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Final

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Hamilton Wetland Restoration Plan

Volume II: EIR/EIS

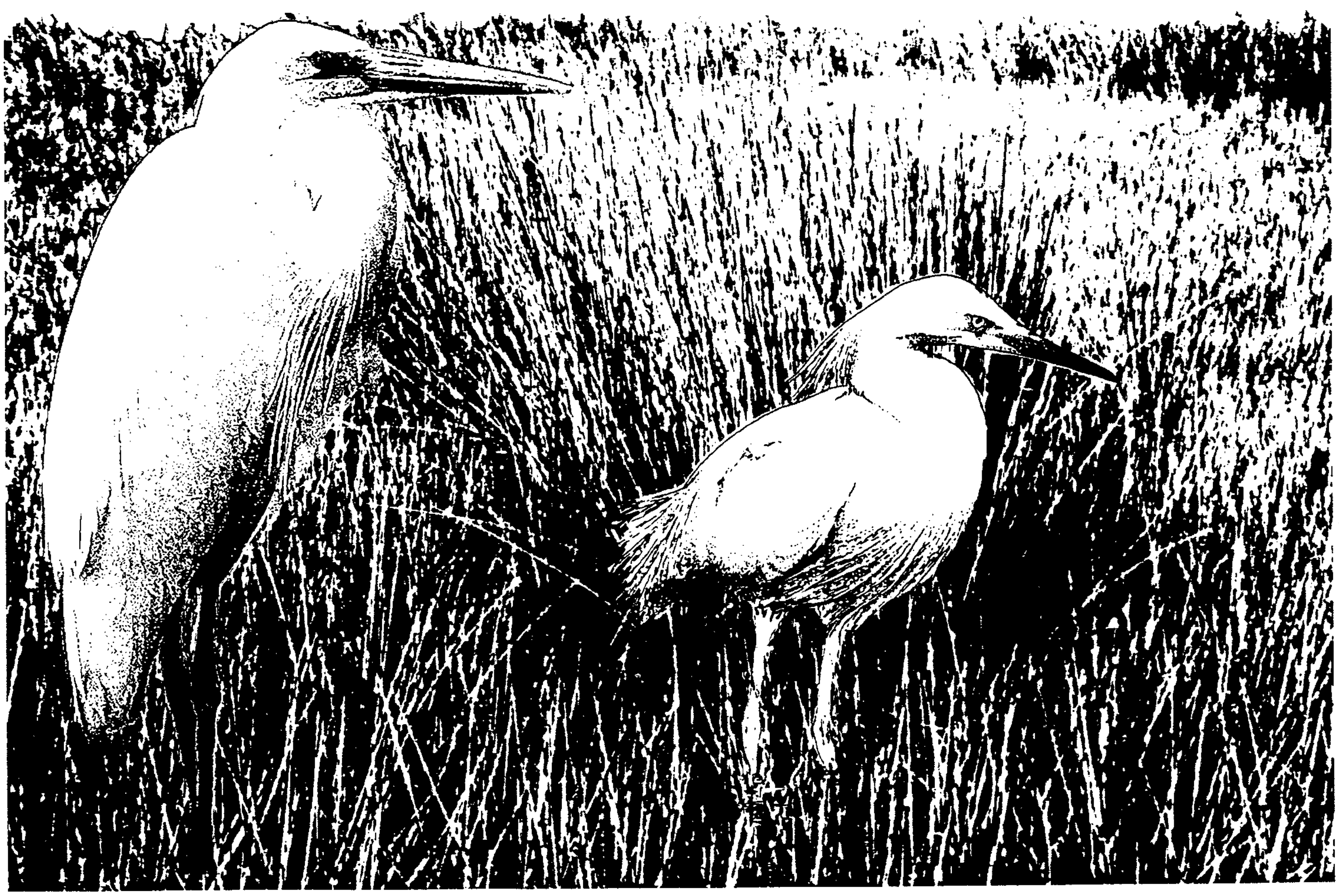
Lead Agencies:

California State Coastal Conservancy

and

U.S. Army Corps of Engineers
San Francisco District

December 1998



HAMILTON WETLAND RESTORATION PLAN

VOLUME II: FINAL EIR/EIS

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Summary

Introduction

The California State Coastal Conservancy (Coastal Conservancy), the San Francisco Bay Conservation and Development Commission (BCDC), and the U.S. Army Corps of Engineers (Corps) are proposing to restore ~~tidal salt marsh~~ wetland habitat at Hamilton Army Airfield (HAAF) and the adjacent California State Lands Commission (SLC) parcel. Approximately 90% of the original tidal wetlands of San Francisco Bay have been destroyed, and this loss has greatly reduced the amount of habitat available to many species of fish and wildlife and has contributed to the listing of several species as endangered. The proposed project ties in or implements many plans or other actions:

- Defense Base Closure and Realignment Act of 1988 (BRAC),
- City of Novato General Plan,
- Hamilton Army Airfield Reuse Plan,
- San Francisco Bay Plan,
- San Francisco Estuary Baylands Ecosystem Goals Project,
- San Francisco Estuary Project Comprehensive Conservation and Management Plan,
- Long-Term Management Strategy for Disposal of Dredged Sediments in San Francisco Bay,
- CALFED Ecosystem Restoration Plan, and
- Oakland Harbor Navigation Improvement (50-Foot) Project.

These plans are described more fully in Chapter 2, "Purpose of and Need for the Hamilton Wetland Restoration Plan", of the environmental impact report/environmental impact statement (EIR/EIS).

The EIR/EIS evaluates the environmental impacts of restoring wetlands on the HAAF and SLC parcels as described in the draft Hamilton Wetlands Conceptual Restoration Plan.

Proposed Action

Project Objectives

The project purpose and need are fully described in Chapter 2. The goal of the Hamilton Wetland Restoration Project is to create a diverse array of wetlands and fish and wildlife habitats that would benefit endangered species as well as other migratory and resident species. Project objectives developed for the project include:

- to design and engineer a restoration project that stresses simplicity and has little need for active management;
- to demonstrate the beneficial use of dredged material, if feasible;
- to recognize existing opportunities and constraints, including the runway and remediation of contaminated areas, as integral components of design;
- to ensure no net loss of wetland habitat presently provided at the HAAF site;
- to create and maintain wetland habitats that sustain viable wildlife populations, and, in particular, Bay Area special-status species;
- to include buffer areas along the upland perimeter of the project area, particularly adjacent to residential areas, so that wildlife will not be impacted by adjacent land uses;
- to be compatible with adjacent land uses and wildlife habitats; and
- to provide for public access that is compatible with protection of resource values and regional local public access policies.

Alternatives

The project objectives could be attained by restoring wetlands either through the process of natural sedimentation or by actively placing dredged material on the site. Four wetland restoration alternatives are evaluated in the EIR/EIS. These alternatives include restoration of wetlands in the following areas by the following means:

- HAAF parcel by natural sedimentation (Alternative 2),
- HAAF parcel using dredged material (Alternative 3),
- HAAF and SLC parcels by natural sedimentation (Alternative 4), and
- HAAF and SLC parcels using dredged material (Alternative 5).

In addition, the No-Action Alternative (Alternative 1) is described in the EIR/EIS, serving as a baseline condition from which to evaluate environmental impacts of the four project alternatives.

The Preferred Alternative

The four project alternatives have been evaluated at an equal level of detail. Coastal Conservancy staff and the Corps have selected Alternative 5 as their preferred alternative because it best meets the project goal and objectives and provides greater diversity of habitat. Under Alternative 5, the use of dredge material would reduce the amount of time necessary for the restored wetlands to become fully functional, the use of dredged material for restoration would help reduce the amount of dredge material that could be disposed of in the bay or the ocean, and the alternative has lower maintenance requirements than alternatives that do not rely on dredged material.

Site Preparation and Wetland Construction

All of the alternatives assume that contaminants will be ~~removed from the site~~ remediated to allow wetland creation and that the current flooding and drainage issues will be resolved by the Army before the site is transferred to the Coastal Conservancy.

All four alternatives involve creating a variety of habitats, including salt marsh, seasonal wetlands, and intertidal and subtidal channels. Only those alternatives using dredged material would involve the creation of tidal pannes. The development of the alternatives involve:

- relocating and modifying Novato Sanitary District facilities,
- constructing levees and internal peninsulas,
- lowering and breaching the bayward levee, and
- public access.

Alternatives using dredged material (Alternatives 3 and 5) would also require the use of ~~a~~ hydraulic off-loaders and piping to transport the dredged material to the site during construction. Alternatives not using dredged material (Alternatives 2 and 4) would require the construction of a cross-panhandle levee to separate the tidal wetland from the seasonal wetlands.

Environmental Consequences

The EIR/EIS evaluates the environmental consequences of the alternatives. A summary of the impact analysis for these alternatives is presented at the end of this chapter

(Table S-1). In addition, the California Environmental Quality Act and the National Environmental Policy Act require a review of other issues, which are summarized below.

Significant Unavoidable Effects

Neither the preferred alternative nor any other alternative would result in a significant impact that could not be mitigated to a less-than-significant level.

Irreversible and Irretrievable Commitment of Resources

The proposed project would result in the irretrievable commitment of fossil fuels and other energy sources needed to build, operate, and maintain the wetlands. The restoration of the site to wetlands, however, is not considered an irreversible commitment because the landscape could once again be converted to other land uses in the future, even after restoration; in other words, the project does not involve converting the land to urban land uses, which tend to be irreversible.

Relationship between Short-Term Uses of the Environment and the Maintenance and Enhancement of Long-Term Productivity

Short-term uses of the environment that would occur with restoration include the impacts on existing wetlands and habitat. However, in the long term, the site is expected to be substantially more productive for habitat and fish and wildlife values.

Selection of the Preferred Alternative

The Coastal Conservancy and the Corps have selected Alternative 5, Restoration of Wetlands in the HAAF and SLC Parcels Using Dredged Material, as the preferred alternative. This alternative was selected because it would best meet all the project objectives of:

- creating a wetland restoration project that emphasizes simplicity and has little need for active management;
- using dredged material in a beneficial manner;

- recognizing existing site opportunities and constraints and incorporating them into site design;
- providing for no net loss of wetland habitat functions currently provided at the HAAF site;
- creating and maintaining wetland habitats that sustain viable fish and wildlife populations, particularly for Bay Area special-status species;
- providing buffer areas so that wildlife would not be adversely affected by adjacent land uses;
- ensuring compatibility of fish and wildlife habitats and adjacent land uses; and
- providing for public access compatible with protection of resource values.

The following provides a comparative discussion of how the restoration project alternatives would meet the project objectives and why Alternative 5 would best meet these objectives.

Management Considerations

Alternatives 2 and 4 would include a cross panhandle levee with gated culverts to protect upland areas from inundation. A cross panhandle levee would not be needed under Alternative 3 or 5 because raising the surface elevation of the panhandle area would protect the area from tidal inundation. Because a cross panhandle levee and gated culverts would need to be periodically inspected and possibly maintained and repaired, management costs would be greater under Alternative 2 or 4 than under Alternative 3 or 5.

Beneficial Use of Dredged Material

Alternative 5 would use the greatest amount of dredged material of the four alternatives. Restoration of wetlands under Alternatives 2 and 4 is based on the process of natural sedimentation and would not require the use dredged material. Both Alternatives 3 and 5 would be created through the use of dredged material. Alternative 5 would allow the greatest use of dredged material because it is approximately 280 acres larger than Alternative 3. This larger acreage would allow up to ~~8.4~~ 10.6 million cubic yards of dredged material to be placed on Alternative 5 compared to ~~7.5~~ 7.1 million cubic yards of material placed under Alternative 3.

Site Opportunities and Constraints

Site opportunities and constraints were recognized in the site design for all alternatives.

No Net Loss of Habitat Functions

Because all alternatives would result in the restoration of wetlands and associated habitat functions, no net loss of habitat functions would occur under Alternative 2, 3, 4, or 5.

Creation and Maintenance of Wetland Habitats

Alternatives 4 and 5 would provide the greatest acreage of wetland habitat types of the four alternatives because of the addition of the 280-acre SLC parcel. Although Alternative 4 would provide a slightly greater diversity in habitat types (perennial hypersaline ponds and perennial brackish ponds), Alternative 5 would include a substantial acreage of tidal pannes, not a component of Alternative 4. Habitat types created under both alternatives are subtidal channel/open water, intertidal channel/mudflat, coastal salt marsh, tidal ponds, seasonal wetlands/ponds, perennial emergent marsh, and grassland.

An important advantage of Alternative 5 over Alternative 4 is that it requires less time before the habitat types would be created and associated benefits to wildlife would begin to occur. Figures 3-5a, 3-5b, and 3-5c graphically depict these changes. The largest habitat type, coastal salt marsh, would develop more quickly under Alternative 5 than under ~~any of the other alternatives~~ Alternatives 2 and 4. In addition, the largest acreage of habitat important for special-status species would ~~restore~~ be restored faster under Alternative 5 than under Alternative 2, 3, or 4.

Buffers between Wildlife and Adjacent Land Uses

Alternatives 2~~, 3,~~ and 4~~, and 5~~ do not provide equal buffers between the restored wetlands and adjacent land uses. Alternatives 3 and 5 provide buffers and wildlife corridors along the New Hamilton Partnership levee.

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Compatibility with Adjacent Land Uses and Wildlife Habitats

Land uses adjacent to the wetland restoration site include residential development, open space, and agricultural land. As indicated in this EIR/EIS, all alternatives would be considered compatible with existing land uses. Alternatives 4 and 5 would enhance compatibility because the NSD dechlorination plant would be moved off the restoration site.

Public Access Compatible with Protection of Resource Values

Public access to the wetland restoration site would be the same under all alternatives. Generally, this access would be limited to the western edge of the restoration site. All alternatives would protect the resource values created as a result of wetland restoration.

Table S-1.
Summary of Impacts and Mitigation Measures for Alternatives 2, 3, 4, and 5

Impact	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Geology and Soils				
4.2 Settlement of soils from fill loads for levees and sedimentation	LTS	LTS	LTS	LTS
4.3 Potential levee slope failure resulting from low strength of underlying bay mud	LTS	LTS	LTS	LTS
4.4 Potential seepage through or under the levee from materials placed on the bay side of the levee	LTS	LTS	LTS	LTS
4.5 Potential exposure of sensitive wetlands and levees to seismic hazards	LTS	LTS	LTS	LTS
4.6 Settlement of soils from fill loads for levees, sedimentation, and dredged material	--	S - MM4.6 Limit the height of dredged material placed against New Hamilton Partnership levee to 4 feet	--	S - MM4.6 Limit the height of dredged material placed against New Hamilton Partnership levee to 4 feet
4.7 Potential for levee failure resulting from low strength of underlying bay mud	--	LTS	--	LTS
Surface Water Hydrology and Water Quality				
5.1 Loss of drainage capacity from New Hamilton Partnership development	S - MM5.1 Provide allowance for drainage similar to design specified for New Hamilton Partnership east outfall	S - MM5.1 Provide allowance for drainage similar to design specified for New Hamilton Partnership east outfall	S - MM5.1 Provide allowance for drainage similar to design specified for New Hamilton Partnership east outfall	S - MM5.1 Provide allowance for drainage similar to design specified for New Hamilton Partnership east outfall
5.2 Potential exceedance of water quality objectives	LTS	LTS	LTS	LTS

Note: B = beneficial; LTS = less than significant; S = significant before mitigation, which would result in a less-than-significant impact. MM = mitigation measure. -- = no impact. Impacts that would occur only under Alternative 1: No Action are not included in this table.

Alternative 2: Restoration of wetlands in the HAAF parcel through natural sedimentation, Alternative 3: Restoration of wetlands in the HAAF parcel using dredged material, Alternative 4: Restoration of wetlands in the HAAF and SLC parcels through natural sedimentation, Alternative 5: Restoration of wetlands in the HAAF and SLC parcels using dredged material.

Impact	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Surface Water Hydrology and Water Quality (continued)				
5.3 Potential for degradation of water quality in restored wetlands	LTS	LTS	LTS	LTS
5.4 Potential degradation of groundwater quality	LTS	LTS	LTS	LTS
5.5 Potential degradation of surface water quality	--	LTS	--	--
5.6 Potential degradation of surface water quality	--	--	--	LTS
Tidal Hydraulics				
6.1 Modification to circulation in San Pablo Bay	LTS	LTS	LTS	LTS
6.2 Modification to sedimentation processes and morphology in San Pablo Bay	LTS	LTS	LTS	LTS
6.3 Changes in circulation and morphologic evolution in tidal wetland	S - MM6.3 Ensure adequate tidal exchange and develop and implement a monitoring program to assess project evolution	S - MM6.3 Ensure adequate tidal exchange and develop and implement a monitoring program to assess project evolution	S - MM6.3 Ensure adequate tidal exchange and develop and implement a monitoring program to assess project evolution	S - MM6.3 Ensure adequate tidal exchange and develop and implement a monitoring program to assess project evolution
6.4 Inception of or increase in outboard marsh shoreline erosion	LTS	LTS	LTS	LTS
6.5 Excessive or unexpected erosion of perimeter levee	LTS	LTS	LTS	LTS

Note: B = beneficial; LTS = less than significant; S = significant before mitigation, which would result in a less-than-significant impact. MM = mitigation measure. -- = no impact. Impacts that would occur only under Alternative 1: No Action are not included in this table.

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Impact	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Public Health				
7.1 Increase of potential mosquito breeding habitat	S - MM7.1 Coordinate project activities with MSMAD	S - MM7.1 Coordinate project activities with MSMAD	S - MM7.1 Coordinate project activities with MSMAD	S - MM7.1 Coordinate project activities with MSMAD
Biological Resources				
8.2 Increase in subtidal aquatic habitat for resident and anadromous fish	B	--	B	--
8.3 Short-term loss of or disturbance to and long-term increase in intertidal mudflats	B	--	B	--
8.4 Loss of tidal coastal salt marsh	S - MM8.4 Monitor site development and implement actions to increase the rate of marsh development if required	--	S - MM8.4 Monitor site development and implement actions to increase the rate of marsh development if required	--
8.5 Loss of approximately 1.2 acres of brackish marsh	S - MM8.5 Monitor development of brackish marsh vegetation and implement actions to increase the area of brackish marsh if required	--	S - MM8.5 Monitor development of brackish marsh vegetation and implement actions to increase the area of brackish marsh if required	--

Note: B = beneficial; LTS = less than significant; S = significant before mitigation, which would result in a less-than-significant impact. MM = mitigation measure. -- = no impact. Impacts that would occur only under Alternative 1: No Action are not included in this table.

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Impact	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Biological Resources (continued)				
8.6 Temporary disturbance of approximately 2.9 acres of brackish marsh	S - MM8.6 Avoid or minimize temporary construction-related impacts on brackish marsh associated with Pacheco Pond	--	S - MM8.6 Avoid or minimize temporary construction-related impacts on brackish marsh associated with Pacheco pond	--
8.7 Loss of approximately 0.1 acre of seasonal wetlands	LTS	--	LTS	--
8.8 Conversion of or temporary disturbance to approximately 19.4 acres of seasonal wetlands	B	--	B	--
8.9 Loss of grassland	LTS short-term B long-term		LTS short-term B long-term	--
8.10 Temporary disturbance to California clapper rail and California black rail during construction	S - MM8.10 Avoid construction activities near occupied habitat during breeding periods	--	S - MM8.10 Avoid construction activities near occupied habitat during breeding periods	--
8.11 Temporary disturbance to northern harrier, burrowing owl, salt marsh common yellowthroat, and San Pablo song sparrow during construction	S - MM8.11 Conduct surveys to locate nest sites before construction is initiated	--	S - MM8.11 Conduct surveys to locate nest sites before construction is initiated	--
8.12 Potential for construction-related mortality of salt marsh harvest mice	S - MM8.12 Remove salt marsh harvest mice from the immediate vicinity of operating equipment	--	S - MM8.12 Remove salt marsh harvest mice from the immediate vicinity of operating equipment	--

Note: B = beneficial; LTS = less than significant; S = significant before mitigation, which would result in a less-than-significant impact. MM = mitigation measure. -- = no impact. Impacts that would occur only under Alternative 1: No Action are not included in this table.

Alternative 2: Restoration of wetlands in the HAAF parcel through natural sedimentation, Alternative 3: Restoration of wetlands in the HAAF parcel using dredged material, Alternative 4: Restoration of wetlands in the HAAF and SLC parcels through natural sedimentation, Alternative 5: Restoration of wetlands in the HAAF and SLC parcels using dredged material.

Impact	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Biological Resources (continued)				
8.13 Potential for construction-related mortality of California clapper rails and California black rails	S - MM8.13 Avoid operation of equipment in the outboard tidal marsh during breeding periods	--	S - MM8.13 Avoid operation of equipment in the outboard tidal marsh during breeding periods	--
8.14 Potential for mortality of San Pablo song sparrows	S - MM8.14 Conduct surveys to locate San Pablo song sparrow nest sites before construction is initiated	--	S - MM8.14 Conduct surveys to locate San Pablo song sparrow nest sites before construction is initiated	--
8.15 Potential for mortality of burrowing owls	S - MM8.15 Conduct surveys to locate burrowing owl nest sites before construction is initiated	--	S - MM8.15 Conduct surveys to locate burrowing owl nest sites before construction is initiated	--
8.16 Potential disturbance to or mortality of special-status species resulting from management and maintenance activities	S - MM8.16 Develop and implement a restoration management and maintenance program designed to minimize potential impacts on special-status species	--	S - MM8.16 Develop and implement a restoration management and maintenance program designed to minimize potential impacts on special-status species	--
8.17 Loss of habitat for California clapper rail, California black rail, salt marsh harvest mouse, and saltmarsh common yellowthroat	S - MM8.4 Monitor site development and implement actions to increase the rate of marsh development if required	--	S - MM8.4 Monitor site development and implement actions to increase the rate of marsh development if required	--
8.18 Loss of refugia for the California clapper rail, California black rail, and salt marsh harvest mouse	LTS	--	LTS	--

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Impact	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Biological Resources (continued)				
8.19 Loss of nesting habitat for the San Pablo song sparrow	S - MM8.4 Monitor site development and implement actions to increase the rate of marsh development if required	--	S - MM8.4 Monitor site development and implement actions to increase the rate of marsh development if required	--
	S - MM8.5 Monitor development of brackish marsh vegetation and implement actions to increase the area of brackish marsh if required	--	S - MM8.5 Monitor development of brackish marsh vegetation and implement actions to increase the area of brackish marsh if required	--
8.20 Loss of nesting habitat for the burrowing owl	LTS	--	LTS	--
8.21 Increase in suitable nesting habitat for the northern harrier	B	--	B	--
8.22 Increase in suitable habitat for the brown pelican and double-crested cormorant	B	--	B	--
8.23 Increase in suitable nesting habitat for resident waterfowl	B	--	B	--
8.24 Increase in suitable habitat for wintering waterfowl	B	--	B	--
8.25 Increase in suitable habitat for migratory shorebirds`	B	--	B	--
8.26 Increase in subtidal aquatic habitat for resident and anadromous fish	--	B	--	B

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Impact	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Biological Resources (continued)				
8.27 Short-term loss of or disturbance to and long-term increase in intertidal mudflats	--	B	--	B
8.28 Loss of tidal coastal salt marsh	--	S - MM8.4 Monitor site development and implement actions to increase the rate of marsh development if required	--	S - MM8.4 Monitor site development and implement actions to increase the rate of marsh development if required
8.29 Loss of approximately 1.2 acres of brackish marsh	--	S - MM8.5 Monitor development of brackish marsh vegetation and implement actions to increase the area of brackish marsh if required	--	S - MM8.5 Monitor development of brackish marsh vegetation and implement actions to increase the area of brackish marsh if required
8.30 Temporary disturbance of approximately 2.9 acres of brackish marsh	---	S - MM8.6 Avoid or minimize temporary construction-related impacts on brackish marsh associated with Pacheco Pond	--	S - MM8.6 Avoid or minimize temporary construction-related impacts on brackish marsh associated with Pacheco Pond
8.31 Loss of approximately 19.5 acres of seasonal wetlands	--	B	--	B
8.32 Loss of grassland	--	LTS	--	LTS
8.33 Temporary disturbance to the California clapper rail and California black rail during construction	--	S - MM8.10 Avoid construction activities near occupied habitat during breeding	--	S - MM8.10 Avoid construction activities near occupied habitat during breeding

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Impact	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Biological Resources (continued)				
8.34 Temporary disturbance to the northern harrier, burrowing owl, saltmarsh common yellowthroat, and San Pablo song sparrow during construction	--	S - MM8.11 Conduct surveys to locate nest sites before construction is initiated	--	S - MM8.11 Conduct surveys to locate nest sites before construction is initiated
8.35 Potential for construction-related mortality of chinook salmon, Central Valley steelhead, and longfin smelt	--	LTS	--	LTS
8.36 Potential for construction-related mortality of salt marsh harvest mice	--	S - MM8.12 Remove salt marsh harvest mice from the immediate vicinity of operating equipment	--	S - MM8.12 Remove salt marsh harvest mice from the immediate vicinity of operating equipment
8.37 Potential for construction-related mortality of California clapper rails and California black rails	--	S - MM8.37 Avoid operation of equipment in the outboard tidal marsh during the breeding period for the California clapper rail and California black rail	--	S - MM8.37 Avoid operation of equipment in the outboard tidal marsh during the breeding period for the California clapper rail and California black rail
8.38 Potential for mortality of San Pablo song sparrows	--	S - MM8.14 Conduct surveys to locate San Pablo song sparrow nest sites before construction is initiated	--	S - MM8.14 Conduct surveys to locate San Pablo song sparrow nest sites before construction is initiated
8.39 Potential for mortality of burrowing owls	--	S - MM8.15 Conduct surveys to locate burrowing owl nest sites before construction is initiated	--	S - MM8.15 Conduct surveys to locate burrowing owl nest sites before construction is initiated

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Impact	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Biological Resources (continued)				
8.40 Potential disturbance to or mortality of special-status species resulting from management and maintenance activities	--	S - MM8.16 Develop and implement a restoration management and maintenance program designed to minimize potential impacts on special-status species	--	S - MM8.16 Develop and implement a restoration management and maintenance program designed to minimize potential impacts on special-status species
8.41 Loss of habitat for California clapper rail, California black rail, salt marsh harvest mouse, and saltmarsh common yellowthroat	--	S - MM8.4 Monitor site development and implement actions to increase the rate of marsh development if required	--	S - MM8.4 Monitor site development and implement actions to increase the rate of marsh development if required
8.42 Loss of refugia for the California clapper rail, California black rail, and salt marsh harvest mouse	--	LTS	--	LTS
8.43 Loss of nesting habitat for the San Pablo song sparrow	--	S - MM8.4 Monitor site development and implement actions to increase the rate of marsh development if required	--	S - MM8.4 Monitor site development and implement actions to increase the rate of marsh development if required
	--	S - MM8.5 Monitor development of brackish marsh vegetation and implement actions to increase the area of brackish marsh if required	--	S - MM8.5 Monitor development of brackish marsh vegetation and implement actions to increase the area of brackish marsh if required
8.44 Loss of nesting habitat for the burrowing owl	--	LTS	--	LTS

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Impact	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Biological Resources (continued)				
8.45 Increase in suitable nesting habitat for the northern harrier	--	B	--	B
8.46 Increase in suitable habitat for the brown pelican and double-crested cormorant	--	B	--	B
8.47 Increase in suitable nesting habitat for resident waterfowl	--	B	--	B
8.48 Increase in suitable habitat for wintering waterfowl	--	B	--	B
8.49 Increase in suitable habitat for migratory shorebirds	--	B	--	B
8.50 Temporary disturbance of fish in San Pablo Bay during construction	--	LTS	--	LTS
Land Use and Public Utilities				
9.1 Consistency with Novato General Plan, San Francisco Bay Plan, and Hamilton Reuse Plan	LTS	LTS	LTS	LTS
9.2 Compatibility with Bay Trail alignment plans	LTS	LTS	LTS	LTS
9.3 Potential loss of maintenance access to NSD outfall pipeline	LTS	LTS	LTS	LTS
9.4 Compatibility with adjacent land uses	LTS	--	--	--
9.5 Compatibility with adjacent land uses	--	LTS	--	--
9.6 Increased light and glare	--	LTS	--	--

Note: B = beneficial; LTS = less than significant; S = significant before mitigation, which would result in a less-than-significant impact. MM = mitigation measure. -- = no impact. Impacts that would occur only under Alternative 1: No Action are not included in this table.

