorbed gases, such as chlorides or ammonium, that may be injurious to health. The largest sources of particulate matter include demolition and construction activities, and road dust from vehicular traffic. Agricultural operations such as soil preparation, planting, and harvesting of dry crops also produce dust containing particulate matter. The effects of high concentration on humans include aggravation of chronic disease and heart/lung disease symptoms. Non-health effects include reduced visibility and soiling of surfaces.

perennial: For streams, present during all seasons of the year (opposite of ephemeral). For plants, regenerating year after year from persistant roots or stems.

permeability: For soils, the ability to allow water to pass through, thereby

lowering surface runoff.

pH: A measurement of acidity. The pH values in soils influence what type of plants will thrive. Some plants require more acid soil than others (lower pH). Marsh plants favor soils that are less acidic (higher pH values).

pore water: Water which is within or absorbed into other materials. For the project in particular, water contained in dredged materials prior to slurrying or disposal.

redox: Reduction-oxidation processes involving the exchange of electrons; reduction being the acceptance of electrons, oxidation being the loss of electrons. Oxygen is the strongest common electron acceptor and, when it is present, is typically reduced, while other substances are oxidized. When oxygen is lacking, redox yields less energy, and other substances, e.g., metals, are likely to be reduced and often become more toxic or reactive.

riprap: Rubble such as broken concrete and rock placed on a surface to stabilize it and reduce erosion.

root zone: The portion of the soil profile occupied by plant roots.

runoff: Water from a storm which runs off a site and into local watercourses or the local storm drainage system.

salinity: The level of salt concentration.

scenic quality: The general impression that an individual retains after being in an area.

scour: Action of a stream or channel which has the ability to erode or clear debris and silt out of an area.

screening criteria: A set of criteria used to determine what and where concentrations of contaminants are acceptable. These criteria are developed and used by agencies such as the Corps of Engineers and the Regional Water Quality Control Board, specifically for determining acceptable levels of contaminants in dredged materials for beneficial reuse projects. (See Chapter 2 of this report).

seasonal wetlands: Wetlands which are wet in winter and spring or early summer, and are dry in summer to early fall. They are distinct from tidal wetlands, which are subject to periodic ebb and flow of tidal waters rather than seasonal rainfall.

sediment: The matter, usually finely divided particles, that settles to the bottom of a body of water.

sediment sink: A coastal environment that favors the massive accumulation of sediment.

sedimentation: The settling of finely divided solid particles from a liquid.

slope failure: A slope that is unable to maintain itself and fails by mass movement such as a landslide, slump, or similar movement.

slurry: A suspension of a solid in a liquid. For the proposed project, mixing sediment with groundwater or pond water.

shrink-swell potential: A soil's ability to change its volume as a result of saturation. See also *expansive*.

substrate: The base on which an organism lives, generally the soil and its cover.

sump: A pit, well, or the like, in which water or other liquid is collected.

supernatant: Floating on or above the surface.

tidal: Of or pertaining to the periodic rise and fall of the waters of the ocean and its inlets.

tidal datum: A curved surface representing one phase of a tide taken as a

datum level.

tidal marsh: An area of low wetland periodically and naturally inundated by

tidal waters.

tidal prism: A volume of water exchanged over a tidal cycle.

tidal regime: The alternate inflow and outflow of tidal waters as modified by local shoreline configurations.

Transfer of Development Rights (TDR): When development rights are separated from the land in an area in which a community wishes to limit development.

trophic: Of or pertaining to nutrition.

turbidity: A measure of the clearness or transparency of water as a function of suspended sediment.

viewer response: A combination of viewer exposure and viewer sensitivity. Viewer response varies with the distance of the views, the number of viewers, the views seen, and the viewer duration, while viewer sensitivity relates to the degree of the public's concern for certain views.

visual character: The visual character of a landscape is formed by the order of patterns composing it; the visual elements of these patterns are form, line, color, and texture.

vernal pool: A pool which appears only during rainy seasons and which supports animals and vegetation specialized to this type of environment.

watershed: Technically, the dividing line between two basins, this term is now used interchangeably with *basin* to denote a single area which drains to a particular stream or body of water.

weir: A small dam in a river, stream, or channel.

wetland: A term generally applied to an area where the ground is permanently wet or wet most of the year and is occupied by water-loving or tolerant vegetation.

wick drains: A geotextile membrane that can be installed in the ground that "wicks" (draws) water up to the surface. The water is then used in project operations, conveyed off-site, or it evaporates.

wind fetch: An area where ocean or water body waves are being generated by the wind.

xeric: Characterized by or requiring a small amount of moisture.

11.2 Acronyms

APCD	Air Pollution Control District
AQMD	Air Quality Management District
AM	After midnight
ARB	Air Resources Board
BAAQMD	Bay Area Air Quality Management District
BCDC	San Francisco Bay Conservation and Development Commission
BFC	Bayfront Conservation Zone
BMK	Bel Marin Keys
CAA	Clean Air Act
CAP	Clean Air Plan
CDFG	California Department of Fish and Game
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
cfs	Cubic feet per second
cm	Centimeter
CO	Carbon monoxide
Corps	U.S. Army Corps of Engineers
dB	Decibel
dBA	A-weighted decibel
DDT	Dichloro-diphenyl-tricholoro-ethane
DWR	Department of Water Resources
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
FEMA	Federal Emergency Management Agency
FONSI	Finding of No Significant Impact
FWS	U.S. Fish and Wildlife Service
F-1	Primary Floodway
F-2	Secondary Floodway
HAAF	Hamilton Army Airfield
HC	Hydrocarbons
Ldn	Day-night equivalent noise level
Leq	Energy equivalent noise level
LOS	Level of Service
LPP	Suisun Marsh Local Protection Program
LS	Less Than Significant
LTMS	Long-Term Management Strategy
MCL	Maximum Contamination Level
MHHW	Mean Higher High Water
MHW	Mean High Water
MLLW	Mean Lower Low Water
MLW	Mean Low Water
MSCS	Montezuma Salinity Control Structure

MTC	Metropolitan Transportation Commission
MTL/MSL	Mean Tide Level/Mean Sea Level
NA	Not Applicable
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NGVD	National Geodetic Vertical Datum
NMFS	National Marine Fisheries Service
NO_2	Nitrogen Dioxide
No_x	Nitrogen Oxide
NPDES	National Pollution Discharge Elimination System
O_3	Ozone
PAH	Polyaromatic hydrocarbons
PC	Planned Community
PCB	Polychlorinated biphenyls
pH	Hydrogen power
PM	Before midnight
PM_{10}	Particulate matter smaller than 10 microns in diameter
POL	Petroleum, oil and lubrication point
ppt	Parts per thousand
RASP	Regional Airport System Plan
RSP	Residential Single-Family Planned
RTP	Regional Transportation Plan
RWQCB	Regional Water Quality Control Board
S	Significant
SCMAD	Solano County Mosquito Abatement District
SFRWQCB	San Francisco Regional Water Quality Control Board
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SMHM	Salt Marsh Harvest Mouse
SO_2	Sulfur dioxide
SU	Significant Unavoidable
SWRCQ	State Water Regional Control Board
TOS	Total Dissolved Solids
TSS	Total Suspended Soils
USCG	U.S. Coast Guard
USFWS	U.S. Fish and Wildlife Service
WQOL	Water Quality Objective Limits