Alternative 2: Restoration of wetlands in the HAAF parcel through natural sedimentation, Alternative 3: Restoration of wetlands in the HAAF parcel using dredged material, Alternative 4: Restoration of wetlands in the HAAF and SLC parcels through natural sedimentation, Alternative 5: Restoration of wetlands in the HAAF and SLC parcels using dredged material.

Impact	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Land Use and Public Utilities (continued)				
9.7 Compatibility with adjacent land uses	--	--	LTS	--
9.8 Compatibility with adjacent land uses	--	--	--	LTS
9.9 Increased light and glare	--	--	--	LTS
Hazardous Substances, Waste, and Site Remediation				
10.1 Potential exposure of humans, plants, or wildlife to contaminants as a result of remediation activities for the proposed action	LTS	LTS	LTS	LTS
10.2 Potential exposure of humans, plants, or wildlife to hazardous chemicals contained in dredged material used as fill material	--	LTS	--	LTS
Transportation				
11.1 Change in LOS at important intersections and roadway segments during construction phase	LTS	LTS	LTS	LTS
11.2 Change in LOS at important intersections and roadway segments during operation phase	LTS	LTS	LTS	LTS
11.3 Disruption of vessel transportation in San Pablo Bay by hydraulic off-loaders and pipes during construction phase	--	LTS	--	LTS

Note: B = beneficial; LTS = less than significant; S = significant before mitigation, which would result in a less-than-significant impact. MM = mitigation measure. -- = no impact. Impacts that would occur only under Alternative 1: No Action are not included in this table.

Alternative 2: Restoration of wetlands in the HAAF parcel through natural sedimentation, Alternative 3: Restoration of wetlands in the HAAF parcel using dredged material, Alternative 4: Restoration of wetlands in the HAAF and SLC parcels through natural sedimentation, Alternative 5: Restoration of wetlands in the HAAF and SLC parcels using dredged material.

Impact	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Air Quality				
12.1 Construction-related emissions of PM10	S - MM12.1 Control PM10 emissions in accordance with BAAQMD standards	S - MM12.1 Control PM10 emissions in accordance with BAAQMD standards	S - MM12.1 Control PM10 emissions in accordance with BAAQMD standards	S - MM12.1 Control PM10 emissions in accordance with BAAQMD standards
12.2 Construction-related emissions of ozone precursors	LTS	LTS	LTS	LTS
Noise				
13.1 Potential increases in traffic noise levels	LTS	LTS	LTS	LTS
13.2 Temporary increases in noise levels to more than 60 dBA during construction	S - MM13.2 Employ noise-reducing construction practices	S - MM13.2 Employ noise-reducing construction practices	S - MM13.2 Employ noise-reducing construction practices	S - MM13.2 Employ noise-reducing construction practices
13.3 Increased noise from use of hydraulic off-loaders and supplemental booster pumps	--	LTS	--	LTS
Cultural Resources				
14.1 Potential disturbance of unknown resources on the SLC parcel	--	--	S - MM14.1 Avoid or document significant historic-period cultural resources S - MM14.2 Avoid or document significant prehistoric cultural resources	S - MM14.1 Avoid or document significant historic-period cultural resources S - MM14.2 Avoid or document significant prehistoric cultural resources

Note: B = beneficial; LTS = less than significant; S = significant before mitigation, which would result in a less-than-significant impact. MM = mitigation measure. -- = no impact. Impacts that would occur only under Alternative 1: No Action are not included in this table.

Alternative 2: Restoration of wetlands in the HAAF parcel through natural sedimentation, Alternative 3: Restoration of wetlands in the HAAF parcel using dredged material, Alternative 4: Restoration of wetlands in the HAAF and SLC parcels through natural sedimentation, Alternative 5: Restoration of wetlands in the HAAF and SLC parcels using dredged material.

Chapter I. Introduction

This chapter provides a brief overview of the Hamilton wetland restoration project, describes the environmental review requirements that must be met before the project can be approved, identifies the scope of this document, and describes how to use the document.

Overview of the Proposed Project

The Proposal

The Hamilton wetland restoration project site is located within the San Francisco Bay Estuary in the City of Novato, Marin County. The 900-acre site comprises three areas: the Hamilton Army Airfield (HAAF), an approximately 644-acre parcel currently being closed by the U.S. Army ~~Corps of Engineers (Corps)~~; the approximately 20-acre Navy ballfield site; and the California State Lands Commission (SLC) parcel (also known as the Antenna Field), a 250-acre parcel owned by the State of California and administered by the SLC. The impact analysis includes the Navy ballfield as part of the HAAF parcel. A large portion of these areas, which lie between Novato Creek to the north and Long Point to the south, were historically tidal wetlands. The Hamilton ~~wetland conceptual restoration plan~~ Wetlands Conceptual Restoration Plan would return the site to seasonal and tidal wetland conditions and reestablish important ecological functions in the San Francisco Bay Estuary.

This environmental impact report/environmental impact statement (EIR/EIS) presents an evaluation of the impacts associated with restoration of wetlands at HAAF and the adjacent SLC parcel. Other reuse options for the HAAF parcel are not evaluated in this EIR/EIS. These options, including aviation use of HAAF, were evaluated by the Army as part of the environmental documentation on the disposal and reuse of HAAF and by the City of Novato as part of developing the reuse plan for HAAF. As indicated in the final reuse plan for HAAF, the HAAF parcel is designated as open space for wildlife habitat and wetland restoration uses (City of Novato 1996). A description of the relationship of the wetlands restoration project and other projects and plans is included in Chapter 2.

Project Sponsors

The California State Coastal Conservancy (Coastal Conservancy) is the state lead agency for the Hamilton wetland restoration project. The Coastal Conservancy was created by the state legislature for the purpose of developing and sponsoring a wide variety of environmental projects to protect, preserve, and enhance the coastal resources of California's coastline and San Francisco Bay. The Coastal Conservancy is working in cooperation with the U.S. Army Corps of Engineers (Corps) (and other agencies, including the San Francisco Bay Conservation and Development Commission [BCDC]) to develop plans for the Hamilton wetland restoration project.

Congress will determine whether the proposed project is in the federal interest based on a feasibility study, which is being prepared by the Corps. The feasibility study was authorized in 1997 and is being prepared under a feasibility cost-share agreement with the Coastal Conservancy.

Overview of CEQA and NEPA

The California Environmental Quality Act (CEQA) requires state and local agencies to estimate and evaluate the environmental implications of their actions and aims to prevent adverse environmental impacts of those actions by requiring those agencies, when feasible, to avoid or reduce significant environmental impacts of their decisions. One tool that is used to estimate and evaluate environmental implications is an EIR. CEQA requires that the lead agency prepare an EIR when the lead agency determines that a project may have a significant effect on the environment.

The National Environmental Policy Act (NEPA) involves a process that is similar to the CEQA process but applies only to federal agencies. Under NEPA, federal agencies are authorized and directed to the fullest extent practical to carry out their regulations, policies, and programs according to NEPA's policies of environmental protection. To ensure that these policies are carried out, NEPA requires that every federal agency prepare an EIS for a major federal action significantly affecting the quality of the human environment.

When a project is subject to review under both CEQA and NEPA, state and local agencies are encouraged to cooperate with federal agencies in the environmental review process and to prepare a joint environmental document. For the Hamilton wetland restoration project, the state (Coastal Conservancy) and the federal government (the Corps) have determined that the proposed project could significantly affect the environment and have therefore prepared this joint EIR/EIS.

Scope of the EIR/EIS

Definition and Purposes of Scoping

The process of determining the scope, focus, and content of an EIR/EIS is known as scoping. The scoping process assists the lead agencies in determining the substantive issues to be addressed in the EIR/EIS. In summary, the purposes of scoping are to:

- help identify the range of actions, alternatives, environmental effects, and mitigation measures to be evaluated in depth in the EIR/EIS;
- bring together interested governmental agencies, project sponsors, and other interested parties to listen to and help resolve concerns; and
- eliminate from further study those issues that are not important to the decision at hand.

Elements of the Scoping Process

Tools used in scoping include the notice of preparation (NOP) and the notice of intent (NOI) issued for the project, scoping meetings, and early consultation with governmental agencies and the public.

Notice of Preparation and Notice of Intent

Immediately after a local or state lead agency decides that an EIR is required, the lead agency must prepare an NOP soliciting participation in determining the scope of the EIR; the NOP is sent to responsible and trustee agencies and involved federal agencies, the State Clearinghouse, and parties that previously requested notice in writing. Although further distribution is not required, the lead agency should consider sending the NOP to all parties that may be interested in the project, such as adjacent property owners (Pub. Res. Code Section 2310092.2). The Coastal Conservancy prepared and distributed an NOP for this project on March 9, 1998, in compliance with CEQA requirements. Responses to the NOP must be submitted to the lead agency within 30 days of issuance of the NOP.

Similar to an NOP, the NOI is the first formal step in EIS preparation. The NOI must be published in the Federal Register. The NOI for the Hamilton Wetland Restoration Plan EIR/EIS was published in the Federal Register on March 18, 1998. Agency and public comments received by the Coastal Conservancy and the Corps during the scoping process have been assembled in a scoping report (Jones & Stokes Associates 1998).

Scoping Meetings

Although not required by CEQA or NEPA, scoping meetings can improve the effectiveness of the scoping process by acting as another forum for agencies and the public to provide input on the range of issues, alternatives, and mitigation measures that should be included in the EIR/EIS. The Coastal Conservancy and the Corps conducted two scoping meetings, one on March 25, 1998, and the other on March 30, 1998.

Early Consultation

In addition to the NOP/NOI, lead agencies are encouraged to consult directly with responsible and trustee agencies early in the environmental review process to ensure that the EIR/EIS meets the needs of other agencies that will be relying on the document for related discretionary actions (e.g., permits and approvals). For the Hamilton Wetland Restoration Plan EIR/EIS, the lead agencies are consulting with the U.S. Fish and Wildlife Service (USFWS), the California Department of Fish and Game (DFG), the Port of Oakland, local public service and utility providers, and several other agencies.

Scoping Report

The scoping process is thoroughly documented in a scoping report (Jones & Stokes Associates 1998) on file with the Coastal Conservancy and the Corps. It contains copies of the NOP and NOI, written comments, summaries of oral comments, and a description of how those comments were to be addressed in the EIR/EIS.

Topics Addressed in the EIR/EIS

Based on the scoping process for the Hamilton Wetland Restoration Plan EIR/EIS, the following topics were determined to require evaluation to assess potentially significant impacts:

- geology and soils;
- surface water hydrology and water quality;
- tidal hydraulics;
- public health and safety;
- biological resources;
- land use and public utilities;
- hazardous substances, waste, and site remediation;
- transportation;
- air quality;
- noise; and
- cultural resources.

Potential effects on aesthetics and population, housing, and employment are not evaluated in this EIR/EIS because these impacts would be obviously less than significant.

Specifically, the conversion of an abandoned airstrip and disturbed fields to restored wetlands would likely result in an overall visual enhancement compared with existing conditions. Furthermore, the project would generate no population or demand for housing and only a minor amount of construction employment. Therefore, these issues are not explored further in the document.

Framework of the EIR/EIS

Following this introduction, the EIR/EIS contains a thorough description of alternatives, including Alternative 1: No Action. Chapters 4 through 14 each contain a setting or affected environment section for a particular resource topic, which is the point from which the discussion of impacts of the alternatives begins. An impact is judged to be *significant* (or *less than significant*) based on whether it meets specific significance criteria, which are professional standards. If an impact is judged to be significant, mitigation measures or ways to reduce or avoid the impact are identified and roles and responsibilities for implementing the mitigation are described. If an impact cannot be avoided or reduced substantially, it is considered a *significant unavoidable* impact of project implementation.

The Next Steps in the Environmental Review Process

This document is a draft EIR/EIS. It is being circulated for 45 days for review and comment by the public, responsible and trustee agencies, and other stakeholders. After the public review period closes on September 28, 1998, a final document will be prepared that responds to substantive comments received. This final document will be used by the lead agencies to decide which alternative is preferred, which mitigation measures to adopt, and whether to approve the project.

PA-01 0433

Chapter 2. Purpose of and Need for the Hamilton Wetland Restoration Plan

Introduction

CEQA requires an EIR to contain a statement of the objectives sought by the project proponents. Similarly, NEPA requires an EIS to briefly describe the underlying purpose of and need for the action and alternatives proposed by the lead agency. This chapter addresses these requirements.

Need for Tidal Habitat Restoration in San Francisco Bay

This project is being proposed to restore important tidal salt marsh habitat in San Francisco Bay. Approximately 90% of the original tidal wetlands of San Francisco Bay have been destroyed by being diked or filled for purposes such as agriculture, urban development, and salt production. This loss of tidal wetlands has greatly reduced the amount of habitat available to many species of fish and wildlife. Several local animal and plant species, including the salt marsh harvest mouse and the California clapper rail, have been listed as endangered as a direct result of the reduction in extent and quality of their wetland habitats. Many other species, including migratory shorebirds, waterfowl, and numerous fish species, also have been affected by this loss of habitats.

Project Purposes

As described in Chapter 1, the Coastal Conservancy was created by the state legislature for the express purpose of developing and sponsoring environmental projects to protect, preserve, and enhance the coastal resources along the 1,100-mile California coastline and around San Francisco Bay. The Coastal Conservancy's broad authority enables participation in a diverse array of projects involving habitat creation, enhancement, and restoration. The Coastal Conservancy is also the designated state agency for planning and coordinating federal surplus land sales in the coastal zone. Under this authority, the Coastal Conservancy has been developing the Hamilton wetland conceptual restoration plan in partnership with the BCDC, the state agency with planning and regulatory authority in the San Francisco Bay area, and the Corps, the federal agency that would help secure funding for implementation if the project is authorized under the federal Water Resources Development Act.

The project has four broadly defined purposes:

- ✦ Create up to 900 acres of habitat, with the potential to expand the project in a future phase to 2,500 acres.
- ✦ Implement numerous federal, state, regional, and local plans (described below), including the Hamilton Base Reuse Plan, the Long-Term Management Strategy for Disposal of Dredge Sediments in San Francisco Bay, the San Francisco Bay Plan, the Regional Habitat Goals Project, the U.S. Environmental Protection Agency (EPA) Estuary Project's Comprehensive Conservation and Management Plan, and the City of Novato General Plan.
- ✦ Establish a partnership between state and federal agencies (the Corps, the BCDC, and the Coastal Conservancy) to accommodate the habitat restoration objectives.
- ✦ Enable completion of the U.S. Army's base closure and property disposal process (the Coastal Conservancy is working with USFWS to support and approve a no-cost transfer of HAAF to the Coastal Conservancy).

Project Goal and Objectives

In 1996, the National Marine Fisheries Service (NMFS) convened a group of federal and state agency representatives to explore the concept of restoring lands at HAAF to tidal wetlands. This group was expanded and evolved to form the Hamilton Restoration Group (HRG), an advisory body composed of representatives from the City of Novato (the City), state and federal agencies, landowners in the vicinity, environmental and local interest groups, and local citizens. The following specific project goal and objectives, which were derived through the HRG, have been adopted for the project:

Goal:

- ✦ To create a diverse array of wetland and wildlife habitats at HAAF that benefits a number of endangered species as well as other migratory and resident species.

Objectives:

- ✦ To design and engineer a restoration project that stresses simplicity and has little need for active management.
- ✦ To demonstrate beneficial reuse of dredged material, if feasible.

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- ✦ To recognize existing site opportunities and constraints, including the runway and remediation of contaminated areas, as integral components of design.
- ✦ To ensure no net loss of wetland habitat functions presently provided at the HAAF site.
- ✦ To create and maintain wetland habitats that sustain viable wildlife populations, particularly for Bay Area special-status species.
- ✦ To include buffer areas along the upland perimeter of the project area, particularly adjacent to residential areas, so that wildlife will not be impacted by adjacent land uses. Perimeter buffer areas should also function for upland refuge, foraging, and corridors for some species.
- ✦ To be compatible with adjacent land uses and wildlife habitats.
- ✦ To provide for public access that is compatible with protection of resource values and regional and local public access policies.

These goals and objectives were used by the Corps to establish the planning objectives indicated in the feasibility study. The planning objectives include restoring wetlands, ensuring beneficial reuse, facilitating base closure, and providing public access.

Relationship to Other Projects and Plans

The proposed project implements or ties in with many national, regional, and local planning efforts.

Defense Base Closure and Realignment Act of 1988

The Defense Base Closure and Realignment Act of 1988 (BRAC I, Public Law 100-526) required the closure and disposal of various military properties and facilities still in military ownership, including HAAF. During the BRAC process, disposal of the property could be accomplished through a Public Benefit Discount Conveyance, through which state or local entities may obtain property at less than fair market value when supported by a federal agency (in the case of HAAF, the USFWS) for uses that would benefit the public.

Currently, the U.S. Army anticipates transfer of the BRAC parcel to the Coastal Conservancy by the turn of the century. A condition of this transfer is remediation of contamination at the site. As a result, HAAF is undergoing investigation and remediation of contaminated areas. All sites known to be contaminated will be remediated by the U.S. Army to levels that meet federal, state, and local regulations and protect human health and the environment, and shall be certified to be clean by proper authorities before they are transferred, sold, or reused.

See Chapter 3 for additional information about the remediation process.

City of Novato General Plan

The City of Novato General Plan designates the project site for open space. The allowable uses within this land use category include uses devoted to, among other purposes, the preservation of natural resources and outdoor education. In addition, the general plan contains EN Program 10.3 as follows:

> Encourage wetlands restoration where appropriate. Restoration of historic wetlands such as those at the Hamilton Field runway is contributing towards restoring those lands that experienced significant loss (over 80 percent) in the bay area.

Lastly, the general plan designates the project site as a "bayfront area"; bayfront areas are areas within Novato that require careful regulation because of their environmental values and the City's desire to preserve and enhance natural resources and historical resources, including wildlife and aquatic habitats, tidal marshes, seasonal marshes, lagoons, wetlands, agricultural lands, and low-lying grasslands overlying historical marshes.

The San Francisco Bay Plan

In 1996, the BCDC amended the San Francisco Bay Plan as it relates to HAAF. The San Francisco Bay Plan designates wildlife priority use for HAAF through the development of a comprehensive wetland habitat plan and long-term management program to restore and enhance wetland habitat in diked former wetlands. The plan also indicates that dredged materials should be used whenever feasible and environmentally acceptable to facilitate wetland restoration.

San Francisco Estuary Baylands Ecosystem Goals Project

The San Francisco Estuary Baylands Ecosystem Goals Project (Goals Project) was established to determine the types and locations of wetlands needed in the estuary. The purpose of this project is to provide a biological basis to guide regional wetland planning for the preservation, enhancement, and restoration of the wetland communities. This process has identified a suite of key species of bayland plants and animal and their associated habitats that are required for their support. The proposed project is anticipated to provide key supporting habitat and species of plants and animals listed by the Goals Project. The proposed restoration plan would implement the specific habitat goals in the June 26, 1998 public review draft of the Goals Project proposed for the Hamilton site, which calls for restoration primarily to tidal marsh with an upland buffer and managed seasonal ponds.

San Francisco Estuary Project Comprehensive Conservation and Management Plan

The San Francisco Estuary Project was established by Congress through the National Estuary Program. The San Francisco Estuary Project promotes consensus on how wetlands should be protected, regulated, and restored throughout the San Francisco Bay Estuary region. A Comprehensive Conservation and Management Plan (CCMP) for the Bay and Delta, completed in 1993, provides a comprehensive implementation strategy describing various actions to protect the estuary of San Francisco Bay. The proposed project meets several of the objectives and recommended actions listed in the CCMP, including the reuse of dredged material for projects such as wetland creation and restoration, levee restoration, landfill cover, and upland building material where environmentally acceptable.

Long-Term Management Strategy for Disposal of Dredged Sediments in San Francisco Bay

For many years, dredged material taken from federal and port channels and berthing areas were removed from the bottom of San Francisco Bay, placed in barges, transported to one of the federally designated areas in the bay or ocean, and dumped. As a result of the controversy over the environmental impacts of this practice on the stressed bay estuary and limited capacity at the main in-bay disposal site near Alcatraz Island, new practices were adopted in the late 1980s by the agencies with authority over dredging and disposal, and disposal operations for large new work projects were substantially curtailed.

An interagency cooperative effort, the Long-Term Management Strategy for Disposal of Dredged Material in the San Francisco Bay Region (LTMS), was established in 1991 to resolve the disposal issues. The goals of the LTMS include conducting disposal of dredged material in the most environmentally sound manner and maximizing the use of dredged material as a resource. The LTMS agencies have agreed on a strategy of decreasing in-bay disposal over time with a goal of only 20% of bay-dredged material being disposed in the bay. The other 80% of the dredged material is proposed to be used as a resource or disposed of at the deep-ocean disposal site. This approach is intended to reduce the risk of adverse impacts from in-bay disposal while maximizing environmental benefits through reuse and providing greater certainty to dredging project sponsors.

Beneficial reuse sites for dredged material will be needed to achieve this goal. HAAF was evaluated as part of a comprehensive review by the LTMS agencies of potential sites for reuse and found to be a very suitable site for wetland restoration using dredged material.

Ecosystem Restoration Program Plan

A framework agreement was signed by various state and federal agencies under the interagency CALFED Bay-Delta Program (CALFED) to address the problems in the San Francisco Bay/Sacramento-San Joaquin River Delta (Bay-Delta) region. The agreement provided a combination of state and federal funding for three specific purposes: Category I is for development of water quality standards, Category II is for water projects, and Category III is for implementation of habitat restoration. California voters approved Proposition 204, which provided state funding for the Category III program. Category III funding is earmarked for projects that benefit targeted species, particularly endangered fish and marsh species.

CALFED has produced a draft Ecosystem Restoration Program Plan that describes the important ecological processes, habitats, species, and stressors of the San Francisco Bay ecosystem. The plan includes "ecological zone visions" for each watershed area that address the potential for restoration in each zone. The proposed project was determined to be consistent with the visions and policies presented in the plan and received CALFED Category III funding.

Oakland Harbor Navigation Improvement (50-Foot) Project

The Port of Oakland proposes to deepen the federal channels of the Oakland Harbor and port-maintained berths to a depth of 50 feet mean lower low water to accommodate the newest generation of deep-draft container ships. The proposed project would involve the dredging and disposal of 12.0-14.5 million cubic yards of bottom sediments.

The final EIR/EIS for the Oakland Harbor Navigation Improvement (50-Foot) Project identifies the preferred alternative, which involves dredging to 50 feet with sediment reuse/disposal at various sites, including Hamilton.

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Chapter 3.
Project Alternatives under Consideration

Introduction

Coastal Conservancy staff, BCDC staff, and the Corps are proposing to restore wetlands at HAAF and the adjacent SLC parcel (Figure 3-1). A 20-acre site owned by the U.S. Navy, which is frequently referred to as the Navy ballfield, is located in the southwest corner of the HAAF parcel. The following discussion and impact analysis includes the Navy ballfield as part of the HAAF parcel.

The project objectives described in Chapter 2 could be attained by restoring wetlands either through the process of natural sedimentation or by actively placing dredged materials on the site. Four wetland restoration alternatives are evaluated in this EIR/EIS. These alternatives include restoration of wetlands in the following areas by the following means:

- HAAF parcel by natural sedimentation (Alternative 2),
- HAAF parcel using dredged material (Alternative 3),
- HAAF and SLC parcels by natural sedimentation (Alternative 4), and
- HAAF and SLC parcels using dredged material (Alternative 5).

Alternative 1: No Action, also described in this EIR/EIS, serves as the baseline condition for evaluating environmental impacts of the other alternatives.

The four project alternatives have been evaluated at an equal level of detail. Coastal Conservancy staff and the Corps have identified Alternative 5 as the preferred alternative because it best meets the project goal and objectives. Under Alternative 5, the use of dredged material would reduce the amount of time necessary for the restored wetlands to become fully functional, the use of dredged material for restoration would help reduce the amount of dredged material that could be disposed of in the bay or the ocean, and maintenance requirements would be lower than under alternatives that do not rely on dredged material.

Project Background

The Hamilton wetland restoration project could include the HAAF and SLC parcels. This section provides information on the current status of each parcel and how these parcels would be integrated into the wetland restoration project.

Hamilton Army Airfield Parcel

Defense Base Closure and Realignment Act of 1988

HAAF is currently owned by the Department of Defense (DoD) and most recently served as a subinstallation to the Presidio of San Francisco (Figure 3-2). BRAC directed DoD to close and dispose of HAAF. Accordingly, the Army evaluated the environmental impacts of disposal and reuse of HAAF in an EIS completed in 1996. A record of decision on disposal and reuse was prepared by the Army in 1997.

Three alternatives were evaluated in the Army's disposal and reuse EIS: no action, disposal without encumbrances, and disposal with encumbrances. The Army identified disposal with encumbrances as its preferred alternative. The record of decision indicates that, as part of the disposal process at HAAF, the Army presently requires new owners to maintain these encumbrances, including maintenance of the Landfill 26 wetland mitigation site, continuation of access easements provided to the Novato Sanitary District (NSD) and the SLC, and provision of a perpetual easement for a flood control levee granted to the New Hamilton Partnership. In addition to these encumbrances, the Army also requires new owners to maintain flood control infrastructure until the new landowner's reuse plan has met all consultation, regulatory, and permitting requirements and has identified a way to control human access to the outboard tidal marsh. <u>However, some of these encumbrances may be modified or eliminated as a result of changed circumstances or actions taken by the Army to meet the conditions of transfer.</u>

Although reuse was not part of the Army's action of disposal, the EIS also disclosed impacts that could occur as a result of the reuse of HAAF. Reuse scenarios evaluated in the EIS included mixed-use development, institutional development, open space with constructed wetland restoration, and open water with natural wetland formation. The reuse scenarios that the Army considered in the EIS were based on the local reuse planning efforts of the City through the Hamilton Reuse Commission (HRC) appointed by the Novato City Council. The HRC's preferred uses of HAAF were wetlands, wetlands with other uses, and low-density mixed-use development. The record of decision for the disposal and reuse EIS did not indicate a preferred reuse scenario and indicated that evaluation and approval of an official reuse plan would be the responsibility of local planning authorities. The Army is committed to clean up HAAF for the purpose of wetland restoration and will continue to pursue the necessary agreements to ensure transfer of HAAF to the Coastal Conservancy.

Local Reuse Plan

After the Army completed the EIS on the disposal and reuse of HAAF, the City adopted a reuse plan for the former Hamilton Air Force Base. The reuse plan included HAAF and indicated a preferred reuse of the area as open space and wetlands. The reuse plan established goals and policies for planning areas throughout the former Hamilton Air Force Base, including the HAAF parcel. The plan identified development of wetlands as the goal for reuse of the HAAF parcel.

The reuse plan eliminated from consideration other uses of the HAAF parcel, such as residential or commercial development and aviation. Because these uses have been addressed previously, the environmental impact analysis contained in this EIR/EIS is focused on evaluating restoration of wetlands in the HAAF and SLC parcels (Hamilton Local Reuse Authority 1996).

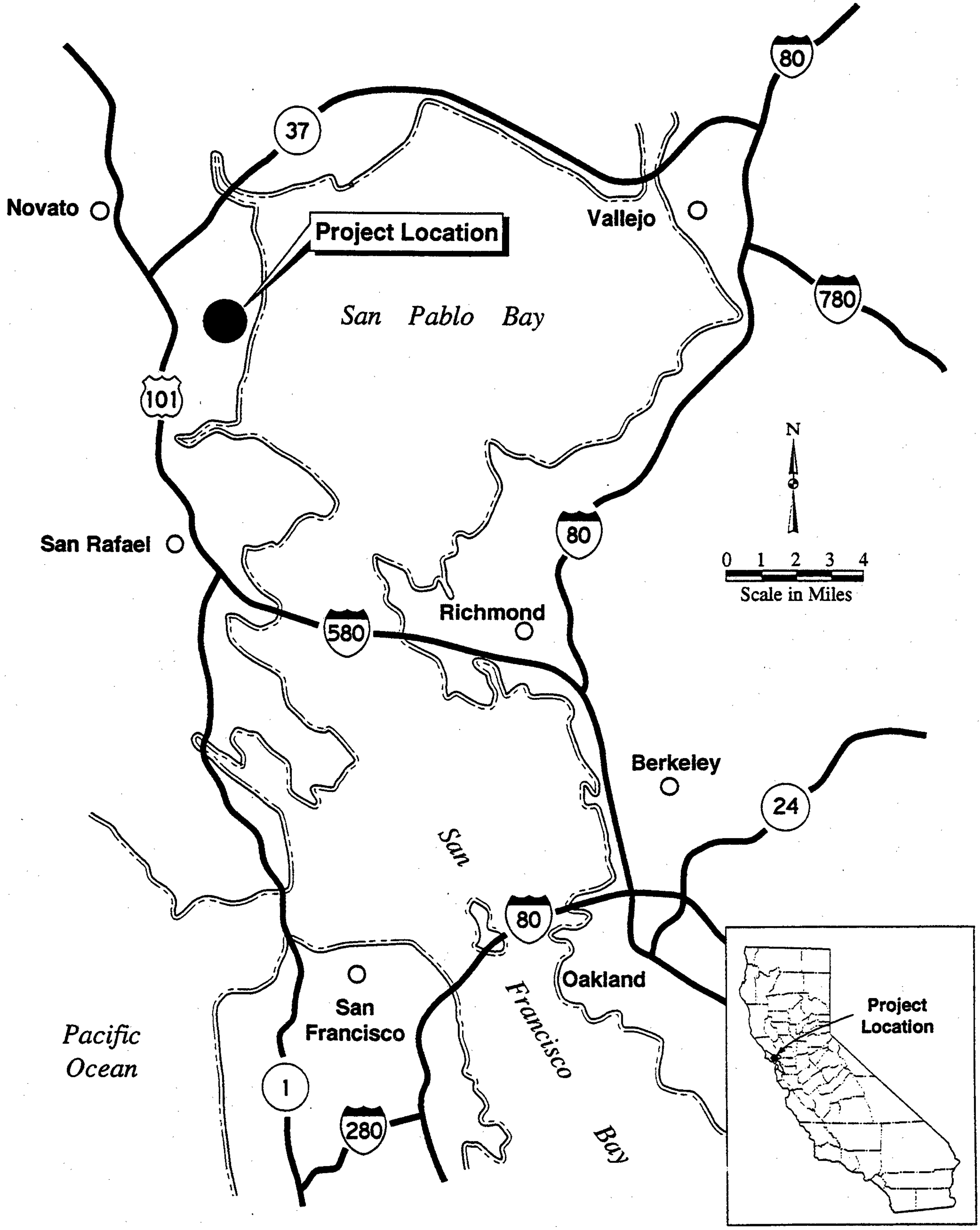
State Lands Commission Parcel

The area known as Antenna Field, or the SLC parcel, was transferred to the SLC as part of the closure of Hamilton Air Force Base. Communications facilities were previously constructed on the parcel by the Air Force (Figure 3-2). The Air Force also granted an easement over the parcel to the NSD for access to wastewater dechlorination facilities. No reuse plan has been developed for the SLC parcel.

<u>The SLC parcel will not be transferred to the Coastal Conservancy as part of the Hamilton wetland restoration project. It will be included in the restoration project only if it is remediated to a level suitable for wetland restoration.</u>

Hamilton Wetlands Conceptual Restoration Plan

The description of alternatives evaluated in this EIR/EIS is based on the concepts developed in the draft Hamilton Wetlands Conceptual Restoration Plan (Woodward-Clyde 1998) prepared for the Coastal Conservancy and BCDC. The plan provides detailed information on restoration of wetlands on the HAAF and SLC parcels through natural sedimentation and using dredged materials. The plan served as the primary information source for the following description of alternatives and is hereby incorporated by reference into this EIR/EIS. <u>A copy of the executive summary of the plan is included as Appendix A.</u>



Jones & Stokes Associates, Inc.

Figure 3-1
Regional Location of the
Hamilton Wetland Restoration Project

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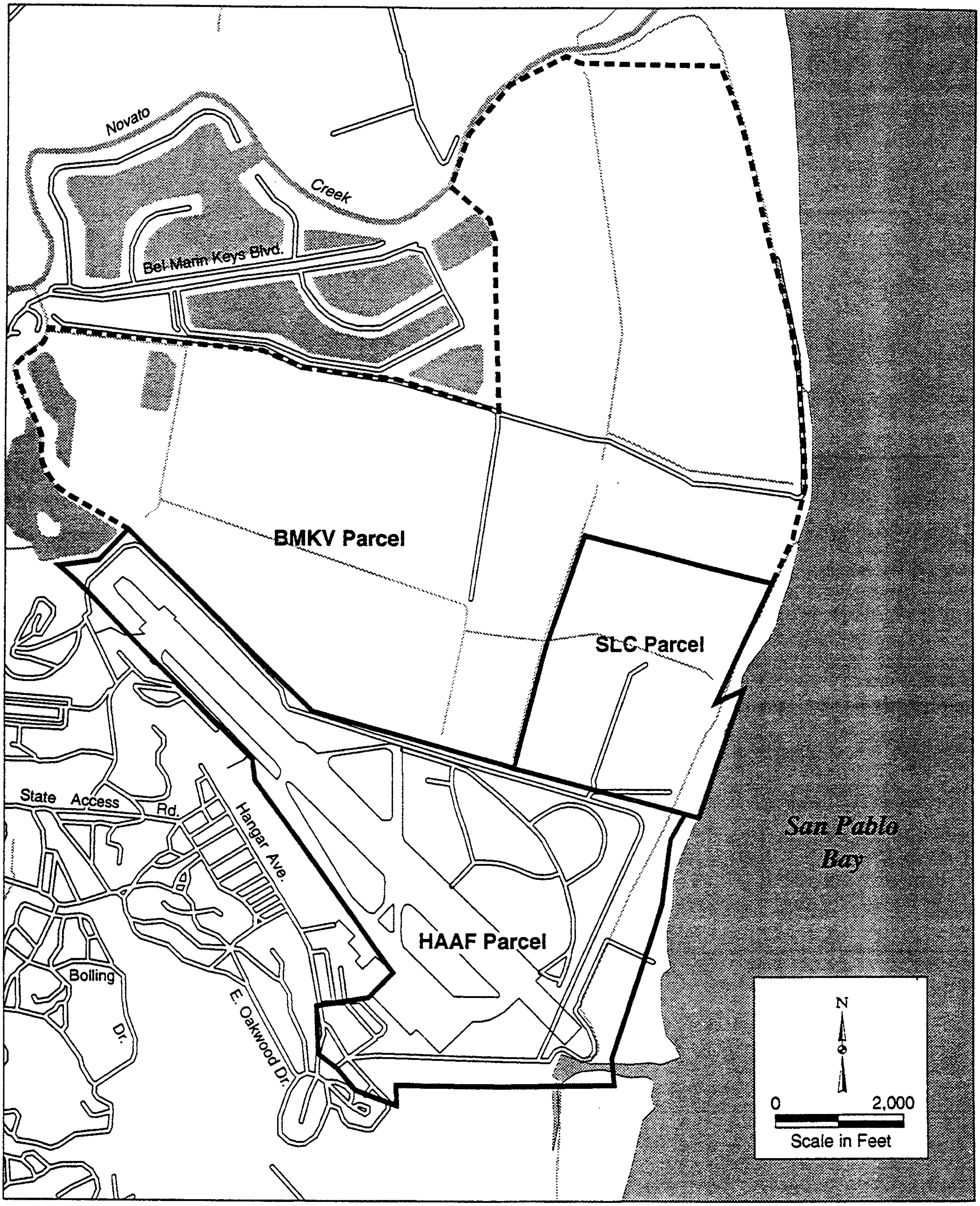

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Figure 3-2
Hamilton Wetland Restoration Project Site

Conditions for Transfer

The EIR/EIS assumes that certain management issues associated with the HAAF parcel would be resolved before the Army transfers the parcel to the Coastal Conservancy. These issues include providing an access route to the HAAF parcel, addressing flooding and drainage issues, and remediating contaminated areas. Existing buildings would be removed by the Army if necessary to remediate contaminated areas.

Access

Access to the wetland restoration site would be provided by an easement over existing and new roads through the General Services Administration (GSA) Sale Parcel at HAAF. The road would connect Nave Drive and Perimeter Road and would serve as the primary access route to the restoration site during the construction phase and for monitoring and caretaking purposes once the construction phase is completed. The road would also serve as access to the NSD outfall pipeline and the SLC parcel. The proposed alignment for the access route is shown in Figure 3-3.

Flood Control and Drainage

The flood control and drainage facilities in the HAAF parcel affect the hydrologic characteristics of surrounding properties, including the New Hamilton Partnership development, the St. Vincent's and Las Gallinas Sanitary District properties, the Bel Marin Keys Unit V (BMKV) development parcel, Landfill 26, Ignacio Reservoir, and the SLC parcel (Figure 3-4). The Coastal Conservancy has indicated that before its acceptance of the HAAF parcel, existing flood control and drainage issues between the Army and surrounding landowners would be resolved. ~~Methods to resolve these issues could include the following:~~

- ~~modification of storm drainage flows from the St. Vincent's and Las Gallinas Sanitary District properties;~~
- ~~identification and implementation of measures to address ponding of water at Landfill 26, and~~
- ~~discontinuance of surface flows from the BMKV parcel to the HAAF parcel.~~

<u>The Army's goal is to resolve flooding and drainage issues with surrounding properties so that flooding and drainage characteristics of parcels surrounding the HAAF parcel are not adversely affected as a result of base closure. To ensure that closure of the HAAF parcel would not affect these flooding and drainage characteristics, the Army has committed to making modifications to the drainage facilities of the surrounding parcels: the St.</u>

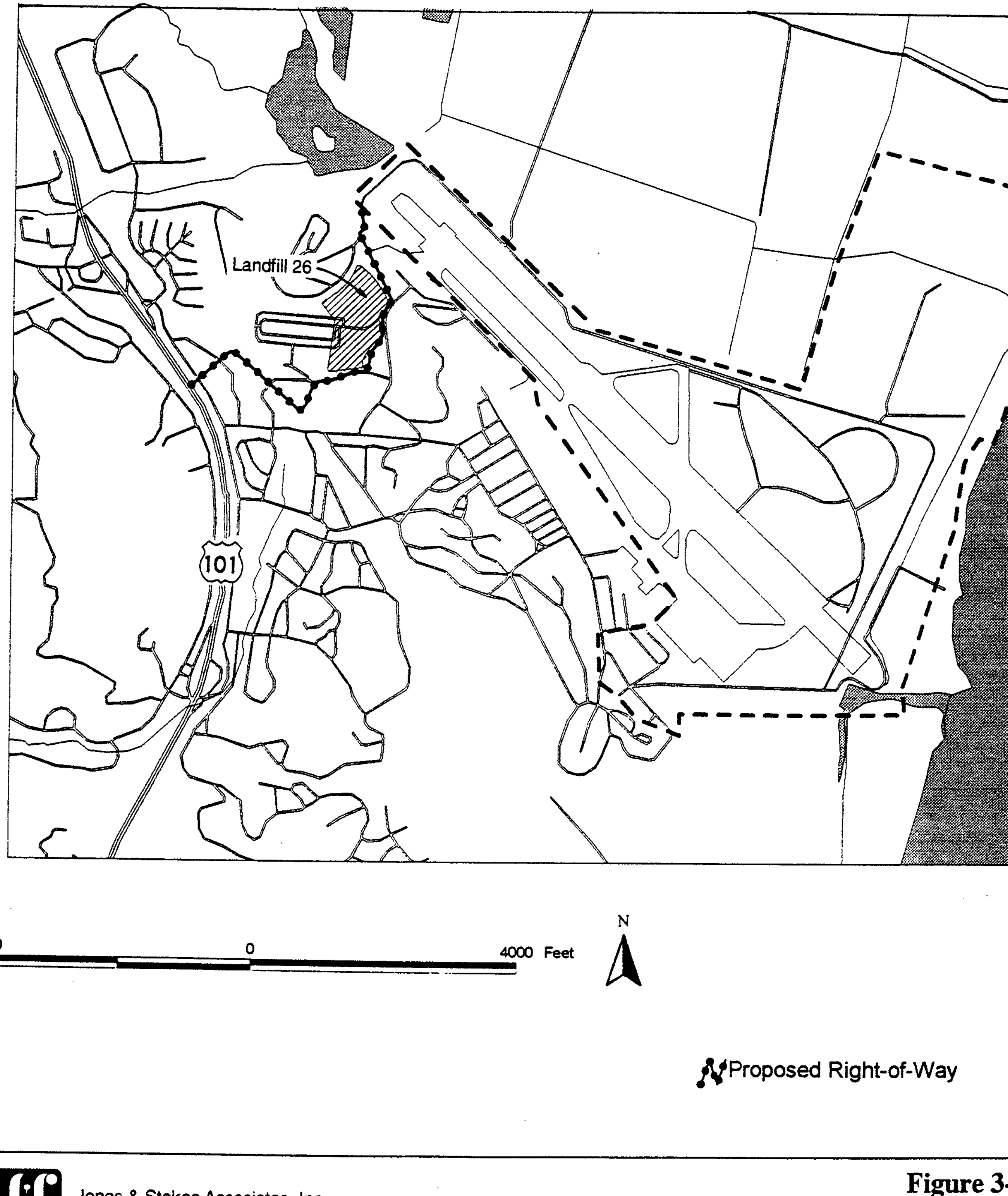

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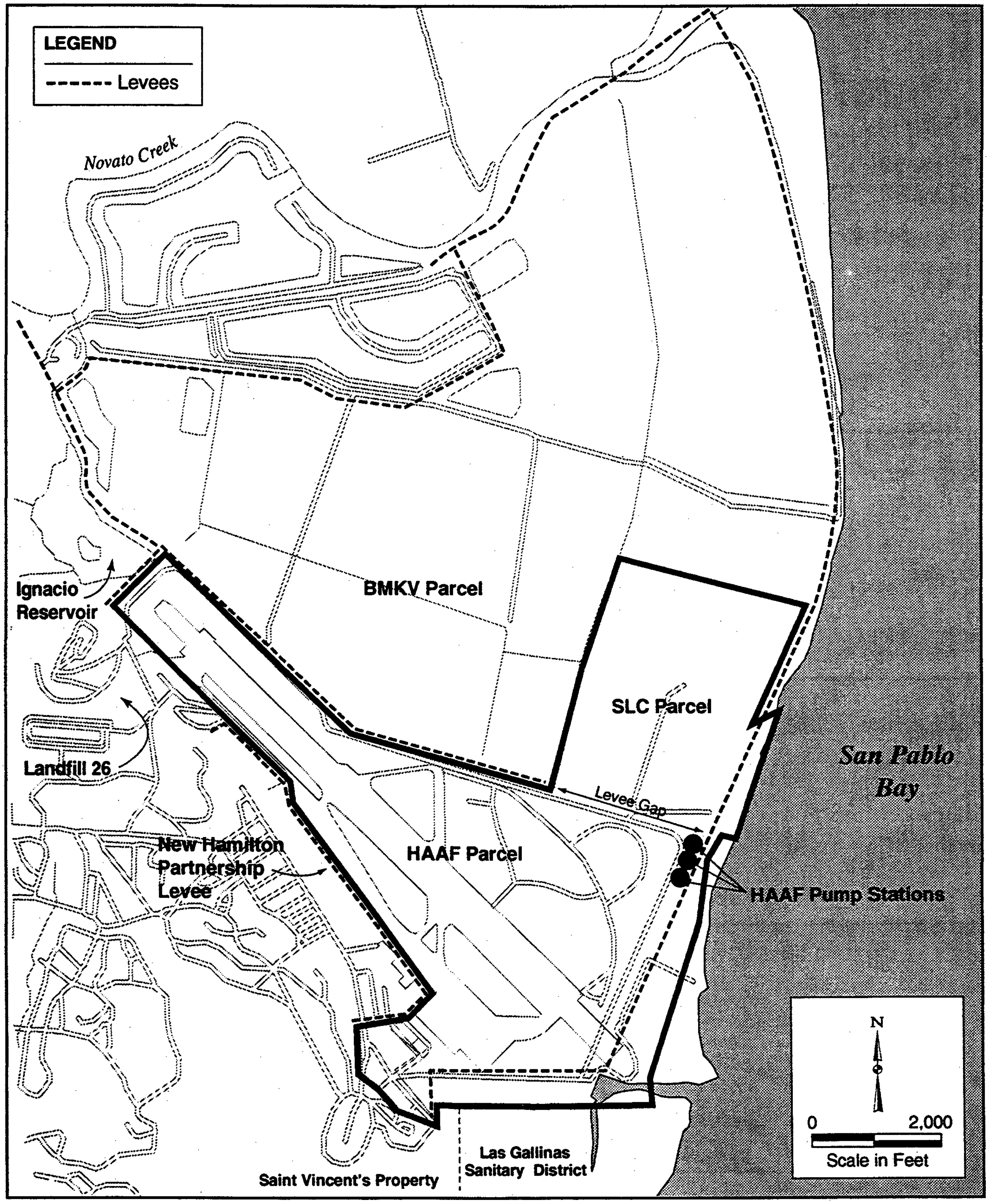
Figure 3-3
Proposed Access Route to the Hamilton Wetland Restoration Project Site



SOURCE:
U.S. Army Corps of Engineers 1996a.

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Figure 3-4
Existing Levees and Adjacent Land Uses

Vincent's, Las Gallinas Sanitary District, and U.S. Navy properties; Landfill 26; the SLC parcel; and the BMKV development parcel.

The Army has agreed to address these drainage issues as part of the closure of HAAF. It has indicated that it will undertake any additional environmental impact analysis that may be required to implement these solutions before transfer of the HAAF parcel. A copy of a recent letter to the Coastal Conservancy from the Army describing these commitments is included in Appendix B of this EIR/EIS.

St. Vincent's, Las Gallinas Sanitary District, and U.S. Navy Properties

The Army proposes to permanently close the slide gate on the canal that currently drains these properties onto the HAAF parcel. The existing St. Vincent's pump station is currently being repaired and upgraded so that it will be able to accommodate any additional drainage onto the St. Vincent's parcel resulting from closing the slide gate. The Army will pay for a portion of the cost to repair and upgrade the St. Vincent's pump station. This drainage would be redirected to the upgraded pump station being constructed by St. Vincent's and managed by the Las Gallinas Sanitary District.

Landfill 26

The Army proposes to construct a pump station to convey water from Landfill 26 and the surrounding area to the HAAF parcel. The discharge will be placed at an elevation that allows for gravity drainage through the proposed wetland restoration project. The Army and the City of Novato are negotiating an agreement stating that the City will maintain and operate the pump station as a condition of using Landfill 26 for recreation purposes. The resolution of this issue is pending formal response from the City to accept and manage the pump station.

State Lands Commission Parcel

As part of the original transfer of the "antenna field" from the Army to the SLC, the Army reserved the right to block the drainage of surface water from the SLC parcel onto the HAAF parcel. This right will be transferred to the Coastal Conservancy as part of the transfer of the HAAF parcel.

Bel Marin Keys Unit V Parcel

Three 30-inch-diameter corrugated steel pipes run through the perimeter levee that separates the HAAF parcel from the BMKV parcel. The pipes are plugged and do not provide drainage between the HAAF and BMKV parcels. The Army is working with the owner of the BMKV parcel to resolve this issue and is determining the function of the drainage. It is the Army's intent to obtain approval from the landowner to permanently block the culverts without making modification to the BMKV parcel drainage system. If this agreement is not reached, the Army will undertake the additional steps necessary to secure approval of the adjacent landowner to permanently block the drainpipes.

The EIR/EIS discloses hydrologic impacts that are directly attributable to restoration of wetlands in the HAAF and SLC parcels.

Flood control for the New Hamilton Partnership development has been resolved through construction of a flood control levee between the development and the HAAF parcel. The new levee and pumping facilities provide adequate flood protection and drainage for the new development. Drainage from the development would continue to be discharged to the restored wetlands.

Structures

Structures remaining in the HAAF parcel include three buildings; three pump stations and the associated drainage ditches; miscellaneous structures, such as runway landing lights and small outbuildings; and the main runway, taxiways, and aircraft parking areas. The EIR/EIS assumes that the Army would leave in place the main runway, taxiways, and aircraft parking areas and those facilities needed by the Coastal Conservancy until the bayward levee is breached. The Army would remove buildings from the HAAF parcel if necessary to remediate contaminated areas.

Process by Which the Site Is Being Remediated

Several federal and state agencies have regulations that govern the use, generation, transport, and disposal of hazardous substances. The principal federal regulatory agency is EPA. The primary state agency in California with similar authority and responsibility is the California Environmental Protection Agency (Cal-EPA) Department of Toxic Substances (DTSC), which may delegate enforcement authority to other local agencies. Federal regulations applicable to hazardous substances are contained primarily in Titles 29, 40, and 49 of the Code of Federal Regulations (CFR). State regulations have been consolidated into California Code of Regulations (CCR) Title 26.

This subsection describes the governing agencies responsible for oversight and cleanup of hazardous substances at the HAAF and SLC sites.

HAAF Parcel

CERCLA. The identification, decontamination, and disposal of hazardous waste at HAAF is regulated by the Resource Conservation and Recovery Act (RCRA); Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA);

CCR Titles 22 and 23; and all applicable or relevant appropriate requirements (ARARs). The Army is responsible for the cleanup process and performs the cleanup with funding provided through BRAC (Public Law 100-526). The DTSC is the lead agency for regulatory enforcement and oversight of those cleanup activities; however, the Army also must submit findings regarding the effectiveness of the cleanup to EPA and the San Francisco Bay RWQCB.

Any transfer of property must be accompanied by a Finding of Suitability for Transfer (FOST) issued by the Army. A FOST is issued when a property has been determined to be environmentally suitable for transfer. CERCLA Section 120(h)(3) identifies the requirements for environmental suitability.

Regardless of the assessment and cleanup methods used by the Army, the ultimate condition of contaminated areas of HAAF must comply with regulatory cleanup levels established on the basis of the reuse plan for the property. Under certain circumstances, a FOST can be issued for a property with ongoing remediation of previous contamination when CERCLA Section 120(h)(3) requirements have been met, the proposed land use (e.g., wetlands) is compatible with the environmental condition of the property, no additional public or environmental health risk exists, and issuing such a finding does not interfere with the ongoing action, which is the proposed wetland restoration project.

The BRAC parcel at HAAF is not on the National Priorities List of contaminated sites requiring cleanup. A decision was made to pursue a programmatic approach for cleanup based on EPA's Guidance on Conducting Time-Critical Removal Actions under CERCLA (U.S. Army Corps of Engineers 1998b).

The BRAC parcel will be cleaned up under a sequence of regulatory phases. The Army identified the nature and extent of contamination during a series of assessments and investigations culminating in the Comprehensive Remedial Investigation Report (U.S. Army Corps of Engineers 1998c). Based on those investigations, site-specific removal actions during 1998 and 1999 will be used to clean up contamination to preliminary screening levels recommended by oversight regulatory agencies. A combination of confirmatory sampling, toxicity testing, and ecological and human health risk assessments will provide information used to determine final cleanup goals (remedial action objectives) in a focused feasibility study during 1999. It is intended that all remedial action required to meet those goals will be completed during the removal and confirmatory stages of fieldwork, leading to an environmental Record of Decision that does not require further work; however, if necessary, further remediation will be taken to meet final cleanup goals.

As part of the BRAC process, the Army is planning or conducting activities at sites to address contaminated soils at these sites. Sites affected by petroleum hydrocarbons include underground storage tanks at buildings 15, 20, 35, and 41; the east levee tank pad; the former sewage treatment plant sludge-drying beds; the perimeter stormwater drainage ditch; and the former aircraft revetment that was used for firefighter training activities. Sites with electrical transformers include the east levee boat dock and buildings 82, 92, and 94. These sites are shown in Figure 1, Appendix B.

Soil removal and treatment guidelines for the sites at the HAAF parcel were recommended by regulatory agencies. The soil removal and treatment guidelines are consistent with the proposed restoration of wetlands at HAAF. For all nonpetroleum chemicals of interest, guidance levels are ER-Ms derived from Long 1991 and Long et al. 1995. Guidelines for petroleum chemicals of interest, including TPH-purgeable, TPH-extractable, and BTEX, are based on RWQCB standards (Regional Water Quality Control Board 1995).

Other Concerns. Although petroleum hydrocarbons are not covered by CERCLA, cleanup of these substances is being addressed through the state oversight process. Concerns have been raised about asphalt proposed to be left in place because it contains polyaromatic hydrocarbons (PAHs).

Asphalt contains high-molecular-weight PAHs, which are the least toxic fraction of this class of chemicals. Further, these PAHs are tightly bound in the matrix of the asphalt. For these reasons, weathered asphalt does not pose a significant toxicity risk from PAHs and can be used widely in the environment with little concern. The asphalt in the wetlands project will be buried under sediments and therefore will not be exposed to significant tidal action, which potentially could grind up the asphalt and increase bioavailability. Those areas where asphalt would interfere with tidal channels forming on the site will be removed before dredged material is placed.

Because of the depth of sediments to be placed over the tidal portions of the site, ingestion or bioturbation by benthic infauna also is not expected to be a problem. More than 6 feet of dredged material will be placed, on average, over the existing substrate and asphalt in the tidal areas. Sedimentation will then increase the depth of cover. Therefore, even if the asphalt were broken up substantially because of the weight of emplaced dredged material and presents more surface area, it will not be exposed to benthic organisms. The only remaining contaminant pathway is through groundwater. High-molecular-weight PAHs have very low solubility, particularly in the low-oxygen groundwater environment in the marsh. Therefore, there is little risk that these tightly bound PAHs in the asphalt would contaminate groundwater, even if the asphalt cracks and presents more surface area because of the weight of emplaced dredged material.

The buildings planned for removal may contain lead-based paint or asbestos or both. The Army has agreed to remove any asbestos found in the buildings. The Corps and Coastal Conservancy plan to remove any lead-based paint in conjunction with the removal of buildings.

SLC Parcel

The SLC parcel was owned by the Air Force and was operated as part of Hamilton Air Force Base until 1974. While the base was in active use by the Air Force, the parcel was used for a variety of purposes, including a rifle range, a pistol range, skeet shooting, fire-fighting training, and as a communication facility with a number of large antennae. Following the decommissioning of Hamilton Air Force Base, the State of California

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acquired the parcel and leased a portion of the rifle range to the City of Novato Police Department for small-arms training.

Because ownership of the SLC parcel was transferred from the U.S. Department of Defense (DoD) in 1974, environmental cleanup falls under the Formerly Used Defense Site (FUDS) program. The FUDS program, an element of the Defense Environmental Restoration Program (DERP) (10 USC 2701 et seq.), requires remediation of contaminated sites consistent with CERCLA. The objective of the FUDS program is to reduce, as swiftly and cost-effectively as possible, the risk to human health, safety, and the environment resulting from past DoD activities. Apportionment of liability for contamination associated with the subsequent property owner, or third parties, is addressed through the Potentially Responsible Party (PRP) component of the DERP FUDS process. The goal of the PRP process is to negotiate a fair and equitable settlement that represents DoD's responsibility for contamination at a property.

The SLC parcel is currently in the preliminary assessment/site investigation portion of the CERCLA process. This investigation includes the rifle range, which is a PRP site. Subsequent investigation of the SLC parcel will be conducted, if necessary, during a remedial investigation. The remedial cleanup values developed for the HAAF parcel also will be used for the SLC parcel because the contaminants, geology, and anticipated future land use are similar for both parcels. An interim removal action is planned for the conclusion of the site investigation. This interim removal action will include the rifle range if PRP negotiations have resulted in a settlement. After a Record of Decision is agreed to by DoD and federal and state regulators, any remaining cleanup will be conducted.

Level to Which the Site Will Be Cleaned

As committed to by the Army, the sites will be remediated to a level suitable for wetland restoration as determined by the regulatory agencies overseeing the cleanup of the HAAF and SLC parcels. This remediation will exceed the CERCLA requirements for base closure by taking into account the impacts of any contaminants or other site conditions in the context of the proposed breach of the bayfront levees and other wetland restoration activities; it will include the elimination or reduction of potential impacts from asbestos, pesticides, or petroleum products found onsite. An ecological risk assessment will be used to set the acceptable levels for contamination, and soil bioassays will be used to determine toxicity. As stated previously, these cleanup activities are being conducted as part of an ongoing regulatory process that includes public review.

HAAF Disposal and Reuse EIS Encumbrances

Certain encumbrances and mitigation measures were identified in the Army's record of decision on the HAAF disposal and reuse EIS, including the following:

- maintenance of the Landfill 26 wetland mitigation site,
- an access easement over HAAF to the NSD outfall and dechlorination plant,
- an access easement over HAAF to the SLC parcel,
- an easement on the HAAF parcel to construct the New Hamilton Partnership perimeter levee, and
- control of human access to the salt marsh to protect endangered species.

Implementation of the wetland restoration plan would result in filling the Landfill 26 wetland mitigation site. Before proceeding with this modification, the Coastal Conservancy would secure approval by the California Regional Water Quality Control Board (RWQCB) to modify the waste discharge requirement (Order 92-029) under which the wetlands were constructed.

The Coastal Conservancy would continue to provide easements to the NSD for access to the outfall pipeline and to the SLC for access to the SLC parcel. The requirement for access to the SLC parcel would no longer be an issue if the SLC parcel were incorporated into the wetland restoration project, as is expected under Alternative 4 or 5.

The easement on the HAAF parcel to construct the New Hamilton Partnership perimeter levee would be conveyed to the ~~Coastal Conservancy~~ City of Novato~~, and~~. The City of Novato also would take title to the underlying fee interest of the perimeter levee. In addition, the City would convey an easement to the Coastal Conservancy to allow flooding and surcharge on the HAAF parcel side of the levee. ~~the~~ The wetland restoration plan does not provide for uncontrolled public access to the salt marsh.

Alternative 1: No Action

Under Alternative 1, the HAAF parcel would not be transferred from the Army to the Coastal Conservancy, and the wetland restoration plan developed by the Coastal Conservancy would not be implemented. HAAF would remain under Army ownership until the parcel was transferred from the Army to a new owner. Under Alternative 1, it is assumed that the Army would:

- complete the cleanup of contaminants at HAAF already under way;

- continue to operate and maintain drainage and pumping facilities;
- provide easements across HAAF to the NSD, SLC, and New Hamilton Partnership; and
- maintain the Landfill 26 wetland mitigation site.

Ground-disturbing activities at HAAF would end when the cleanup of contaminants at HAAF is completed and the parcel is placed in caretaker status. During the period when the Army maintains ownership, acreage of wetlands or other habitat types in the HAAF parcel may change over time. However, any discussion of how habitats in the HAAF parcel could change in the absence of a management plan is speculative. For the purpose of assessing the impacts of the various alternatives, habitat conditions in the HAAF parcel under future without-project conditions are assumed to be the same as existing conditions.

The SLC parcel is currently open space and is not being actively managed. The current acreage and distribution of habitat types in the SLC parcel would continue under future without-project conditions because land uses in the area are not expected to change.

For the purposes of this analysis, two baseline conditions were evaluated. For comparison with Alternatives 2 and 3, baseline conditions are represented by existing conditions in the HAAF parcel. For comparison with Alternatives 4 and 5, baseline conditions are represented by existing conditions in the HAAF and SLC parcels.

Alternative 2: Restoration of Wetlands in the HAAF Parcel through Natural Sedimentation

Under Alternative 2, tidal wetlands would be restored in the HAAF parcel through the process of natural sedimentation. A cross-panhandle levee on the HAAF parcel and a perimeter levee surrounding the area of the HAAF parcel proposed for tidal marsh restoration would be constructed and the bayward levee would be breached. Dredged material would not be used to restore wetlands.

Restoration Targets

The ultimate objective for a fully functioning wetland restoration project under Alternative 2 is to create tidal coastal salt marsh, seasonal wetlands, and grasslands. The acreage of each habitat type created or enhanced under Alternative 2 is shown in Table 3-1. The estimated rates at which these habitat types are expected to form under Alternative 2 are shown in Figures 3-5a, 3-5b, and 3-5c. The predominant habitat type would be tidal coastal salt marsh, followed by seasonal wetland. The distribution of habitat types in the HAAF parcel is shown in Figure 3-6.

The restoration of these habitats would benefit numerous wildlife species. Restored seasonal wetlands would provide foraging habitat for wintering waterfowl and wintering and migrant shorebirds. Seasonal wetlands are also expected to provide suitable refuge habitat for shorebirds that use coastal marshes during periods of extreme high tides that inundate their coastal habitats. Restoration of coastal salt marsh and associated aquatic habitats is expected to contribute to the recovery of populations of several special-status species dependent on San Pablo Bay. The restoration of coastal salt marsh would increase the available habitat area for the endangered California clapper rail, California black rail, and salt marsh harvest mouse and two DFG-designated California Species of Special Concern, the saltmarsh common yellowthroat and San Pablo song sparrow. Restoration of subtidal, tidal, and intertidal habitats associated with restored marsh vegetation would also benefit several other special-status species that use San Pablo Bay, including the chinook salmon, Central Valley steelhead, longfin smelt, California brown pelican, and double-crested cormorant.

The tidal marsh and aquatic habitat area that would be restored under Alternative 2 is similar to that expected to be restored under Alternative 3 once the restoration has evolved to maturity except that no tidal pannes would be created under Alternative 2. Coastal salt marsh habitat areas, however, are expected to establish more slowly under Alternative 2. Consequently, less habitat area would be available for species dependent on coastal salt marsh and more habitat area would be available for species dependent on subtidal and intertidal aquatic habitats during the period when the restoration is evolving than under Alternative 3. The total area of tidal marsh and aquatic habitats restored under Alternative 2 is less than the area that would be restored under Alternatives 4 and 5.

Construction and Restoration Timing

Complete restoration of tidal wetlands under Alternative 2 is estimated to take up to 50 years. Site preparation is estimated to take 2 years to complete and would end with the breaching of the bayward levee. The proposed restoration of tidal wetlands in the HAAF parcel is characterized by the following steps, including the estimated time necessary for the restored wetlands to become fully functional:

- sediment accretion to mean high water level (year 3 through year 12),
- development of mean high water marsh plain (year 13 through year 27),
- development of mean high water marsh plain in back marsh (year 18 through year 32),
- development of mean higher high water marsh plain (year 18 through year 42), and
- development of mean higher high water marsh plain in back marsh (year 23 through year 48).

Table 3-1.
Estimated Acreage of Each Habitat Type under Alternatives 1, 2, 3, 4, and 5

	HAAF Parcel Only					HAAF and SLC Parcels				
	Alternative 1: No Action	Alternative 2[a]		Alternative 3[a]		Alternative 1: No Action	Alternative 4[a]		Alternative 5[a]	
Habitat Type		At Levee Breach	50 Years after Levee Breach	At Levee Breach	50 Years after Levee Breach		At Levee Breach	50 Years after Levee Breach	At Levee Breach	50 Years after Levee Breach
Subtidal channel/open water	0	371	26	4	26	0	585	44	5	44
Intertidal channel/mudflat	0	69	14	383	14	0	69	22	582	22
Coastal salt marsh	88	84	480	84	485	120	115	698	115	690
Tidal pannes	0	0	0	33	33	0	0	0	41	41
Tidal ponds	0	0	3	0	3	0	0	4	0	4
Nontidal wetlands										
Seasonal wetlands/ponds	20	13	13	120	62	36	13	13	120	62
Perennial emergent marsh	4	65	65	2	2	4	65	65	2	2
Perennial hypersaline pond	0	13	13	0	0	0	13	13	0	0
Perennial brackish pond	13	17	17	0	0	13	17	17	0	0
Grassland	259	36	36	41	41	493	74	74	85	85
Developed area	284	0	0	0	0	284	0	0	0	0

[a] Acreages of restored habitats were derived or estimated from Woodward-Clyde 1998.

Note: The alternatives are defined as follows:

- Alternative 2: Restoration of wetlands in the HAAF parcel through natural sedimentation
- Alternative 3: Restoration of wetlands in the HAAF parcel using dredged material
- Alternative 4: Restoration of wetlands in the HAAF and SLC parcels through natural sedimentation
- Alternative 5: Restoration of wetlands in the HAAF and SLC parcels using dredged material

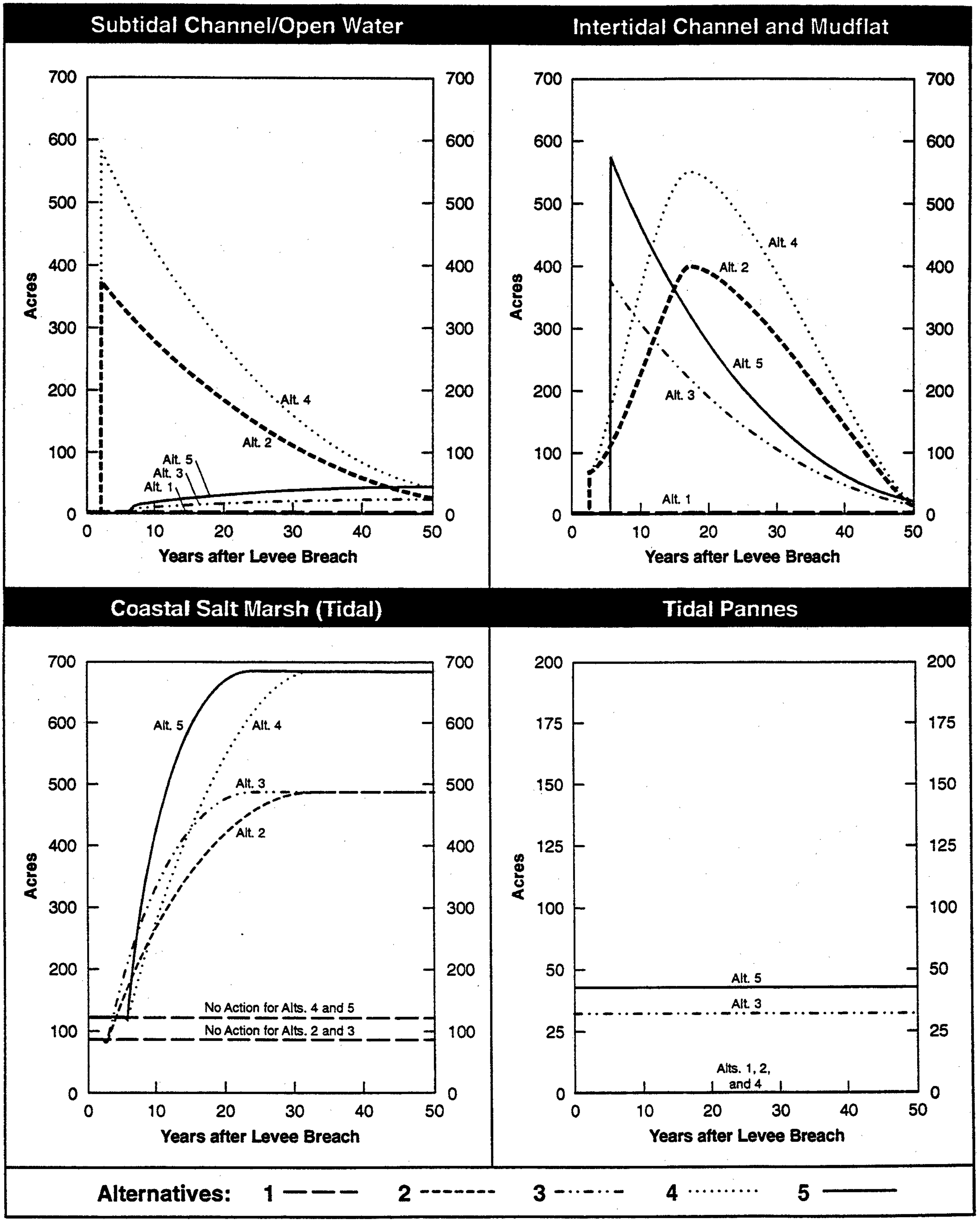

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Figure 3-5a
Habitat Acreages at Levee Breach and 50 Years after Levee Breach

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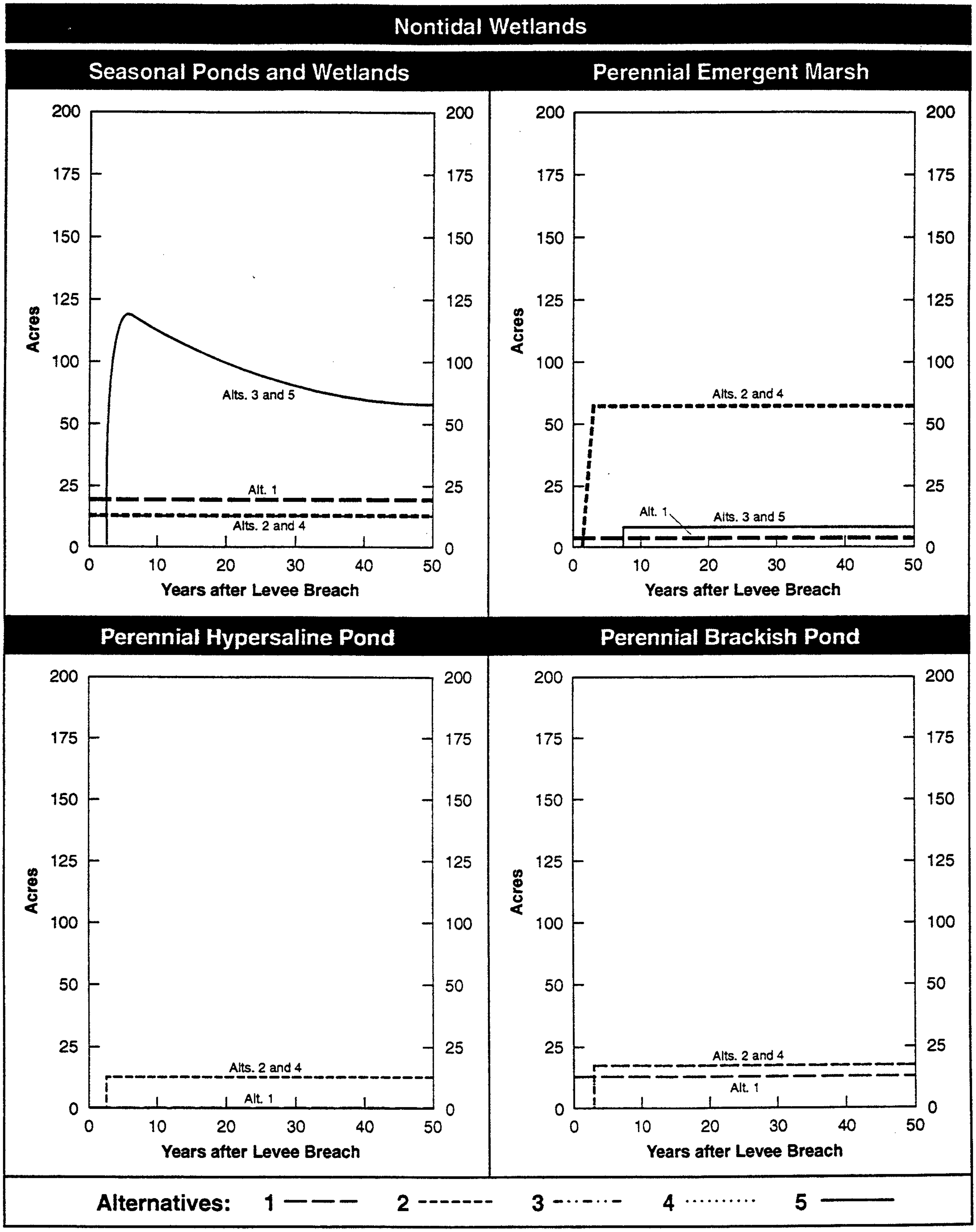

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Figure 3-5b
Habitat Acreages at Levee Breach and 50 Years after Levee Breach

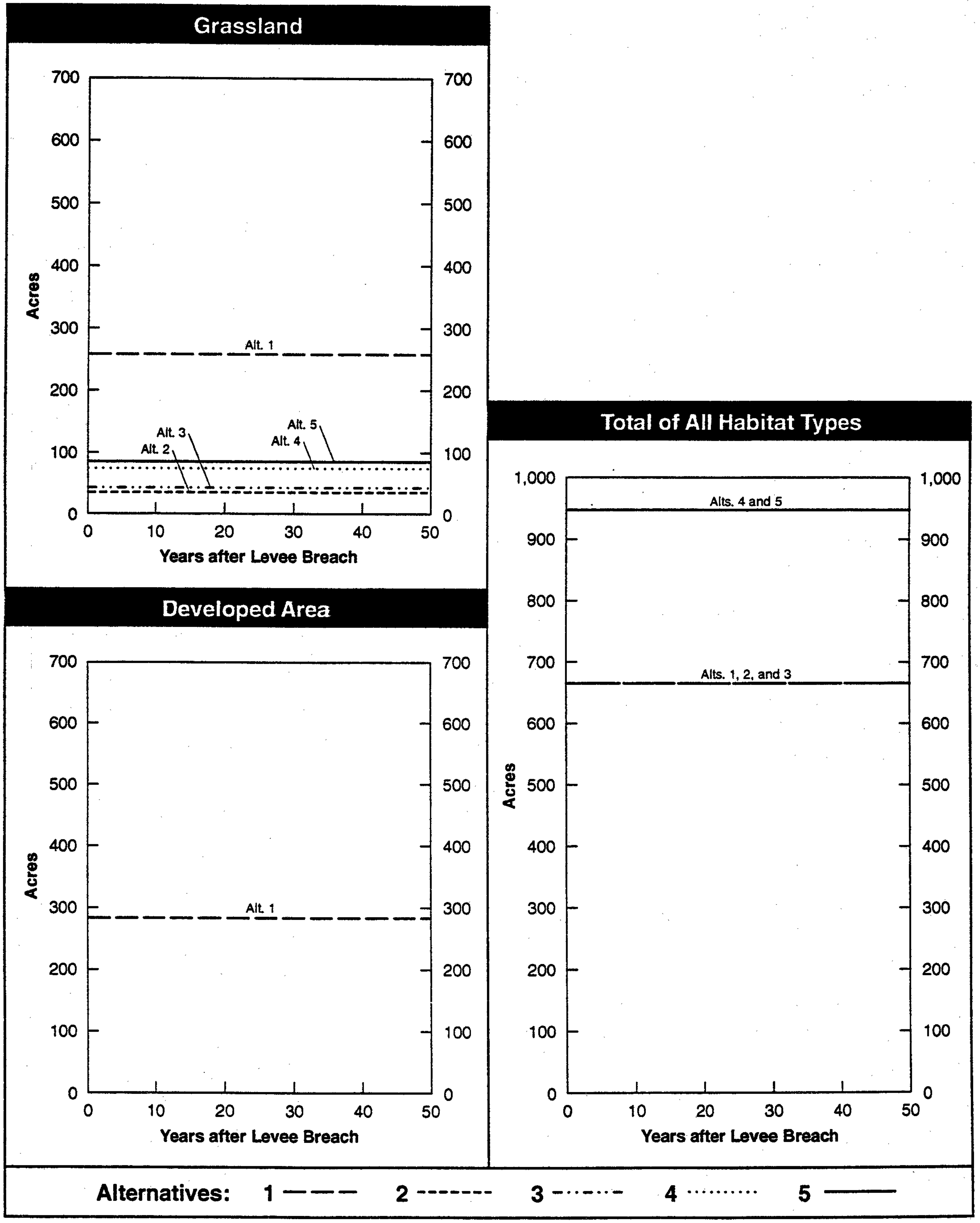

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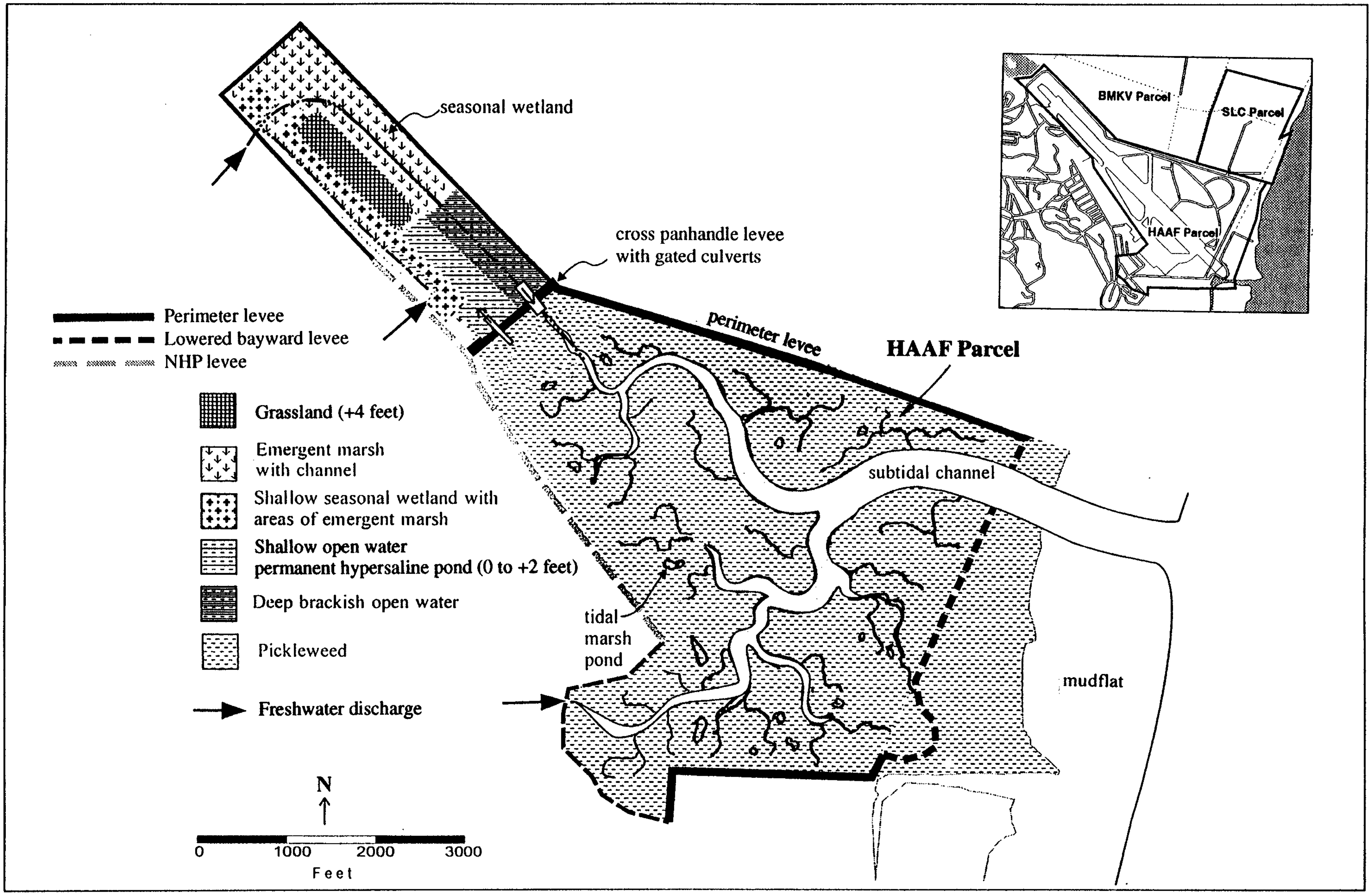
Figure 3-5c
Habitat Acreages at Levee Breach and 50 Years after Levee Breach



Source: Woodward-Clyde 1998.

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Figure 3-6
Alternative 2: Restoration of Wetlands in the HAAF Parcel through Natural Sedimentation at Maturity

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Site Preparation

Site preparation activities that would occur before the bayward levee is breached include removing remaining buildings and structures; providing temporary drainage; providing drainage from the SLC parcel; constructing perimeter levees, the cross-panhandle levee, and internal peninsulas; lowering the bayward levee; and breaching the bayward levee. The site preparation phase of the project is assumed to extend over a 2-year period.

Removing Buildings and Structures

The Army ~~may remove some of the remaining buildings and structures~~ has removed building 86 on the HAAF parcel ~~if necessary to complete the remediation of contaminated areas~~. The remaining buildings and structures ~~that may be removed by the Army have not yet been identified. The buildings and structures not removed by the Army would~~ will be removed by the Coastal Conservancy before the bayward levee is breached.

Providing Temporary Drainage

To provide temporary drainage from the HAAF parcel, drainage weirs would be installed through the outboard levee (Figure 3-7). These weirs would be removed when the bayward levee is lowered.

SLC Parcel Drainage

Drainage from the SLC parcel can enter the HAAF parcel through two 24-inch culverts located near the NSD dechlorination plant. Under Alternative 2, drainage from the SLC parcel would be blocked by the perimeter levee constructed around the HAAF parcel. The Coastal Conservancy will ensure that drainage of the SLC parcel is provided at preproject levels before the perimeter levee is constructed. Drainage from the SLC parcel could be redirected to the BMKV parcel's drainage system, or a pumping facility could be constructed that would discharge drainage water directly to San Pablo Bay.

Constructing Levees and Internal Peninsulas

Under Alternative 2, ~~7,500~~ 8,600 feet of perimeter levee would be constructed (Figure 3-8). An internal levee, ~~1,070~~ 1,100 feet long, would be constructed to separate seasonal wetlands, uplands, brackish open water, and hypersaline ponds from the tidal marsh. The cross-sectional dimensions of the perimeter and internal levees are shown in Figure 3-9. To achieve a long-term levee crest elevation of +8 feet NGVD, perimeter levees would be constructed to an elevation of +12 feet initially, to offset an estimated 4 feet of long-term settlement.

Perimeter levees would separate the HAAF parcel from the BMKV parcel, the SLC parcel, and the St. Vincent's Silveira Landholdings property. The cross-panhandle levee would protect Pacheco Pond and Landfill 26. The levee between the New Hamilton Partnership development and the HAAF parcel provides adequate flood protection to the development and would not be modified for flood control purposes. However, fill would be placed along 4,800 feet of the wetland side of the New Hamilton Partnership levee to create a wildlife corridor (Figure 3-8).

Before levee construction, a project levee and fill placement plan would be prepared. The plan would address levee and fill placement with respect to site settlement, stability of slopes, soil constraints, and potential for earthquake-induced ground failure. In addition, a ~~monitoring and inspection program~~ maintenance, monitoring, and adaptive management plan would be implemented to evaluate settlement and its effects (Appendix C).

Levee construction techniques would provide adequate stability with regard to the potential for earthquake-induced ground failure. End-of-construction conditions necessary to satisfy the stability factor of safety would be met by constructing levees with side slopes of 3:1 (horizontal to vertical) or flatter and by constructing toe berms on both sides of the perimeter levees averaging 6 feet high and 50 feet wide. The perimeter levees would have a ~~200-foot-wide~~ footprint 200 feet wide. Over time, as the levee settles and the underlying bay mud consolidates and gains strength, the stability factor of safety would increase to a level well in excess of the required stability criteria.

Internal peninsulas would be constructed with the primary objective of reducing fetch and the potential for erosion of perimeter levees from wave action. The cross-sectional dimensions of the internal peninsulas are shown in Figure 3-9.

Construction of the levees and internal peninsulas could be completed within 6-8 months. A sufficient amount of suitable material is likely to be available from the HAAF parcel for use in constructing levees and internal peninsulas; however, some material may be brought in from offsite. A specific source for this material has not been identified.

The perimeter levees for the Hamilton wetland restoration project will be designed and constructed by the Corps. Generally, the engineering and design of the levees will be in accordance with the Corps levee engineering and design manual (U.S. Army Corps of Engineers 1978). The levees will be designed for seismic stability in accordance with the levee engineering and design manual and other applicable guidelines (Hynes-Griffin and Franklin 1984, California Department of Mines and Geology 1977). The levees will be designed to withstand earthquake ground motions that have an exceedance probability of 10% in 50 years (primarily the mean peak horizontal acceleration).

Lowering the Bayward Levee

Before it is breached, most of the HAAF parcel bayward levee would be lowered to an elevation similar to the elevation of the marsh plain adjacent to the levee. Portions of the levee would remain at higher elevations to provide high tide refugia. Material removed

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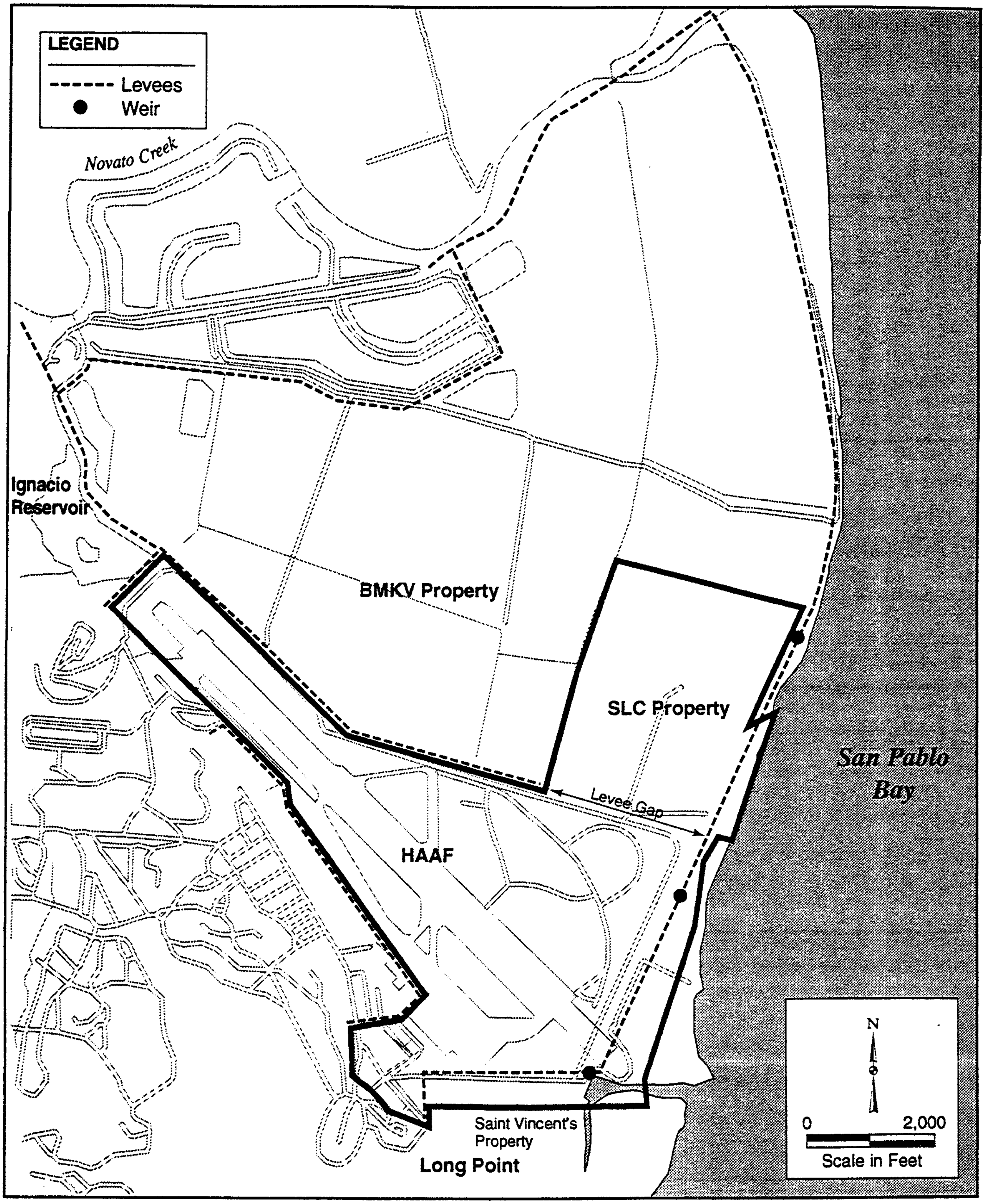

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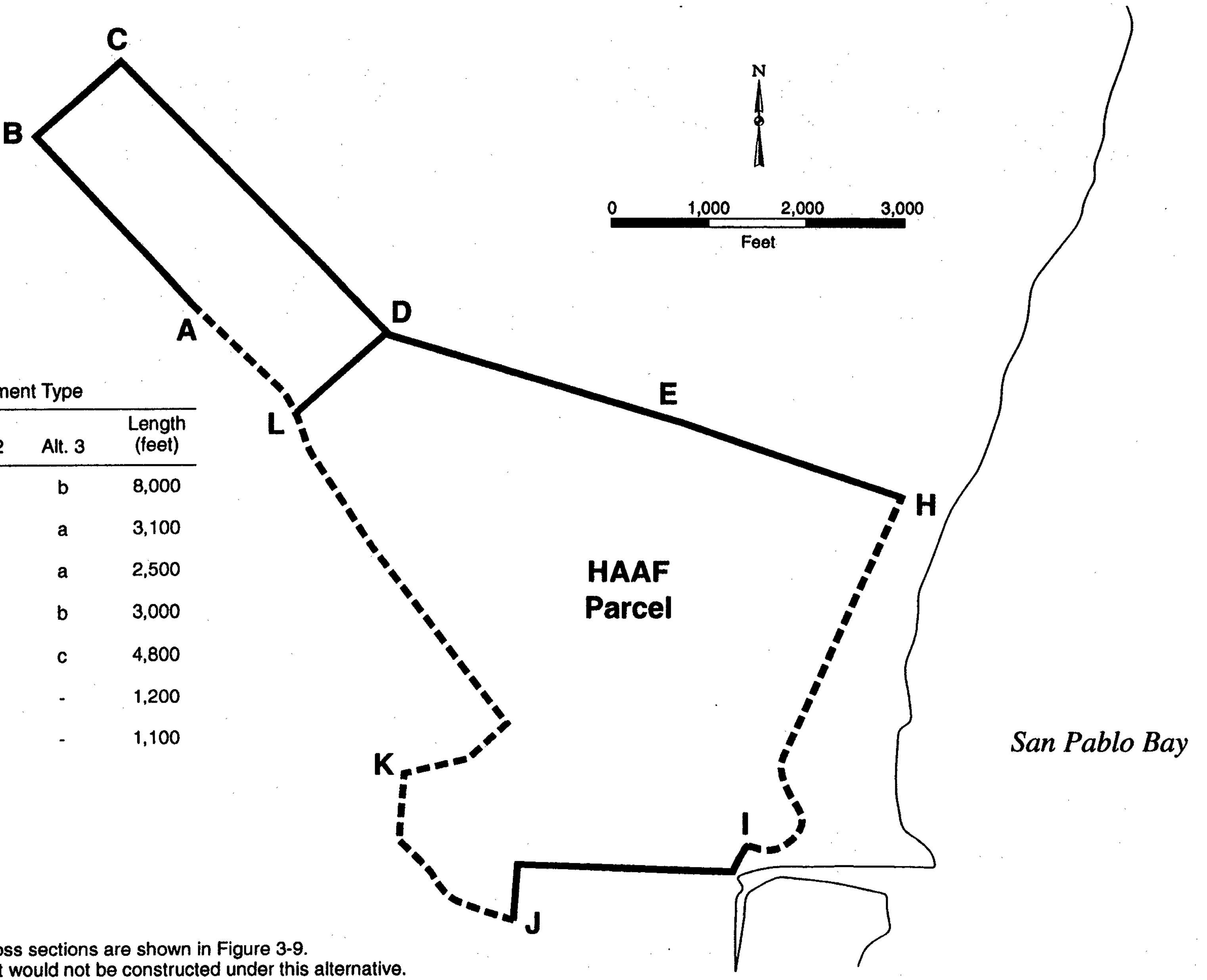
Figure 3-7
Temporary Drainage Weirs



Levee Segment	Alt. 2	Alt. 3	Length (feet)
	Segment Type		
A-B-C-D	-	b	8,000
D-E	a	a	3,100
E-H	a	a	2,500
I-J	b	b	3,000
K-L	c	c	4,800
L-A	-	-	1,200
L-D	b	-	1,100

Notes: Levee segment cross sections are shown in Figure 3-9.
- = Levee segment would not be constructed under this alternative.

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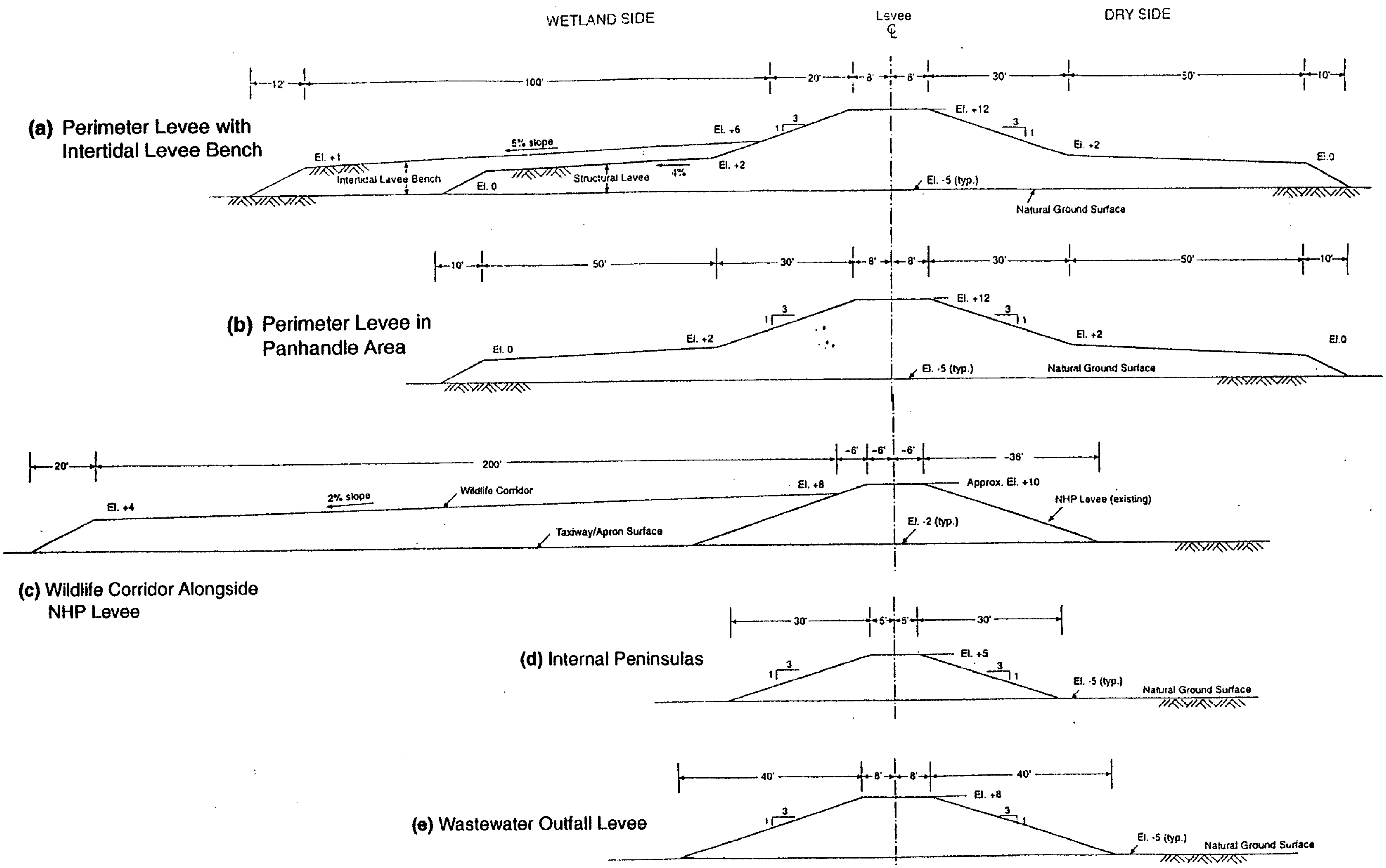
Figure 3-8
Levee Segments for Alternatives 2 and 3



Note: End-of-construction elevations shown; final evevations will be lower.

Source: Woodward - Clyde 1998.

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Figure 3-9
Typical Levee Cross Sections

from the levee would be used for construction of the perimeter levees. Approximately 3,900 feet of levee would be modified.

Breaching the Bayward Levee

After site preparation activities are completed, the levee separating the HAAF parcel from San Pablo Bay would be breached and a pilot channel would be excavated between the levee breach and San Pablo Bay (Figure 3-6). The initial size of the levee breach and pilot channel would be 280 feet wide and 200 feet long and 165 feet wide and 800 feet long, respectively.

The combined amount of material removed to breach the levee and excavate the pilot channel would be 50,500 cubic yards. The excavated material would be deposited on the HAAF parcel.

The surface area disturbed by the levee breach and pilot channel would total 4.3 acres. Excavating the levee breach and pilot channel would affect 1.3 acres of grassland and 3 acres of coastal salt marsh.

Track-mounted excavators would be used to excavate the levee breach. A 6- to 10-inch suction dredge mounted on a small barge would be used to excavate the pilot channel. Material excavated by the dredge would be pumped directly to the HAAF parcel. This method would limit the amount of coastal salt marsh disturbed during the dredging process.

Public Access

Public access to the wetland restoration site would be provided by ~~the proposed Bay Trail and spur trails. In addition to the Bay Trail proposals, HRG is proposing an alignment that would provide enhanced public access to the western side of the wetland restoration project, generally along the New Hamilton Partnership levee.~~ trails on the western side of the wetland restoration site, generally along the New Hamilton Partnership levee. In addition, the City of Novato will provide a scenic overlook on the top of Reservoir Hill. ~~Formal~~ Public access to the wetland restoration site would be limited to these points, generally located on the western edge of the site. To protect resource values, public access would not be allowed to the entire site.

Alternative 3: Restoration of Wetlands in the HAAF Parcel Using Dredged Material

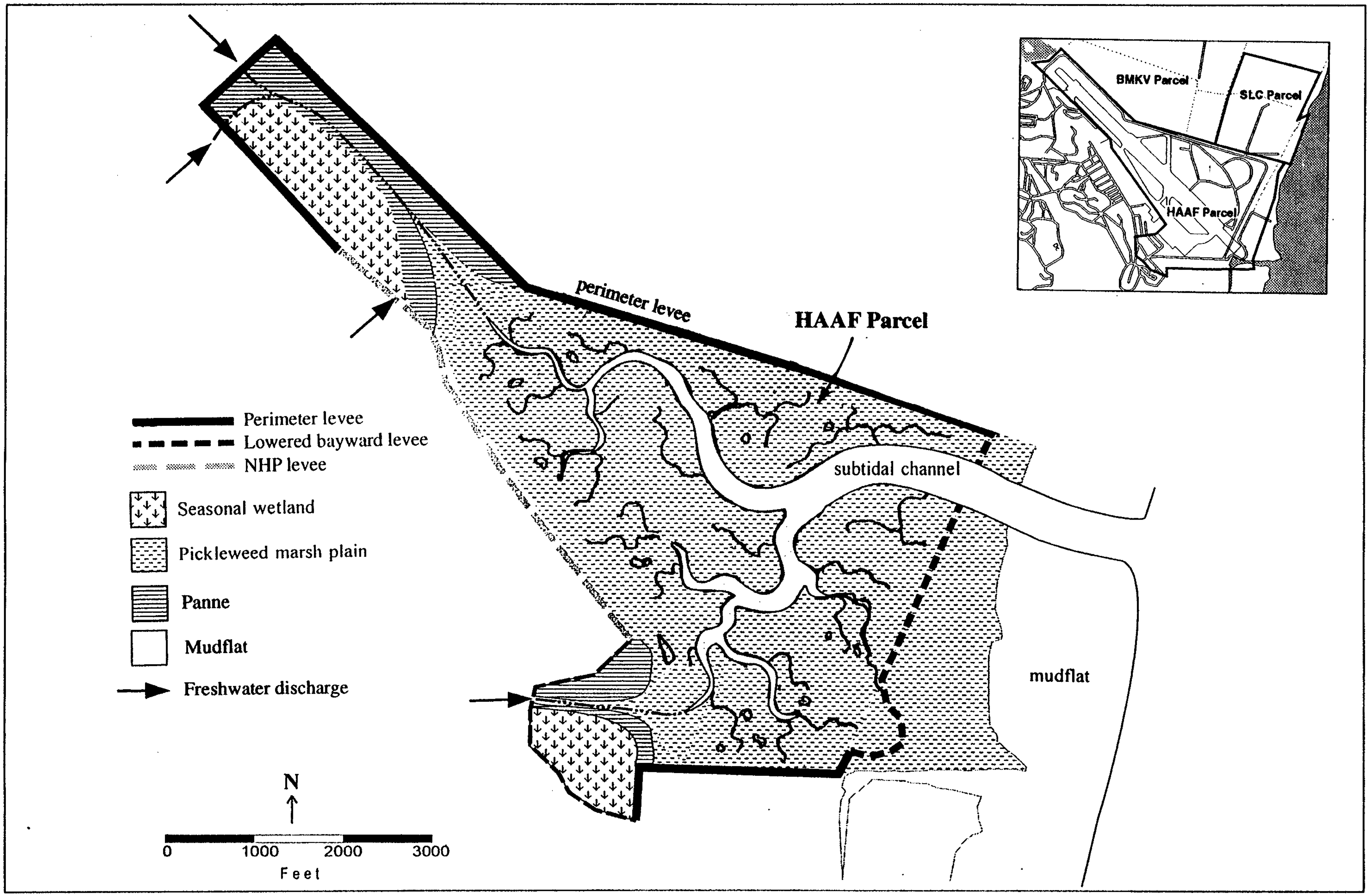
Under Alternative 3, seasonal and tidal wetlands would be restored in the HAAF parcel using dredged material in combination with natural sedimentation. Before dredged material is placed in the area, perimeter levees would be constructed; the bayward levee would be breached after dredged material is placed.

Restoration Targets

The ultimate objective for a fully functioning wetland restoration project under Alternative 3 is to create tidal coastal salt marsh, seasonal wetlands, tidal pannes, and grasslands. The acreage of each habitat type that would be created or enhanced under Alternative 3 is shown in Table 3-1. The estimated rates at which these habitat types are expected to form under Alternative 3 are shown in Figures 3-5a, 3-5b, and 3-5c. As under Alternative 2, the predominant habitat types would be tidal coastal salt marsh and seasonal wetland. Establishment of tidal pannes (a particular subtype of marsh pond) in the HAAF parcel is an additional objective of Alternative 3 not included in Alternative 2. The distribution of habitat types in the HAAF parcel is shown in Figure 3-10.

Restoration of these habitats under Alternative 3 is expected to provide benefits for special-status species that use San Pablo Bay similar to those described under Alternative 2 when the restoration has evolved to maturity. The restored coastal marsh community under Alternative 3, however, would more closely resemble the coastal salt marsh communities historically present in San Pablo Bay than under Alternative 2 because tidal pannes would be created under Alternative 3. Coastal salt marsh habitat areas are also expected to establish more rapidly under Alternative 3; consequently, more habitat area would be available for species dependent on coastal salt marsh and less habitat area would be available for species dependent on subtidal and intertidal aquatic habitats during the period when the restoration is evolving than would be available under Alternative 2. As described for Alternative 2, the total area of tidal marsh and aquatic habitats restored under Alternative 3 would be less than the area that would be restored under Alternatives 4 and 5.

Although the total acreage of the restoration project would be the same under Alternative 3 as under Alternative 2, the habitat types restored under Alternative 3 would be more diverse than those restored under Alternative 2 because of the addition of tidal pannes. When compared to Alternative 2, the use of dredged material under Alternative 3 would shorten the period needed for these habitats to become fully functional and hence would enable the project to begin providing benefits for wildlife sooner. Similar to Alternative 2, the total acreage of habitat created under Alternative 3 would be less than that created under Alternative 4 or 5.



Source: Woodward-Clyde 1998.

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Figure 3-10
Alternative 3: Restoration of Wetlands in the HAAF Parcel Using Dredged Material at Maturity

PA-01 0471

Construction and Restoration Timing

Complete restoration of wetlands under Alternative 3 is estimated to take 30 years. Site construction is estimated to take 5 years to complete and would end with the breaching of the bayward levee. This period would include the following activities:

- 2 years for site preparation,
- 1 year to place dredged material for restoration of seasonal wetland, and
- 3 years to place dredged material for restoration of tidal wetlands.

The proposed restoration of wetlands in the HAAF parcel is characterized by the following steps, including the estimated time necessary for the restored wetlands to become fully functional:

- sediment accretion to mean high water level (year 7 through year 10),
- development of mean high water marsh plain (year 12 through year 21), and
- development of mean higher high water marsh plain (year 17 through year 31).

An important advantage in the use of dredged material is the reduction in the time necessary for restored wetlands to become fully functional. For example, the period over which the mean high water marsh plain is expected to be completely developed would be 6 years shorter under Alternative 3 than under Alternative 2, and the period over which the mean higher high water marsh plain is expected to develop would be 10 years shorter.

Site Preparation and Placement of Dredged Material

Site preparation activities that would occur under Alternative 3 include removing remaining buildings and structures, providing temporary drainage, providing drainage from the SLC parcel, installing ~~a~~ hydraulic off-loaders and piping to transport dredged materials, constructing perimeter levees and internal peninsulas, lowering the bayward levee, and breaching the bayward levee. Site preparation activities would extend over a 2-year period.

Removing Buildings and Structures

The Army ~~may remove some of the remaining buildings and structures~~ has removed building 86 on the HAAF parcel ~~if necessary to complete the remediation of contaminated areas~~. The remaining buildings and structures ~~that may be removed by the Army have not yet been identified. The buildings and structures not removed by the Army would~~ will be removed by the Coastal Conservancy before the bayward levee is breached.

Providing Temporary Drainage

To provide temporary drainage for rainfall and process water from the HAAF parcel, drainage weirs would be installed through the outboard levee (Figure 3-7). These weirs would be removed when the bayward levee is lowered.

SLC Parcel Drainage

Drainage from the SLC parcel can enter the HAAF parcel through two 24-inch culverts located near the NSD dechlorination plant. Under Alternative 3, drainage from the SLC parcel would be blocked by the perimeter levee constructed around the HAAF parcel. The Coastal Conservancy will ensure that drainage of the SLC parcel is provided at preproject levels before the perimeter levee is constructed. Drainage from the SLC parcel could be redirected to the BMKV parcel's drainage system, or a pumping facility could be constructed that would discharge drainage water directly to San Pablo Bay.

Installing and Operating Hydraulic Off-Loaders and Piping

~~To allow the use of dredged material under Alternative 3, a hydraulic off-loader would be placed in San Pablo Bay and piping would be installed to connect the off-loader to the HAAF parcel. The off-loader would be located as much as 34,000 feet offshore but away from major shipping routes (Figure 3-11). The off-loader would be powered by electricity and could be in operation as long as 4 years. Although the exact timing of delivery of dredged material to the off-loader is not known, off-loading could occur at any time during the construction period.~~

~~The off-loader and piping would be properly marked and lighted, consistent with U.S. Coast Guard regulations, to prevent navigational hazards to watercraft using the area at all times of the day and night. The U.S. Coast Guard would be notified to include an update on project activities in its Information Notice to Mariners.~~

To allow the use of dredged material under Alternative 3, two hydraulic off-loaders would be placed in San Pablo Bay, and piping would be installed to connect the off-loaders to the HAAF parcel. One off-loader would be placed in a deep water location and one in a shallow water location. Both off-loaders would be located in western San Pablo Bay but away from major shipping routes (Figure 3-11). The deep water off-loader would be located from 24,000 to 34,000 feet from the project site. The shallow water off-loader site would be located from 15,000 to 25,000 feet from the project site. The off-loaders would be powered by electricity and could be in operation for as long as 4 years. Electricity would be provided by a submerged 12.5-kilovolt power cable via either Point San Pablo or San Rafael Rock Quarry. The cable would be laid and marked in a manner to prevent any land, shore, or navigation hazards. This type of power supply is standard in the dredging industry. Although the exact timing of delivery of dredged material to the off-loaders is unknown, off-loading could occur at any time during the construction period.

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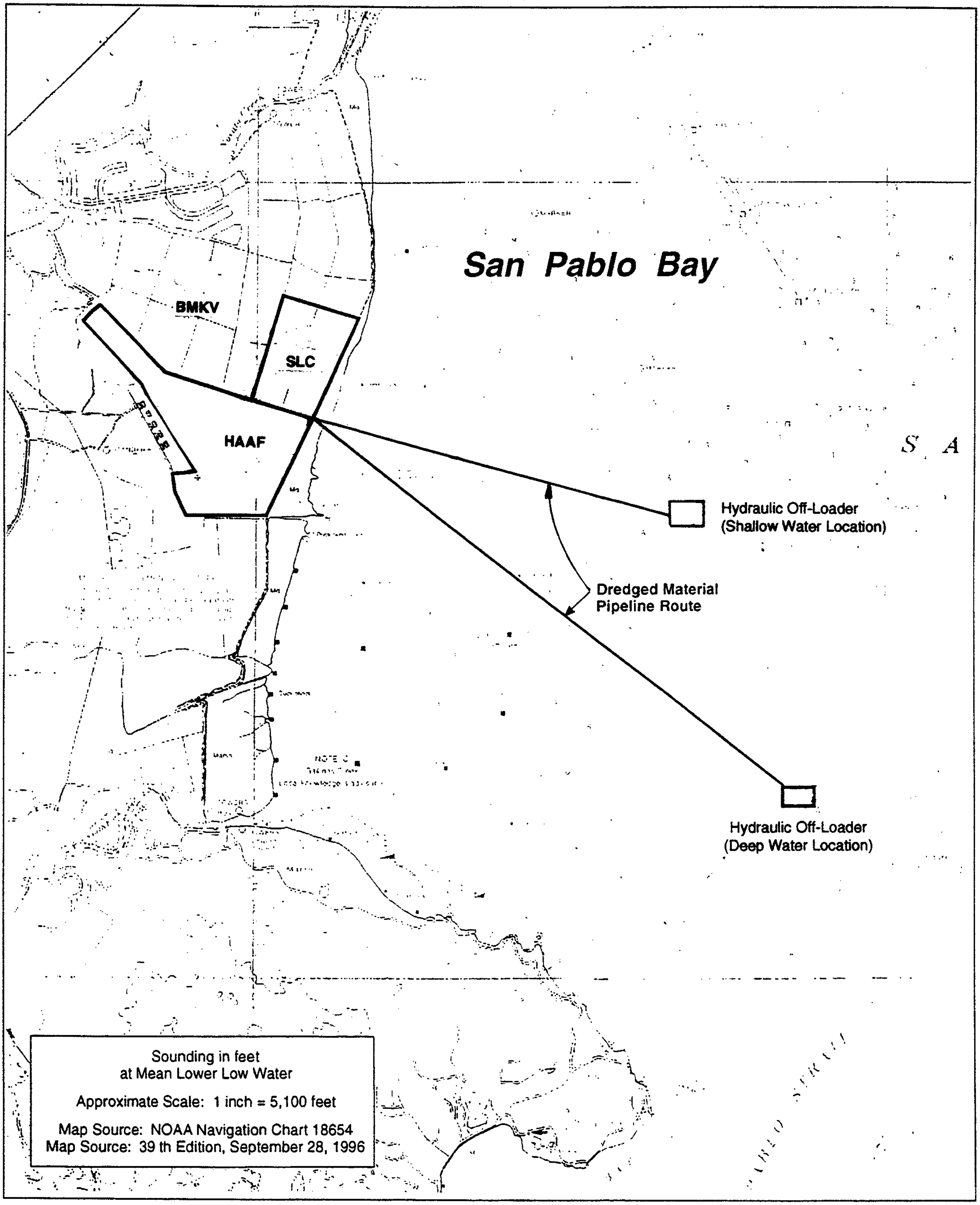

Source: Woodward-Clyde 1998.

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Figure 3-11
Location of Hydraulic Off-Loaders and Pipeline Routes

The off-loaders and piping would be properly marked and lighted, consistent with U.S. Coast Guard regulations, to prevent navigational hazards to watercraft using the area at all times of the day and night. The U.S. Coast Guard would be notified to include an update on project activities in its Information Notice to Mariners.

Constructing Levees and Internal Peninsulas

Under Alternative 3, ~~13,800~~ 16,600 feet of perimeter levee would be constructed (Figure 3-8). The cross-sectional dimensions of the perimeter and internal levees are shown in Figure 3-9. Perimeter levees would separate the HAAF parcel from Landfill 26, the BMKV parcel, the SLC parcel, and the St. Vincent's and Las Gallinas Sanitary District properties. The levee between the New Hamilton Partnership development and the HAAF parcel provides adequate flood protection to the development and would not be modified for flood control purposes. However, fill would be placed on the wetland side of the New Hamilton Partnership levee to create a wildlife corridor (Figure 3-9). To achieve a long-term levee crest elevation of +8 feet NGVD, perimeter levees would be constructed to an elevation of +12 feet initially, to accommodate an estimated 4 feet of long-term settlement.

Before levee construction, a project levee and fill placement plan would be prepared. The plan would address levee and fill placement with respect to site settlement, stability of slopes, soil constraints, and potential for earthquake-induced ground failure. In addition, a ~~monitoring and inspection program~~ maintenance, monitoring, and adaptive management plan would be implemented to evaluate settlement and its effects (Appendix C).

Levee construction techniques would provide adequate stability with regard to the potential for earthquake-induced ground failure. End-of-construction conditions necessary to satisfy the stability factor of safety would be met by constructing levees with side slopes of 3:1 (horizontal to vertical) or flatter and by constructing toe berms on both sides of the perimeter levees averaging 6 feet high and 50 feet wide. The perimeter levees would have a ~~200-foot-wide~~ footprint 200 feet wide. Over time, as the levee settles and the underlying bay mud consolidates and gains strength, the stability factor of safety would increase to a level well in excess of the required stability criteria.

Internal peninsulas would be constructed with the primary objective of reducing fetch and the potential for erosion of perimeter levees from wave action. The cross-sectional dimensions of the internal peninsulas are shown in Figure 3-9.

Construction of the levees and internal peninsulas could be completed within 6-8 months. A sufficient amount of suitable material is likely to be available from the HAAF parcel for use in constructing levees and internal peninsulas; however, some material may be brought in from offsite. A specific source for this material has not been identified.

The perimeter levees for the Hamilton wetland restoration project will be designed and constructed by the Corps. Generally, the engineering and design of the levees will be in accordance with the Corps levee engineering and design manual (U.S. Army Corps of Engineers 1978). The levees will be designed for seismic stability in accordance with the levee engineering and design manual and other applicable guidelines (Hynes-Griffin and Franklin 1984, California Department of Mines and Geology 1977). The levees will be designed to withstand earthquake ground motions that have an exceedance probability of 10% in 50 years (primarily the mean peak horizontal acceleration).

Lowering the Bayward Levee

Before it is breached, most of the HAAF parcel bayward levee would be lowered to an elevation similar to the elevation of the marsh plain adjacent to the levee. Portions of the levee would remain at higher elevations to provide high tide refugia. Material removed from the levee would be used for construction of the perimeter levees. Approximately 3,900 feet of levee would be modified.

Breaching the Bayward Levee

After construction of perimeter levees and placement of dredged material is completed, the levee separating the HAAF parcel from San Pablo Bay would be breached and a pilot channel would be excavated between the levee breach and San Pablo Bay (Figure 3-9). The levee breach would be 280 feet wide and 200 feet long. The pilot channel would be 165 feet wide and 800 feet long.

The combined amount of material removed to breach the levee and excavate the pilot channel would be 50,500 cubic yards. Excavated material would be deposited on the HAAF parcel.

The surface area disturbed by the levee breach and pilot channel would total 4.3 acres. Excavating the levee breach and pilot channel would affect 1.3 acres of grassland and 3 acres of coastal salt marsh.

Track-mounted excavators would be used to excavate the levee breach. A 6- to 10-inch suction dredge mounted on a small barge would be used to excavate the pilot channel. Material excavated by the dredge would be pumped directly to the HAAF parcel. This method would limit the amount of coastal salt marsh disturbed during the dredging process. Regardless of the availability of sediments, the levee breach would be completed no later than 6 years after site preparation begins.

Source of Dredged Material

Dredged material for the wetland restoration project could originate from many sources. One of the most likely sources is the Oakland Harbor navigation improvement project. Other potential sources of material are the Concord Naval Weapons Station, Southampton Shoal, Richmond Harbor, Port Sonoma, Bel Marin Keys, and Bahia Lagoon. Evaluating impacts associated with dredging and transporting material to the off-loaders is assumed to be the responsibility of the sponsor of each dredging project. An EIR/EIS was recently completed on the Oakland Harbor navigation improvement project (U.S. Army Corps of Engineers and Port of Oakland 1998a, 1998b, 1998c, and 1998d). That document addressed impacts associated with transporting dredged material to the HAAF parcel and concluded that transporting material on barges would not result in significant impacts on the environment.

Suitability of Dredged Material

The suitability of dredged material for the project site will be determined through the existing testing and suitability framework used by the state and federal agencies charged with approving disposal of material dredged from San Francisco Bay: the RWQCB, BCDC, EPA, and the Corps.

These agencies have established a cooperative DMMO, which makes joint recommendations on the suitability of dredged material for proposed disposal sites. The agencies require dredging project applicants to sample and test sediments proposed to be dredged for chemical constituents of concern and for toxicity, using protocols acceptable to the agencies. The adequacy of the sampling and testing is evaluated by the DMMO, which then reviews the test results to evaluate the acceptability of the dredged material for disposal at proposed sites in the bay, ocean, wetland, or upland environments.

To aid in determining the suitability of dredged material for use in wetland environments, the RWQCB has developed guidelines, known as the Wolfenden and Carlin guidelines (Wolfenden and Carlin 1992), that identify acceptable contaminant levels for use in wetlands projects. The DMMO will use these or updated guidelines and other pertinent information to assess any dredged material proposed for use at the project site. Although the Wolfenden and Carlin document specifies slightly differing guidelines for "cover" material (which can be used anywhere in a wetland) and "noncover" material (which needs to be properly buried), only material appropriate for "cover" as determined by the DMMO will be accepted for use at the project site. Separate tests for contaminant leaching are used to evaluate the acceptability of material for upland disposal. Only material found suitable by the DMMO will be used as part of the upland components of the project.

Placement of Dredged Material

The time elapsed between the initiation of site preparation activities to place dredged material and breaching of the levee on the HAAF parcel is expected to be 5 years and could extend to a maximum of 6 years. Placement of dredged material on the HAAF parcel could be divided between nontidal areas and the remaining portion of the parcel, with sediment placement occurring either sequentially or concurrently. The specific sediment timing and locations of levee breaches would depend on the availability of dredged material and the feasibility of constructing the two areas in separate phases. However, the wetland restoration project could begin to accept dredged material during the site preparation phase.

Routine maintenance dredging could provide, on average, as much as 2.2 million cubic yards of dredged sediment per year. However, the schedule for placement of material assumes that 1.4 million cubic yards per year of sediment are actually dredged. The actual annual dredging volumes are dependent on many factors. For example, dredged sediment may be available from new channel and harbor deepening projects, which would shorten the overall construction schedule. Placement of dredged material in the seasonal wetland will be engineered to ensure impermeability of the surface for seasonal ponding and to minimize cracking during the dry season.

Control of Process Water

The off-loading of dredged material would involve mixing the material with water to allow pumping. After the dredged material slurry is placed, the water would separate from the material and would eventually be discharged to San Pablo Bay. Certain options have been proposed that would ensure that the process water does not violate water quality standards when discharged to the bay. The most viable option is to hold the water in a confined basin within the restoration site for subsequent discharge.

Water quality standards will be specified in the waste discharge requirement stipulated by the RWQCB. The discharge standards for the process water will meet RWQCB standards before water is discharged to the bay.

Public Access

Public access to the wetland restoration site would be provided by ~~the proposed Bay Trail and spur trails. In addition to the Bay Trail proposals, HRG is proposing an alignment that would provide enhanced public access to the western side of the wetland restoration project, generally along the New Hamilton Partnership levee.~~ trails on the western side of the wetland restoration site, generally along the New Hamilton Partnership levee. In addition, the City of Novato will provide a scenic overlook at the top of Reservoir Hill. ~~Formal~~ Public access to the wetland restoration site would be limited to these points, generally located on the western edge of the site. To protect resource values, public access would not be allowed to the entire site.

Alternative 4: Restoration of Wetlands in the HAAF and SLC Parcels through Natural Sedimentation

Under Alternative 4, wetlands would be restored in the HAAF and SLC parcels by the process of natural sedimentation. A cross-panhandle levee on the HAAF parcel and perimeter levees separating the tidal wetlands on the HAAF and SLC parcels from the BMKV parcel would be constructed and the bayward levee would be breached. Although wetlands in both the HAAF and SLC parcels would be restored, the two parcels would not be hydrologically connected because of the need to maintain operation of and access to the NSD outfall pipeline. Dredged material would not be used to restore wetlands under this alternative. Internal peninsulas designed to reduce wave erosion would be constructed on the HAAF parcel only. On the SLC parcel, additional material would be placed along perimeter levees to offset wave erosion.

Restoration Targets

The ultimate objective of a fully functioning wetland restoration project under Alternative 4 is to create tidal coastal salt marsh, seasonal wetlands, and grasslands. The acreage of each habitat type created or enhanced under Alternative 4 is shown in Table 3-1. The estimated rates at which these habitat types are expected to form under Alternative 4 are shown in Figures 3-5a, 3-5b and 3-5c. The predominant habitat type would be tidal coastal salt marsh, followed by seasonal wetland. The distribution of habitat types across the restored wetlands is shown in Figure 3-12.

Habitats restored under Alternative 4 are expected to provide benefits for special-status species that use San Pablo Bay similar to those described under Alternatives 2 and 3. Because a substantially larger area of tidal coastal salt marsh would be restored, however, the magnitude of benefits for these species is also expected to be substantially greater. The area of tidal marsh and aquatic habitats that would be restored under Alternative 4 is similar to that expected to be restored under Alternative 5 once the restoration has evolved to maturity. Coastal salt marsh habitat areas, however, are expected to establish more slowly under Alternative 4; consequently, less habitat area would be available for species dependent on coastal salt marsh and more habitat area would be available for species dependent on subtidal and intertidal aquatic habitats during the period when the restoration is evolving than would be available under Alternative 5. The total area of tidal marsh and aquatic habitats restored under Alternative 4 is greater than the area that would be restored under Alternatives 2 and 3.

Although the total acreage of the restoration project would be the same under Alternative 4 as under Alternative 5, the habitat types restored under Alternative 4 would be less diverse because tidal pannes would not be created. In addition, the period necessary for habitat to become functional and begin to benefit wildlife would be longer because dredged material would not be used. However, similar to Alternative 5, the total acreage of habitat created would be greater when compared to Alternatives 2 and 3.

Construction and Restoration Timing

Complete restoration of wetlands under Alternative 4 is estimated to take up to 50 years. Site preparation is estimated to take 2 years to complete and would end with the breaching of the bayward levee. The proposed restoration of wetlands in the HAAF and SLC parcels is characterized by the following steps, including the estimated time necessary for the restored wetlands to become fully functional:

- ✦ sediment accretion to mean high water level (HAAF and SLC parcels: year 3 through year 26),
- ✦ development of mean high water marsh plain (HAAF parcel: year 13 through year 27; SLC parcel: year 18 through year 32),
- ✦ development of mean high water marsh plain in back marsh (HAAF and SLC parcels: year 18 through year 32),
- ✦ development of mean higher high water marsh plain (HAAF parcel: year 18 through year 42; SLC parcel: year 23 through year 48), and
- ✦ development of mean higher high water marsh plain in back marsh (HAAF parcel: year 23 through year 48).

Site Preparation

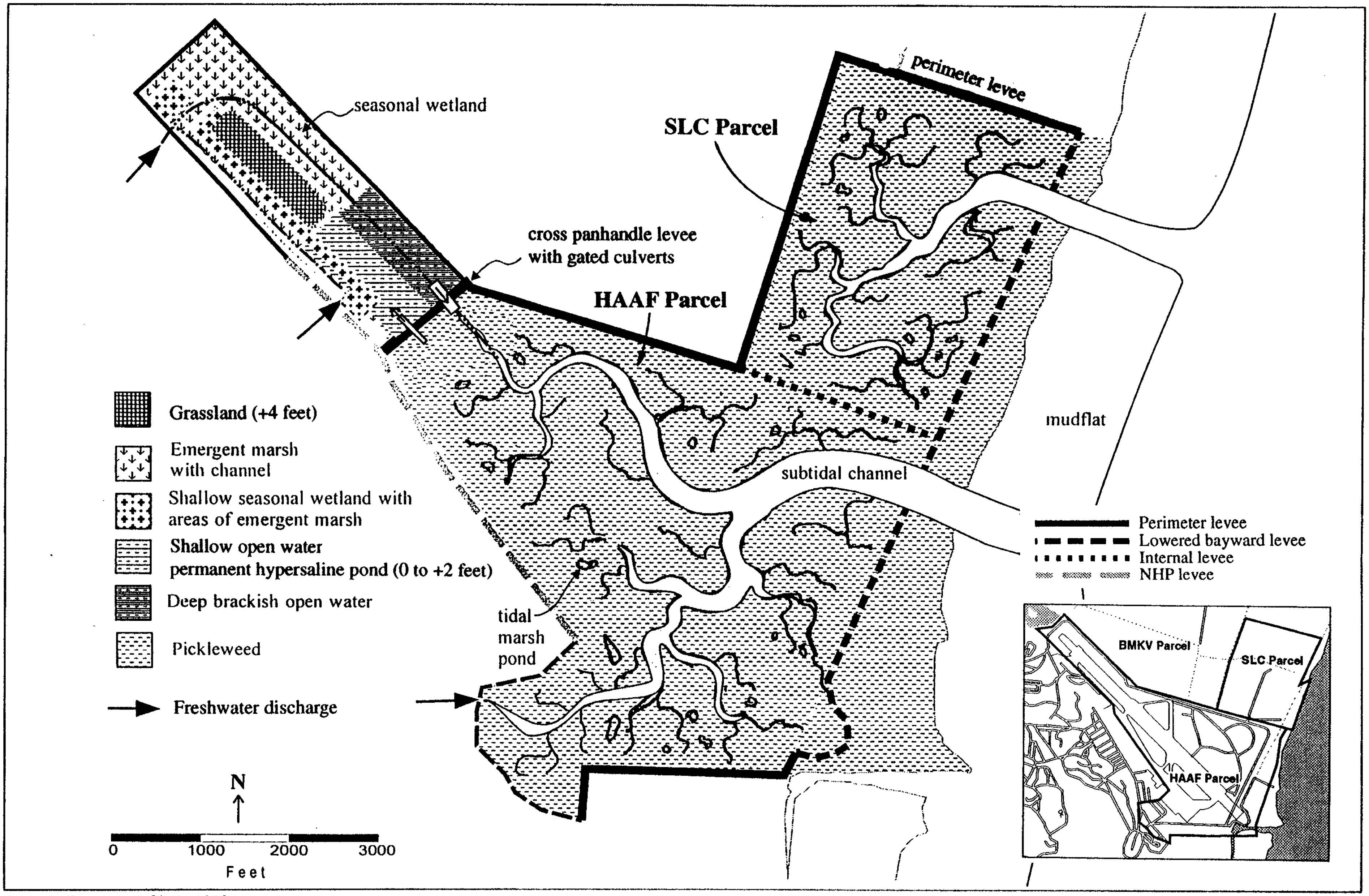
Site preparation activities that would occur under Alternative 4 include removing remaining buildings and structures, providing temporary drainage, relocating the NSD dechlorination plant; modifying the NSD outfall pipeline; constructing perimeter levees, berms, the cross-panhandle levee, and internal peninsulas; lowering the bayward levees; and breaching the bayward levees. The site preparation phase of the project is assumed to extend over a 2-year period.

Removing Buildings and Structures

The Army ~~may remove some of the remaining buildings and structures~~ has removed building 86 on the HAAF parcel ~~if necessary to complete the remediation of contaminated areas~~. The remaining buildings and structures ~~that may be removed by the Army have not yet been identified. The buildings and structures not removed by the Army would~~ will be removed by the Coastal Conservancy before the bayward levee is breached.

Providing Temporary Drainage

To provide temporary drainage from the HAAF parcel, drainage weirs would be installed through the outboard levee (Figure 3-7). These weirs would be removed when the bayward levee is lowered.



Source: Woodward-Clyde 1998.

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Figure 3-12
Alternative 4: Restoration of Wetlands in the HAAF and SLC Parcels through Natural Sedimentation at Maturity

Relocating and Modifying NSD Facilities

Before the levees are constructed between the HAAF parcel and the BMKV and SLC parcels, the NSD dechlorination plant would be relocated and the outfall pipeline would be modified.

The NSD dechlorination plant would be relocated to NSD's Ignacio Treatment Plant, Novato Treatment Plant, or another suitable location. Relocating the dechlorination plant would avoid the need to provide an alternative power supply to the plant and would make the plant more easily accessible to NSD personnel for ~~operational~~ operation and maintenance~~ purposes~~.

The portion of the outfall pipeline that crosses the SLC parcel would be modified to avoid damage that could be caused by placing fill over the pipeline during construction of the perimeter levee between the SLC and BMKV parcels and the levee between the HAAF and SLC parcels. Depths of new fill placed over the pipeline would be 17 feet where the pipeline crosses under the new levee between the SLC and BMKV parcels and 8-10 feet where the pipeline runs parallel to the new levee between the SLC and HAAF parcels. Damage to the pipeline would be avoided by using site-specific soil treatments to avoid settling and sliplining or by constructing the pipeline with flexible couplings.

Constructing Levees and Internal Peninsulas

Under Alternative 4, ~~11,000~~ 12,400 feet of perimeter levee would be constructed (Figure 3-13). An internal levee, ~~1,070~~ 1,100 feet long, would be constructed to separate seasonal wetlands, uplands, brackish open water, and hypersaline ponds from the tidal marsh. The cross-sectional dimensions of the perimeter and internal levees are shown in Figure 3-9. To achieve a long-term levee crest elevation of +8 feet NGVD, perimeter levees would be constructed to an elevation of +12 feet initially, to accommodate an estimated 4 feet of long-term settlement.

Perimeter levees would separate the HAAF parcel from the BMKV parcel and the St. Vincent's and Las Gallinas Sanitary District properties. The internal levee would protect Pacheco Pond and Landfill 26. The levee between the New Hamilton Partnership development and the HAAF parcel provides adequate flood protection to the development and would not be modified for flood control purposes. However, fill would be placed along 4,800 feet of the wetland side of the New Hamilton Partnership levee to create a wildlife corridor (Figure 3-9).

Before levee construction, a project levee and fill placement plan would be prepared. The plan would address levee and fill placement with respect to site settlement, stability of slopes, soil constraints, and potential for earthquake-induced ground failure. In addition, a ~~monitoring and inspection program~~ maintenance, monitoring, and adaptive management plan would be implemented to evaluate settlement and its effects (Appendix C).

Levee construction techniques would provide adequate stability with regard to the potential for earthquake-induced ground failure. End-of-construction conditions necessary to satisfy the stability factor of safety would be met by constructing levees with side slopes of 3:1 (horizontal to vertical) or flatter and by constructing toe berms on both sides of the perimeter levees averaging 6 feet high and 50 feet wide. The perimeter levees would have a ~~200-foot-wide~~ footprint 200 feet wide. Over time, as the levee settles and the underlying bay mud consolidates and gains strength, the stability ~~factor of safety~~ would increase to a level well in excess of ~~the~~ required stability criteria.

Internal peninsulas would be constructed in the HAAF parcel only. The primary objective of the peninsulas is to reduce fetch and the potential for erosion of perimeter levees from wave action. The cross-sectional dimensions of the internal peninsulas are shown in Figure 3-9.

Internal peninsulas would not be constructed on the SLC parcel. As an alternative to constructing internal peninsulas, additional material would be added to the SLC parcel perimeter levees. By design, the additional material would erode and protect the integrity of the perimeter levee. Use of the two erosion control methods would allow a comparative assessment of the costs and benefits of each method.

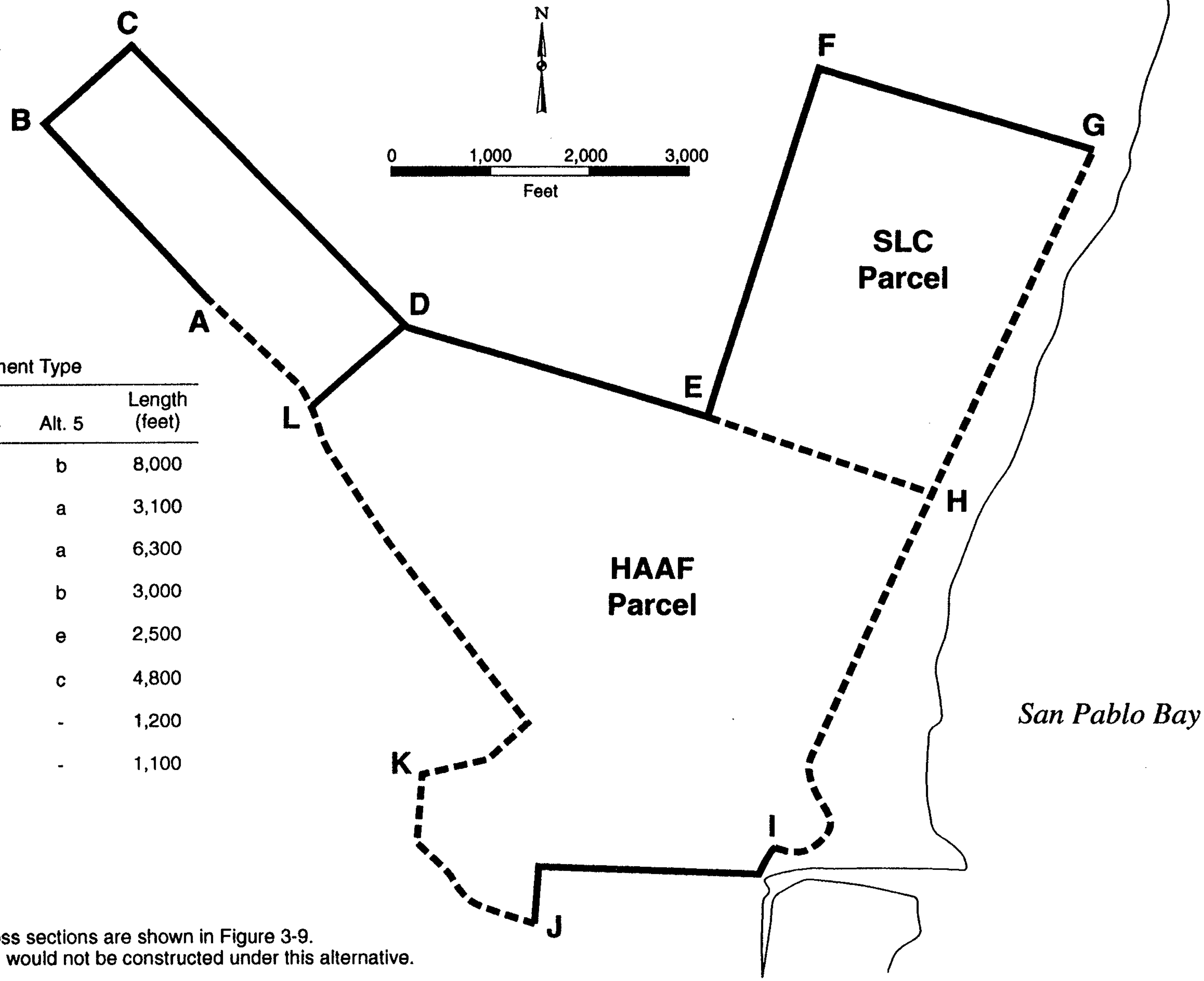
Construction of the levees and internal peninsulas could be completed within 6-8 months. A sufficient amount of suitable material is likely to be available from the HAAF and SLC parcels for use in constructing levees and internal peninsulas; however, some material may be brought in from offsite. A specific source for this material has not been identified.

The perimeter levees for the Hamilton wetland restoration project will be designed and constructed by the Corps. Generally, the engineering and design of the levees will be in accordance with the Corps levee engineering and design manual (U.S. Army Corps of Engineers 1978). The levees will be designed for seismic stability in accordance with the levee engineering and design manual and other applicable guidelines (Hynes-Griffin and Franklin 1984, California Department of Mines and Geology 1977). The levees will be designed to withstand earthquake ground motions that have an exceedance probability of 10% in 50 years (primarily the mean peak horizontal acceleration).

Lowering the Bayward Levees

Before they are breached, most of the bayward levees on the HAAF and SLC parcels would be lowered to an elevation similar to the elevation of the marsh plain adjacent to the levee. Portions of the levees would remain at higher elevations to provide high tide refugia. Material removed from the levees would be used for construction of the perimeter levees. A total of 3,900 feet of levee on the HAAF parcel and 3,350 feet of levee on the SLC parcel would be modified.

Levee Segment	Segment Type Alt. 4	Alt. 5	Length (feet)
A-B-C-D	-	b	8,000
D-E	a	a	3,100
E-F-G	a	a	6,300
I-J	b	b	3,000
E-H	e	e	2,500
K-L	c	c	4,800
L-A	-	-	1,200
L-D	b	-	1,100



Notes: Levee segment cross sections are shown in Figure 3-9.
- = Levee segment would not be constructed under this alternative.

Figure 3-13
Levee Segments for Alternatives 4 and 5

Breaching the Bayward Levees

After site preparation activities are completed, the levees separating the HAAF and SLC parcels from San Pablo Bay would be breached and pilot channels would be excavated (Figure 3-12). The levee breach on the HAAF parcel would be 280 feet wide and 200 feet long and the pilot channel would be 165 feet wide and 800 feet long. The levee breach on the SLC parcel would be 220 feet wide and 50 feet long and the pilot channel would be 100 feet wide and 200 feet long.

The combined amount of material removed to breach the levees and excavate the pilot channels would be 61,800 cubic yards. Excavated material would be deposited on the HAAF and SLC parcels.

The surface area disturbed by the levee breaches and pilot channels would total 5.4 acres. Excavating the levee breaches and pilot channels would affect 1.8 acres of grassland and 3.6 acres of coastal salt marsh.

Track-mounted excavators would be used to excavate the levee breaches. A 6- to 10-inch suction dredge mounted on a small barge would be used to excavate the pilot channels. Material excavated by the dredge would be pumping directly to the HAAF and SLC parcels. This method would limit the amount of coastal salt marsh disturbed during the dredging process.

Public Access

Public access to the wetland restoration site would be provided by ~~the proposed Bay Trail and spur trails. In addition to the Bay Trail proposals, HRG is proposing an alignment that would provide enhanced public access to the western side of the wetland restoration project, generally along the New Hamilton Partnership levee.~~ trails on the western side of the wetland restoration site, generally along the New Hamilton Partnership levee. In addition, the City of Novato will provide a scenic overlook at the top of Reservoir Hill. ~~Formal~~ Public access to the wetland restoration site would be limited to these points, generally located on the western edge of the site. To protect resource values, public access would not be allowed to the entire site.

Alternative 5: Restoration of Wetlands in the HAAF and SLC Parcels Using Dredged Material

Under Alternative 5, wetlands would be restored in the HAAF and SLC parcels using dredged material and natural sedimentation. Before dredged material is placed in the area, perimeter levees would be constructed and the bayward levee would be breached. Although wetlands on both parcels would be restored, the parcels would not be hydrologically connected because of the need to maintain operation of and access to the NSD outfall pipeline. Internal peninsulas designed to reduce wave erosion would be constructed on the HAAF parcel only. On the SLC parcel, additional material would be placed along perimeter levees to offset wave erosion.

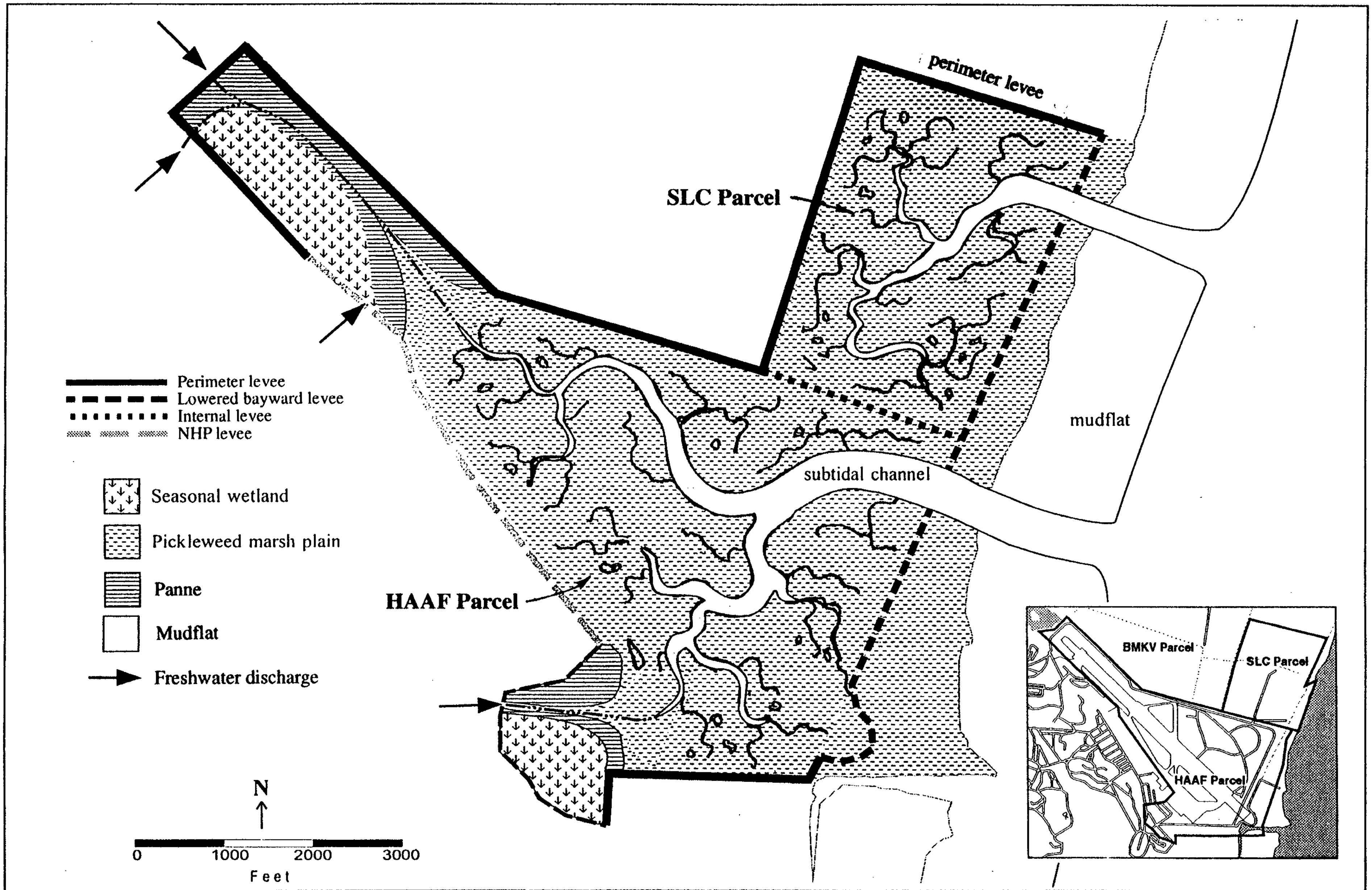
Restoration Targets

Since publication of the draft EIR/EIS, the Army has indicated that the transfer of the HAAF parcel could be modified to include a portion of the area between Landfill 26 and the present western boundary of the wetland restoration site. This area occupies approximately 14 acres and would be restored as seasonal wetlands. Because the area is currently disturbed, the Coastal Conservancy and the Corps have concluded that expanding the project to include this site is not expected to result in significant adverse environmental impacts beyond those evaluated in the following chapters. Moving the boundary of the wetland restoration project east is not expected to affect the Army's plans for addressing the issue of drainage from Landfill 26.

Including this area in the project could increase the benefits associated with the wetland restoration project and decrease site preparation costs. Wildlife dependent on seasonal wetland habitat also would benefit because the acreage of this habitat type would increase. Levee construction costs would be expected to decrease because an existing levee would form the western boundary of the restoration project. For the purposes of the following impact evaluation, the project size, habitat types and acreage, and the length of new and reconstructed levees have not changed from those evaluated in the draft EIR/EIS.

The ultimate objective of a fully functioning wetland restoration project under Alternative 5 is to create tidal coastal salt marsh, seasonal wetlands, tidal pannes, and grasslands. The acreage of each habitat type created or enhanced under Alternative 5 is shown in Table 3-1. The estimated rates at which these habitat types are expected to form under Alternative 5 are shown in Figures 3-5a, 3-5b, and 3-5c. As under Alternative 4, the predominant habitat types would be tidal coastal salt marsh and seasonal wetland. In addition, establishment of tidal pannes in the HAAF parcel is an objective of Alternative 5, similar to Alternative 3. The distribution of habitat types in the restored wetlands is shown in Figure 3-14.

Restoration of these habitats under Alternative 5 is expected to provide benefits for special-status species that use San Pablo Bay similar to those described under Alternatives 2 and 3 when the restoration has evolved to maturity. Because a substantially larger area of tidal coastal salt marsh would be restored, however, the magnitude of benefits to these species is also expected to be substantially greater. Like Alternative 3, the restored coastal marsh community under Alternative 5, however, would more closely resemble the coastal salt marsh communities historically present in San Pablo Bay than under Alternative 4 because tidal pannes would be created under Alternative 5. The area of tidal marsh and aquatic habitats that would be restored under Alternative 5 is similar to that expected to be restored under Alternative 4 once the restoration has evolved to maturity. Coastal salt marsh habitat areas, however, are also expected to establish more



Source: Woodward-Clyde 1998.

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Figure 3-14
Alternative 5: Restoration of Wetlands in the HAAF and SLC Parcels Using Dredged Material at Maturity

rapidly under Alternative 5; consequently, more habitat area would be available for species dependent on coastal salt marsh and less habitat area would be available for species dependent on subtidal and intertidal aquatic habitats during the period when the restoration is evolving than under Alternative 5. As described for Alternative 4, the total area of tidal marsh and aquatic habitats restored under Alternative 5 would be more than the area that would be restored under Alternatives 2 and 3.

Although the total acreage of the restoration project would be the same under Alternative 5 as under Alternative 4, the habitat types restored under Alternative 5 would be more diverse because of the addition of tidal pannes. When compared to Alternative 4, the use of dredged material would shorten the period needed for these habitats to become fully functional and hence would enable the project to begin providing benefits for wildlife sooner. Similar to Alternative 4, the total acreage of habitat created under Alternative 5 would be greater when compared to Alternatives 2 and 3.

Construction and Restoration Timing

Complete restoration of wetlands under Alternative 5 is estimated to take 30 years. Site construction is estimated to take 6 years to complete and would end with the breaching of the bayward levee. This period would include the following activities:

- 2 years for site preparation,
- 1 year to place 2.1 million cubic yards of dredged material for restoration of seasonal wetlands, and
- 3 years to place 8.5 million cubic yards of dredged material for restoration of tidal wetlands.

The proposed restoration of wetlands in the area is characterized by the following steps, including the estimated time necessary for the restored wetlands to become fully functional:

- sediment accretion to mean high water level (year 7 through year 21),
- development of mean high water marsh plain (year 12 through year 21), and
- development of mean higher high water marsh plain (year 17 through year 31).

An important advantage in the use of dredged material is the substantial decrease in the time necessary for restored wetlands to become fully functional. For example, the mean high water marsh plain is expected to be completely developed 6 years sooner under Alternative 5 than under Alternative 4, and the mean higher high water marsh plain is expected to develop 10 years sooner.

Site Preparation and Placement of Dredged Material

Site preparation activities under Alternative 5 include removing remaining buildings and structures; providing temporary drainage; relocating the NSD dechlorination plant; modifying the NSD outfall pipeline; installing and operating the hydraulic off-loaders and piping to transport dredged materials to the HAAF and SLC parcels; constructing perimeter levees, berms, and internal peninsulas; lowering the bayward levee; and breaching the bayward levee.

Removing Buildings and Structures

The Army ~~may remove some of the remaining buildings and structures~~ has removed building 86 on the HAAF parcel ~~if necessary to complete the remediation of contaminated areas~~. The remaining buildings and structures ~~that may be removed by the Army have not yet been identified. The buildings and structures not removed by the Army would~~ will be removed by the Coastal Conservancy before the bayward levee is breached.

Providing Temporary Drainage

To provide temporary drainage for rainfall and process water from the HAAF and SLC parcels, drainage weirs would be installed through the outboard levee (Figure 3-7). These weirs would be removed when the bayward levee is lowered.

Relocating and Modifying NSD Facilities

Before the levees are constructed between the HAAF parcel and the BMKV and SLC parcels, the NSD dechlorination plant would be relocated and the outfall pipeline would be modified.

The NSD dechlorination plant would be relocated to NSD's Ignacio Treatment Plant, Novato Treatment Plant, or another suitable location. Relocating the dechlorination plant would avoid the need to provide an alternative power supply to the plant and would make the plant more easily accessible to NSD personnel for ~~operational~~ operation and maintenance ~~purposes~~.

The portion of the outfall pipeline that crosses the SLC parcel would be modified to avoid damage that could be caused by placing fill over the pipeline during construction of the perimeter levee between the SLC and BMKV parcels and the levee between the HAAF and SLC parcels. Depths of new fill placed over the pipeline would be 17 feet where the pipeline crosses under the new levee between the SLC and BMKV parcels and 8-10 feet where the pipeline runs parallel to the new levee between the SLC and HAAF parcels. Damage to the pipeline would be avoided by using site-specific soil treatments to avoid settling and sliplining or by constructing the pipeline with flexible couplings.

Installing and Operating Hydraulic Off-Loaders and Piping

~~To allow the use of dredged material under Alternative 3, a hydraulic off-loader would be placed in San Pablo Bay and piping would be installed to connect the off-loader to the HAAF parcel. The off-loader would be located as much as 34,000 feet offshore but away from major shipping routes (Figure 3-11). The off-loader would be powered by electricity and could be in operation as long as 6 years. Although the exact timing of delivery of dredged material to the off-loader is not known, off-loading could occur at any time during the construction period.~~

~~The off-loader and piping would be properly marked and lighted, consistent with U.S. Coast Guard regulations, to prevent navigational hazards to watercraft using the area at all times of the day and night. The U.S. Coast Guard would be notified to include an update on project activities in its Information Notice to Mariners.~~

To allow the use of dredged material under Alternative 5, two hydraulic off-loaders would be placed in San Pablo Bay, and piping would be installed to connect the off-loaders to the HAAF parcel. One off-loader would be placed in a deep water location and one in a shallow water location. Both off-loaders would be located in western San Pablo Bay but away from major shipping routes (Figure 3-11). The deep water off-loader would be located from 24,000 to 34,000 feet from the project site. The shallow water off-loader site would be located from 15,000 to 25,000 feet from the project site. The off-loaders would be powered by electricity and could be in operation for as long as 4 years. Electricity would be provided by a submerged 12.5-kilovolt power cable via either Point San Pablo or San Rafael Rock Quarry. The cable would be laid and marked in a manner to prevent any land, shore, or navigation hazards. This type of power supply is standard in the dredging industry. Although the exact timing of delivery of dredged material to the off-loaders is unknown, off-loading could occur at any time during the construction period.

The off-loaders and piping would be properly marked and lighted, consistent with U.S. Coast Guard regulations, to prevent navigational hazards to watercraft using the area at all times of the day and night. The U.S. Coast Guard would be notified to include an update on project activities in its Information Notice to Mariners.

Constructing Levees and Internal Peninsulas

Under Alternative 5, ~~17,330~~ 20,400 feet of perimeter levee would be constructed (Figure 3-13). Perimeter levees would separate the HAAF parcel from Landfill 26, the BMKV parcel, and the St. Vincent's and Las Gallinas Sanitary District properties. An additional 2,200 feet of levee would be constructed to protect and allow access to the NSD wastewater pipeline. The levee between the New Hamilton Partnership development and the HAAF parcel provides adequate flood protection to the development and would not be modified for flood control purposes. However, fill would be placed on ~~6,000~~ 4,800 feet on the wetland side of the New Hamilton Partnership levee to create a wildlife corridor (Figure 3-13). To achieve a long-term levee crest elevation of +8 feet NGVD, perimeter levees would be constructed to an elevation of +12 feet initially, to accommodate an estimated 4 feet of long-term settlement.

Before levee construction, a project levee and fill placement plan would be prepared. The plan would address levee and fill placement with respect to site settlement, stability of slopes, soil constraints, and potential for earthquake-induced ground failure. In addition, a ~~monitoring and inspection program~~ maintenance, monitoring, and adaptive management plan would be implemented to evaluate settlement and its effects (Appendix C).

Levee construction techniques would provide adequate stability with regard to the potential for earthquake-induced ground failure. End-of-construction conditions necessary to satisfy the stability factor of safety would be met by constructing levees with side slopes of 3:1 (horizontal to vertical) or flatter and by constructing toe berms on both sides of the perimeter levees averaging 6 feet high and 50 feet wide. The perimeter levees would have a ~~200-foot-wide~~ footprint 200 feet wide. Over time, as the levee settles and the underlying bay mud consolidates and gains strength, the stability ~~factor of safety~~ would increase to a level well in excess of ~~the~~ required stability criteria.

Internal peninsulas would be constructed within the HAAF parcel only. The primary objective of the peninsulas is to reduce fetch and the potential for erosion of perimeter levees from wave action. The cross-sectional dimensions of the internal peninsulas are shown in Figure 3-9.

Internal peninsulas would not be constructed on the SLC parcel. As an alternative to constructing the internal peninsulas, additional material would be added to the SLC parcel perimeter levees. By design, the additional material would erode and protect the integrity of the levee. Use of the two erosion control methods would allow a comparative assessment of the costs and benefits of each method.

Construction of the levees and internal peninsulas could be completed within 6-8 months. A sufficient amount of suitable material is likely to be available from the HAAF and SLC parcels for use in constructing levees and internal peninsulas; however, some material may be brought in from offsite. A specific source for this material has not been identified.

The perimeter levees for the Hamilton wetland restoration project will be designed and constructed by the Corps. Generally, the engineering and design of the levees will be in accordance with the Corps levee engineering and design manual (U.S. Army Corps of Engineers 1978). The levees will be designed for seismic stability in accordance with the levee engineering and design manual and other applicable guidelines (Hynes-Griffin and Franklin 1984, California Department of Mines and Geology 1977). The levees will be designed to withstand earthquake ground motions that have an exceedance probability of 10% in 50 years (primarily the mean peak horizontal acceleration).

Lowering the Bayward Levees

Before it is breached, most of the bayward levee on the HAAF and SLC parcels would be lowered to an elevation similar to the elevation of the marsh plain adjacent to the levee.

Portions of the levees would remain at higher elevations to provide high tide refugia. Material removed from the levees would be used for construction of the perimeter levees. A total of 3,900 feet of levee on the HAAF parcel and 3,350 feet of levee on the SLC parcel would be modified.

Breaching the Bayward Levees

After site preparation activities are completed, the levees separating the HAAF and SLC parcels from San Pablo Bay would be breached and pilot channels excavated (Figure 3-13). The levee breach on the HAAF parcel would be 280 feet wide and 200 feet long and the pilot channel would be 165 feet wide and 800 feet long. The levee breach on the SLC parcel would be 220 feet wide and 50 feet long and the pilot channel would be 100 feet wide and 200 feet long.

The combined amount of material removed to breach the levees and excavate the pilot channels would be 61,800 cubic yards. Excavated material would be deposited on the HAAF and SLC parcels.

The surface area disturbed by the levee breaches and pilot channels would total 5.4 acres. Excavating the levee breaches and pilot channels would affect 1.8 acres of grassland and 3.6 acres of coastal salt marsh.

Track-mounted excavators would be used to excavate the levee breaches. A 6- to 10-inch suction dredge mounted on a small barge would be used to excavate the pilot channels. Material excavated by the dredge would be pumping directly to the HAAF and SLC parcels. This method would limit the amount of coastal salt marsh disturbed during the dredging process. Regardless of the availability of sediments, levee breaches would be completed no later than 8 years after site preparation begins.

Source of Dredged Material

Dredged material for the wetland restoration project could originate from many sources. One of the most likely sources is the Oakland Harbor navigation improvement project. Other potential sources of material are the Concord Naval Weapons Station, Southhampton Shoal, Richmond Harbor, Port Sonoma, Bel Marin Keys, and Bahia Lagoon. Evaluating impacts associated with dredging and transporting material to the off-loaders is assumed to be the responsibility of the sponsor of each project. An EIR/EIS was recently completed on the Oakland Harbor navigation improvement project (U.S. Army Corps of Engineers and Port of Oakland 1998a, 1998b, 1998c, and 1998d). That document addressed impacts associated with transporting dredged material to the HAAF parcel and concluded that transporting material on barges would not result in significant impacts on the environment.

Suitability of Dredged Material

The suitability of dredged material for the project site will be determined through the existing testing and suitability framework used by the state and federal agencies charged with approving disposal of material dredged from San Francisco Bay: the RWQCB, BCDC, EPA, and the Corps.

These agencies have established a cooperative DMMO, which makes joint recommendations on the suitability of dredged material for proposed disposal sites. The agencies require dredging project applicants to sample and test sediments proposed to be dredged for chemical constituents of concern and for toxicity, using protocols acceptable to the agencies. The adequacy of the sampling and testing is evaluated by the DMMO, which then reviews the test results to evaluate the acceptability of the dredged material for disposal at proposed sites in the bay, ocean, wetland, or upland environments.

To aid in determining the suitability of dredged material for use in wetland environments, the RWQCB has developed guidelines, known as the Wolfenden and Carlin guidelines (Wolfenden and Carlin 1992), that identify acceptable contaminant levels for use in wetlands projects. The DMMO will use these or updated guidelines and other pertinent information to assess any dredged material proposed for use at the project site. Although the Wolfenden and Carlin document specifies slightly differing guidelines for "cover" material (which can be used anywhere in a wetland) and "noncover" material (which needs to be properly buried), only material appropriate for "cover" as determined by the DMMO will be accepted for use at the project site. Separate tests for contaminant leaching are used to evaluate the acceptability of material for upland disposal. Only material found suitable by the DMMO will be used as part of the upland components of the project.

Placement of Dredged Material

The time elapsed between the initiation of site preparation activities to place dredged material and breaching of the levees on the HAAF and SLC parcels is expected to be 6 years and could extend to a maximum of 8 years. Placement of dredged material could be divided by location, including nontidal areas, the SLC parcel, and the remaining portion of the HAAF parcel, with sediment placement occurring either sequentially or concurrently. The specific sediment timing and locations of levee breaches would depend on the availability of dredged material and the feasibility of constructing the three areas in separate phases. However, the wetland restoration project could begin to accept dredged material during the site preparation phase.

Routine maintenance dredging could provide, on average, as much as 2.2 million cubic yards of dredged sediment per year. However, the schedule for placement of material assumes that 1.4 million cubic yards of sediment per year are actually dredged. The actual annual dredging volumes are dependent on many factors. For example, dredged sediment may be available from new channel and harbor deepening projects, which would shorten the overall construction schedule. Placement of dredged material in the seasonal wetland will be engineered to ensure impermeability of the surface for seasonal ponding and to minimize cracking during the dry season.

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Control of Process Water

The off-loading of dredged material would involve mixing the material with water to allow pumping. After the dredged material slurry is placed, the water would separate from the material and would eventually be discharged to San Pablo Bay. Certain options been proposed that would ensure that the process water does not violate water quality standards when discharged to the bay. The most viable option is to hold the water in a confined basin within the restoration site for subsequent discharge.

Water quality standards will be specified in the waste discharge requirement stipulated by the RWQCB. The discharge standards for the process water will meet RWQCB standards before water is discharged to the bay.

Public Access

Public access to the wetland restoration site would be provided by ~~the proposed Bay Trail and spur trails. In addition to the Bay Trail proposals, HRG is proposing an alignment that would provide enhanced public access to the western side of the wetland restoration project, generally along the New Hamilton Partnership levee.~~ trails on the western side of the wetland restoration site, generally along the New Hamilton Partnership levee. In addition, the City of Novato will provide a scenic overlook at the top of Reservoir Hill. ~~Formal~~ Public access to the wetland restoration site would be limited to these points, generally located on the western edge of the site. To protect resource values, public access would not be allowed to the entire site.

Bel Marin Keys V Restoration Scenario: Restoration of Wetlands in the HAAF, SLC, and BMKV Parcels Using Dredged Material

In addition to the four project alternatives, a wetland restoration scenario that includes the BMKV parcel, located northeast of the HAAF parcel, has also been evaluated. Impacts of expanding the wetland restoration project to include the BMKV parcel have been evaluated at the program level and are included for informational purposes. Expanding the wetland restoration project to include the BMKV parcel would substantially increase the amount of wetlands that would be restored, increase the amount of area that could be used for disposal of dredged material, and reduce the number of levees that would need to be constructed. Including the BMKV parcel as part of the wetland restoration project would require separate project-specific documentation under CEQA and/or NEPA.

The BMKV parcel is located north of the HAAF and SLC parcels and is privately owned (Figure 3-2). The owners are proposing a water-oriented residential community and golf course on an approximately 1,610-acre site. The residential component would consist of 801 units on 146 acres. The proposed project is currently being reviewed by the County of Marin. Because development plans for the parcel have not been approved, this analysis assumes that the use of the parcel for production of hay would continue under future without-project conditions.

Under the BMKV Scenario, wetlands would be restored in the HAAF, SLC, and BMKV parcels through the use of dredged material and natural sedimentation. Before dredged material is placed in the area, perimeter levees would ~~not~~ be constructed as needed and the bayward levee would be breached. The three parcels would not be hydrologically connected because of the need to protect the NSD outfall pipeline.

Restoration Targets

The ultimate objective of a fully functioning wetland restoration project under the BMKV scenario is to create tidal coastal salt marsh, seasonal wetlands, tidal pannes, and grasslands. An estimate of the acreage of each habitat type that would be created or enhanced under this scenario is shown in Table 3-2. This estimate is based on habitat ratios developed for Alternative 5. The predominant habitat types would be tidal coastal salt marsh and seasonal wetland.

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**Table 3-2.
Estimated Acreage of Each Habitat Type
for the Bel Marin Keys V Scenario**

Habitat Type	Acres
Subtidal channels	13
Coastal salt marsh (tidal)	1,696
Tidal pannes	80
Seasonal wetland	314
Grassland	204

Construction and Restoration Timing

Complete restoration of wetlands under this scenario would involve a process similar to that proposed for Alternative 5 (30 years) but would probably take longer because of the substantial increase in the number of acres to be restored and the increased volume of dredged material that would be deposited on the project site. The estimated dredged material capacity of the combined BMKV, HAAF, and SLC parcels would total 33 million cubic yards of material.

Site Preparation

Site preparation activities under this scenario would include constructing the perimeter levees, lowering the bayward levee, moving the NSD dechlorination plant, and installing and operating the hydraulic off-loaders. The process for installing and operating the hydraulic off-loaders would be the same as described under Alternative 3.

Constructing Perimeter and Internal Levees

Under this scenario, 23,800 feet of perimeter levee would be constructed. These levees would separate the project site from Landfill 26, Pacheco Pond, the existing Bel Marin Keys development, and the St. Vincent's and Las Gallinas Sanitary District properties. The levee separating the HAAF parcel from the BMKV and SLC parcels would remain to protect and provide access to the NSD outfall pipeline.

Construction of the levees could be completed within 6-8 months. An adequate volume of source material to construct these levees is probably available from the three parcels.

Lowering the Bayward Levee

Before it is breached, most of the bayward levee on the HAAF, SLC, and BMKV parcels would be lowered to an elevation similar to the elevation of the marsh plain adjacent to the levee. Portions of the levees would remain at higher elevations to provide high tide refugia. Material removed from the levees would be used for construction of the perimeter levees.

Breaching the Bayward Levee

After construction of the perimeter levees and placement of dredged material are completed, the levee separating the HAAF, SLC, and BMKV parcels from San Pablo Bay would be breached. Two or more channels of the same or similar configuration as described under Alternative 5 would be constructed. Material from the excavation would be deposited within the HAAF, SLC, and BMKV parcels. The direct loss of pickleweed marsh would be limited to the width and length of the channel.

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Chapter 4. Geology and Soils

Affected Environment

Data Sources

This chapter is based on previous investigations and studies performed by others within the HAAF and neighboring areas. Primary sources of information are the following:

- draft Hamilton Wetlands Conceptual Restoration Plan (Woodward-Clyde 1998);
- Hamilton Army Airfield Reuse Plan Existing Conditions Analysis prepared by Robert Bein, William Frost & Associates (Robert Bein, William Frost & Associates 1995); and
- a comprehensive summary of existing geologic conditions prepared by Environmental Science Associates for the BMKV property (Environmental Science Associates 1993).

Regional Geology and Topography

The project site is located within California's geologically and seismically active Coast Ranges Geomorphic Province. The province is characterized by a series of northwest-trending faults, mountain ranges, and valleys (Figure 4-1) (Environmental Science Associates 1993).

Two distinct geomorphic zones, the Bay Plain and Franciscan Uplands zones, occupy the project site. The Bay Plain extends from the edge of San Pablo Bay to the foot of the hills immediately west of the HAAF parcel. Adjacent to San Pablo Bay, the nearly level site consists of former mudflats and marshlands that have been separated from tidal action by dikes and levees since the early 1900s; the site is drained by a system of trenches and pumps (Robert Bein, William Frost & Associates 1995). As the site dried out and the soil became desiccated after being removed from tidal inundation, it began to settle below its original elevation. Current ground elevations at the site range from +7 to -7 feet NGVD, with a typical ground elevation of -5 feet. (Woodward-Clyde 1998.)

The water table is typically several feet below the surface and varies somewhat seasonally. As shown in Figure 4-2, below a thin near-surface crust, the area is underlain by soft marine clays known as bay mud to depths that vary from 70 feet near San Pablo Bay to 30 feet or less at the northwestern end of the site. The crust is composed of desiccated bay mud throughout the area; in many locations, especially in the HAAF area, the crust also consists of several feet of granular fill and, in the former runway and taxiway areas, pavement (Figure 4-2).

The project site is located on soils of one primary geomorphic types (Figure 4-3):

- **Bay Mud**—The bay mud consists of thick deposits of soft, unconsolidated, water-saturated, silty clays containing vegetative remains and is up to 70 feet thick. This soil type exhibits high compressibility, low shear strength, and generally low permeability and is underlain by much stronger and less compressible soils. The HAAF runway, hangars, and main administrative buildings are situated on the Bay Plain and underlain by bay mud that extends to the historical limits of the marshland of San Pablo Bay. Before dikes were installed in the early 1900s to allow agricultural use of the land, the bay muds were inundated regularly by high tides. Artificial fill (consisting of rock, soil, and other materials) was deposited on top of the bay mud to permit construction of the runway. Artificial fill (containing rock, soil, and other materials) was deposited on top of the bay mud to permit construction of the runway.

Adjacent to the project site are several other geomorphic types:

- **Franciscan Formation**—The hills west of the HAAF parcel are formed of sandstone and shale of the Franciscan Formation, which weather to form a light sandy or silty soil that is moderately well drained. A small portion of the upland area consists of Franciscan Melange, a mixture of rock fragments of variable size in a highly-sheared clay that weathers to a hummocky topography of clay-rich, swelling soils. The upland portions of the HAAF facility are underlain by rocks of the Franciscan Formation, known locally as Hamilton Field arkose, with sandstone and shale in higher elevation areas.

- **Colluvium**—At the base of the slopes are deposits of colluvium, which consist of unsorted, unconsolidated, clay-rich soil and rock fragments. Downslope movements of weathered bedrock and melange materials have resulted in the accumulation of these colluvial deposits at the base of slopes.

- **Alluvium**—Unconsolidated clay, silt, sand, and gravel that have been deposited by streams make up the alluvial material in the northern and eastern lowland areas. Deposition by the local streams has created accumulations of clay, silt, sand, and gravel in the west-central portion of HAAF. (Robert Bein, William Frost & Associates 1995.)

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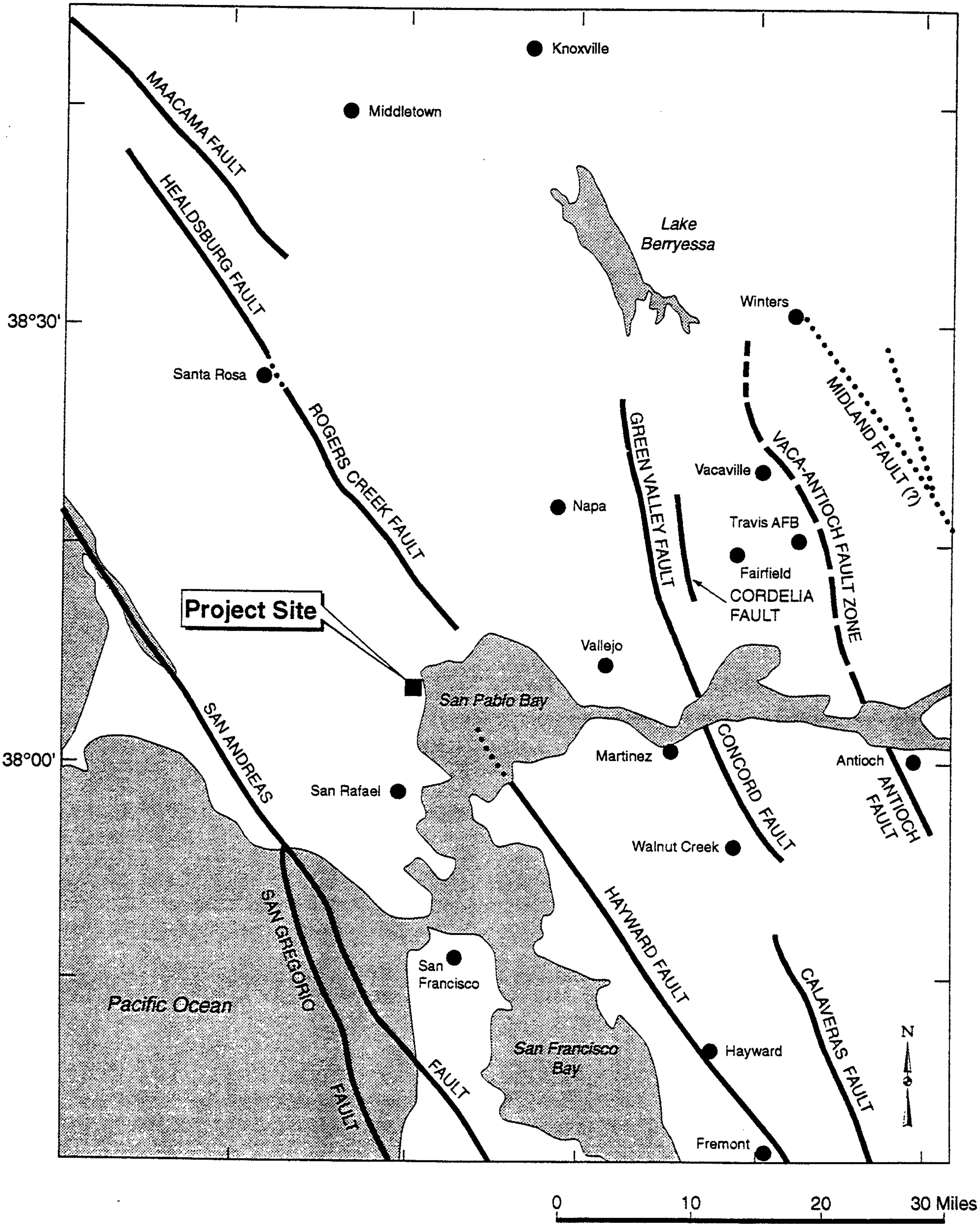

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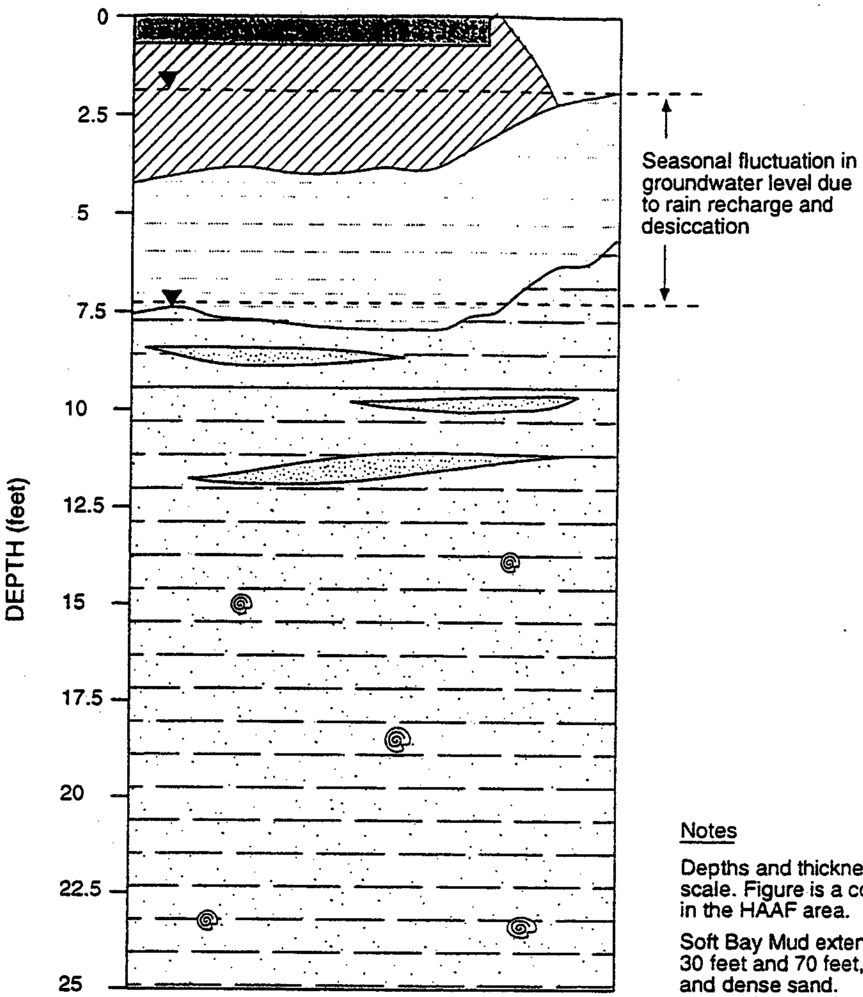
Figure 4-1
Regional Faults



Notes

Depths and thicknesses approximate, no horizontal scale. Figure is a compilation of field and boring logs in the HAAF area.

Soft Bay Mud extends to depth varying between 30 feet and 70 feet, and is underlain by stiff clay and dense sand.

LEGEND

Pavement
concrete or asphalt

Fill
Yellowish-brown (10YR 5/4) to greenish grey (10Y 5/1) gravelly sand to reworked Bay Mud

Desiccated Bay Mud
Silty clay, greenish grey (10Y 5/1) to greyish brown (10YR 3/2), strong iron oxide staining on numerous desiccation cracks

Soft Bay Mud
Silty clay, greenish grey (10Y 5/1) to dark grey (2.5Y 4/1), soft, saturated, shell fragments scattered throughout, rich in organic matter (decayed plant fragments, peat)

Sand lenses
Discontinuous lenses, 1-inch to 3-feet thick, fine to coarse grained, dark greenish grey (10G 3/1) to brown (7.5YR 4/3), clayey, generally found along the hill range

Shells and shell fragments

Source: Woodward-Clyde 1998.

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Figure 4-2
Schematic Stratigraphic Column in Shallow Soil on Hamilton Army Airfield Runway

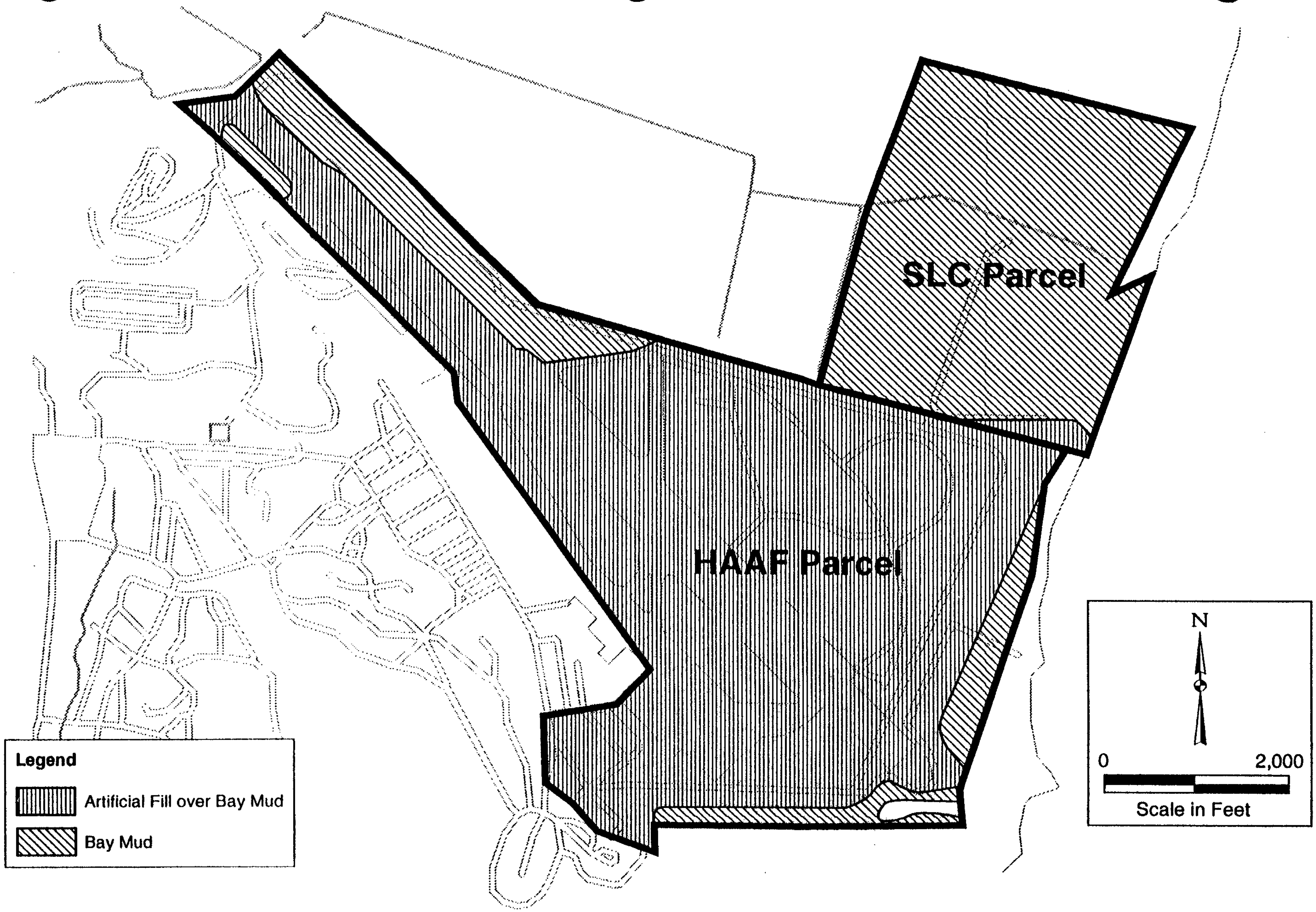

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Figure 4-3
Geology and Soils in the Project Area

Soils

Soils on hills and within existing wetlands on the project site consist primarily of naturally occurring clays, clay loams, and gravelly sandy loams. On the lower, developed portions of the HAAF area, natural soils have been extensively disturbed by grading, fill placement, and construction of buildings and paved areas. Three soil types are present: Saurin Urban Land Bonnydoon, Xerorthents-Urban Land, and Xerorthents. The Saurin series is a clay loam over sandstone bedrock, the Bonnydoon soil is a gravelly loam, and the Xerorthents type is used to describe the highly variable, disturbed urban flatlands. Surrounding areas contain Cortina gravelly sandy loam (industrial park area to the north) and Reyes clay (St. Vincent's Silveira Landholdings to the south). The native Novato soil series is now present in the HAAF area only in the salt marsh east of the levee. (Robert Bein, William Frost & Associates 1995.)

In addition to the three naturally occurring soil types, local upland soil material has been placed as fill ranging in depth from several inches to several feet. This fill has been compacted over extensive areas of Reyes soil, under the roadways and parking pads, and as berms extending into vegetated areas. The fill material is variable but is commonly a reddish-brown, very gravelly, sandy clay loam, which is typical of subsoil material from any of the four major upland soil series in the area. (U.S. Army Corps of Engineers 1996a.)

Seismicity and Geologic Hazards

The project site is located in one of the most seismically active regions in the United States. The site's seismic setting is dominated by the Hayward fault to the southeast, the San Andreas fault to the west, and the Healdsburg-Rogers Creek fault to the northeast (Figure 4-2). The maximum credible earthquake for each of these faults, measured in Richter scale magnitude (M), are as follows:

- the Hayward fault—7.5 M,
- San Andreas fault—8.3 M, and
- Healdsburg-Rogers Creek fault—7.2 M.

Two smaller, potentially active faults are near the project site. A possible trace of the Burdell Mountain fault is mapped as extending toward and terminating about 4,000 feet north and west of the project site. Estimates differ regarding the date of the last displacement on the Burdell Mountain fault. It is generally thought to have been active during the Quaternary period (the last 2.5 million years), and some evidence suggests that it may have been active during the Holocene epoch (the last 11,000 years). (Environmental Science Associates 1993.) The Tolay Fault also reaches to within 6.5 miles of the project site and may be active (Robert Bein, William Frost & Associates 1995).

The project area is likely to undergo ground shaking from a major earthquake. The U.S. Geological Survey has estimated that there is a 67% probability that there will be one or more earthquakes of magnitude 7.0 or greater in the Bay Area in the next 30 years. (Environmental Science Associates 1993.)

Four major hazards are associated with earthquakes. These are surface fault rupture, ground shaking, ground failure, and inundation resulting from earthquake-generated waves or dam failures. (Environmental Science Associates 1993.)

Ground Shaking

Three major factors affect the severity (intensity) of ground shaking at a site in an earthquake: the magnitude of the earthquake; the distance to the fault that generated the earthquake; and the geologic materials that underlie the affected site. Thick, loose soils, such as bay mud, tend to amplify and prolong groundshaking vibration. Because the project site is underlain by bay mud, ground shaking would be more intense at the site than in nearby areas underlain by bedrock. (Environmental Science Associates 1993.)

Surface Fault Rupture

Because no active or potentially active faults are known to cross the project site, the potential for surface fault rupture at the site is remote. (Environmental Science Associates 1993.) In addition, the project site is not within an Alquist-Priolo Special Studies Zone as designated by the state.

Ground Failure

Ground failure hazards of potential concern at the site include liquefaction, earthquake-induced settlement, and lurching. All of these involve displacement of the ground surface resulting from a loss of strength or failure of the underlying materials because of ground shaking.

Liquefaction is the sudden loss of strength in loose, saturated materials (predominantly sands) during an earthquake, which results in temporary fluid-like behavior of those materials (much like quicksand). Liquefaction typically occurs in areas where groundwater is shallow and materials consist of clean, poorly consolidated, fine sands. Subsurface conditions at the project site are not conducive to liquefaction because bay mud does not contain substantial amounts of granular materials.

Ground shaking can also induce settlement of loose, granular soils above the water table. Subsurface conditions at the site consist of clays and silts rather than sands and, thus, are not conducive to earthquake-induced settlement.

Lurching, or lurch cracking, is the cracking of the ground surface in soft, saturated material as a result of earthquake-induced ground shaking. The bay mud that underlies the project site is susceptible to lurching, particularly where deposits are bordered by steep channel banks or adjacent hard ground. (Environmental Science Associates 1993.)

Earthquake-Induced Inundation

Earthquakes could result in the inundation of the project site as a result of tsunamis (or tidal waves), and seismic seiches (oscillating waves in enclosed water bodies).

Tsunamis are sea waves produced by large-scale seismic disturbances of the ocean floor. Tsunamis can be generated by local offshore seismic events, as well as by events thousands of miles away. A tsunami with a 100-year recurrence interval (i.e., a 1% probability of occurrence in a given year) has an estimated runup of 3.7 feet in the vicinity of the project site (i.e., the resulting waves would wash 3.7 feet up on the levee banks in the project area). At its current elevations, the project site could be flooded by a tsunami in the event of levee failure or overtopping. (Environmental Science Associates 1993.)

Seismic seiches may be generated in tidal marsh ponds such as those currently present along the outboard tidal marsh.

Environmental Consequences and Mitigation Measures

Approach and Methods

The approach and methods used to evaluate project impacts on geology and soils consisted of reviewing available soils and geologic data for the site and updating the environmental baseline for these issues.

Impact Mechanisms

The potential for the project to have various geotechnical and geological impacts was considered; these impacts included the potential for personal injury; loss of life; and property damage to structures, utilities, or levees caused by existing geologic hazards such as:

- strong seismic ground shaking,
- liquefaction,
- seismically induced settlement, and
- site settlement under the proposed marsh restoration plan.

One of the special geologic issues associated with this project is the compressibility of the bay mud. Primarily because of its high compressibility and low strength, the soft bay mud poses considerable constraints to development of the perimeter levees, which are critical features of the restoration plan. New fill loads placed on top of areas underlain by bay mud could cause compression of the bay mud, leading to the need for more fill to be placed and causing uneven settlement of the ground surface. Depending on the depth of the bay mud, settlement may take 10–50 years to be fully apparent. Uneven settlement is desirable, however, for the evolution of the wetland topography.

In addition, fill applied over limited areas, such as levee fill, can cause shear stresses in the bay mud. If these stresses exceed the soil's shear strength, stability failure may result. Therefore, new levees should be designed to provide adequate geometric stability, which may require the use of stabilizing berms. (Woodward-Clyde 1998.)

Thresholds of Significance

According to professional criteria and judgment and applicable regulations and plans, the project would result in a significant impact if:

- the potential exists for personal injury, loss of life, or property damage to proposed structures, utilities, or levees caused by existing geological hazards;
- foundation elements, roadways, or other infrastructure elements would be degraded by chemical action or mechanical weathering of onsite soils;
- secondary effects of seismic ground motion could result in damage to proposed site improvement;
- a geologic condition (such as increased liquefaction potential) is created or allowed to persist that could cause substantial structural damage onsite or offsite;
- a substantial change in topography or destruction of any unique soil type would occur; or
- substantial degradation of physical, chemical, or biological soil quality would occur that degrades or destroys the function of the soil to support sensitive habitats, such as wetlands.

Impacts and Mitigation Measures of Alternative 1: No Action

Impact 4.1: Continuation of Existing Levee Maintenance, Pumping, and Subsidence

Under Alternative 1, the HAAF parcel would not be transferred and the Army would retain ownership. The Army would be responsible for continuing maintenance and operation of the drainage and flood control facilities. It is assumed that the Army will maintain the existing level of flood protection at HAAF. This would include monitoring of pumping facilities, drainage ditches, and levees.

Impacts and Mitigation Measures Common to Alternatives 2, 3, 4, and 5

Impact 4.2: Settlement of Soils from Fill Loads for Levees and Sedimentation

The bay mud and Bay Plain soils would be subject to settlement under Alternatives 2-5 and the BMKV Scenario from the loads imposed by the levees and natural sedimentation following levee breach. Differential settlement could lower site elevations below desired grades and damage levees unless the effects of settlement are adequately considered in project design and construction. In addition, an anticipated 0.5-foot sea-level rise could damage levees over the duration of their design lives.

New fill would be placed in the project area to raise the elevation of levees. The weight of the fill would compress the underlying bay mud, leading to possibly uneven settlement of the fill. The main settlement process would occur in the first 30-50 years after fill placement; settlement would slow appreciably after that time.

Settlement rates and amounts have been estimated for various thicknesses of bay mud and various heights of fill because these factors are mutually dependent. That is, for a given thickness of bay mud, settlement would increase in direct proportion to an increase in fill height. Conversely, for a given thickness of fill, the amount of ultimate settlement would increase with the depth of the underlying bay mud. For example, given a 20-foot-thick layer of fill, the ultimate settlement for a 20-foot-thick deposit of bay mud would be 5 feet, whereas for a 70-foot-thick deposit of bay mud, the ultimate settlement of the same 20-foot-thick fill layer would be 13 feet.

As the thickness of the bay mud increases, however, the rate of settlement decreases. In the example above, 9.5 years would be required to achieve 50% of the ultimate settlement with a 20-foot-thick deposit of bay mud, whereas more than 150 years would be required to reach 50% of the ultimate settlement with a 70-foot-thick deposit of bay mud. Using the same example, after 10 years, about 2.5 feet of settlement would occur over a 20-foot deposit of bay mud, whereas about 1.5 feet of settlement would occur over a 70-foot-thick deposit of bay mud.

Settlement can be either uniform or differential. Uniform settlement results in equal amounts of settlement over the area of concern. Differential settlement occurs when some areas settle more than others. Uniform settlement could cause problems if an entire levee or site grade settled sufficiently to allow flooding. Differential settlement could affect development if adjacent areas underwent different degrees of settlement and, as a result, improvements spanning both areas were damaged structurally.

Differential settlement could result from variations in the thickness and compressibility of bay mud and variations in the thickness of fill placed. The potential for differential settlement would be highest where the thicknesses of bay mud and fill change within relatively short horizontal distances. This would be especially true where fill would be placed over existing ditches, levees, or embankments.

To achieve a long-term (50-year) levee crest elevation of +8 feet NGVD, the conceptual plan calls for the levee to be constructed to an elevation of +12 feet initially, to accommodate an estimated 4 feet of long-term settlement. Moderate adjustments can be made to levee crest height if the levee is ultimately observed to settle more than 4 feet. The estimate of 4 feet of settlement also includes a 0.5-foot allowance for sea-level rise.

A design-level subsurface geotechnical investigation will be conducted by a qualified geologist and a comprehensive, detailed geotechnical design will be prepared for the project levee and fill placement plan (see Chapter 3, "Project Alternatives under Consideration"). This design-level investigation will address the levee and fill program with respect to site settlement, stability of slopes, soil constraints, and potential for earthquake-induced ground failure (lurching). The recommendations presented in the Preliminary Conceptual Design Report—Soil Encapsulation Berms prepared by IT Corporation (1997) will be incorporated into the comprehensive geotechnical design and fill placement plan. A comprehensive monitoring and inspection program of settlement and its effects will also be implemented.

Specifically, the subsurface investigation and design will, at a minimum, identify subsurface conditions encountered (e.g., thickness, depth, and compressibility of bay mud; presence of other underlying soil layers or sand or peat lenses) and describe how differential settlement on construction sites throughout the project site will be avoided and/or compensated for using standard engineering techniques. The specific techniques would be selected during the design phase for the project and could include, but need not be limited to:

- placing additional fill to compensate for anticipated settlement and sea-level rise, such as initial construction of levees 4 feet above long-term levee crest elevation to accommodate long-term settlement and sea-level rise;
- application of surcharge loads or other settlement acceleration techniques, such as installation of wick drains; and
- uniform placement of fill during construction and avoidance of excessive fill placement.

Because the conceptual plan addresses and the final design will address this issue and settlement will not cause adverse effects (i.e., levee failure), this impact is considered less than significant.

Impact 4.3: Potential Levee Slope Failure Resulting from Low Strength of Underlying Bay Mud

Under Alternatives 2-5, levees would be constructed on bay mud, which is structurally weak. Slope stability failures could occur, either under static conditions or during seismic shaking, if the levees are not designed and constructed appropriately. Slope stability would be particularly critical when the outboard levee is breached and the area is inundated, providing additional external force on levees. Factors influencing slope stability include strength of natural soils and fills, embankment heights and slopes, and depth of inundation. The severity of seismic shaking, in conjunction with the above factors, also affects slope stability.

Stability of levees, however, would increase over time with consolidation and settlement of material placed within the levees. The current plan proposes a long-term (50-year) levee crest of +8 feet by constructing levees to an initial elevation of +12 feet with 3:1 (horizontal to vertical) or flatter slopes and toe berms on both sides that average 6 feet high and 50 feet wide (for a required minimum stability safety factor of 1.3). This levee has a 200-foot-wide footprint. Over time, as the levee settles and the underlying bay mud consolidates and gains strength, the factor of safety would increase to well in excess of 1.5. ~~The levee is also expected to survive the maximum credible earthquake for the project area.~~ (Woodward-Clyde 1998.) A description of the guidelines that the Corps will use for design of the levees is included in Chapter 3, "Project Alternatives under Consideration".

To ensure the stability of levee slopes, a geotechnical investigation will be conducted and appropriate engineering design of levee slopes and stability, effects of placing fill against them, and the potential need for stabilizing berms will be determined. ~~Therefore, this~~ This impact is considered less than significant because this investigation and subsequent design will minimize the potential for slope failure.

Impact 4.4: Potential Seepage through or under the Levee from Materials Placed on the Bay Side of the Levee

Because water would be introduced on the bay side of the flood control levee, seepage through or under the levee could occur. This seepage may affect adjacent properties.

The conceptual plan calls for the levee to be constructed using fine-grained materials to reduce the potential for through-levee seepage. Existing granular near-surface fill from below the main body of the levee (but not below the toe berms) should be excavated, and a keyway (a trench filled with new levee fill) about 20 feet wide should be constructed through the natural clay crust. (Woodward-Clyde 1998.) Therefore, this impact is less than significant.

Impact 4.5: Potential Exposure of Sensitive Wetlands and Levees to Seismic Hazards

Critical project structures, such as cell and perimeter levees and holding pond levees, could fail or be damaged during an earthquake, releasing contaminants to the environment and delaying marsh restoration. Because no known active faults cross the project site, however, the potential for surface fault rupture at the site is remote.

The project site is likely to undergo ground shaking from a major earthquake in the Bay Area within its 50-year lifespan. Because the project site is underlain by bay mud, ground shaking would be more intense at the site than in nearby areas underlain by bedrock. Seismically induced ground shaking could damage proposed embankments, cut slopes, and levees.

The potential for liquefaction and seismically induced settlement at the site is relatively low; however, the site would be susceptible to lurching from ground shaking. Lurching could affect levee stability and would have to be considered in the design of these improvements.

A tsunami with a 100-year recurrence interval has an estimated runup of 3.7 feet in the vicinity of the project site. At current elevations, the project site could be flooded by a tsunami that resulted in levee failure or overtopping.

Critical project structures, such as levees, will be designed to the engineering standard of practice given their use, such as those recommended by the Corps. Records of the design and reconstruction of the distressed section of the levee and maintenance records will be used to develop design and maintenance criteria for project levees.

Settlement monitoring points and slope inclinometers will be initially placed and then read following an earthquake to evaluate deformation that may not be discernible by visual observation. Because the project site could be flooded by a 100-year tsunami, levee design will accommodate possible overtopping.

Because the final design will address seismic issues, this impact is considered less than significant.

Impacts and Mitigation Measures Unique to Alternative 2

No impacts and mitigation measures are unique to Alternative 2.

Impacts and Mitigation Measures Unique to Alternative 3

Impact 4.6: Settlement of Soils from Fill Loads for Levees, Sedimentation, and Dredged Material

This impact would be the same as Impact 4.2, although the addition of dredge materials to accelerate the creation of wetlands would also increase the rate of settlement (Geomatrix Consultants 1998) from the surcharge load. The conceptual plan calls for placing dredged material against the outboard slope of the New Hamilton Partnership levee. The fill may be placed up to the full height of the levee (elevation 8 feet) and slope gently away from the levee at a 2% grade. The dredged material is expected to be sandy soil rather than soft clay (bay mud).

The existing New Hamilton Partnership flood control levee was completed in November 1996. The levee was designed to retain water from San Pablo Bay when the existing dike system is breached. Design of the levee included an evaluation of settlement and slope stability. Placement of approximately 10 feet of dredged soil against the levee would affect settlement and stability of the levee (discussed below).

To accommodate settlement and provide adequate slope stability during a strong seismic event, New Hamilton Partnership plans to raise the level of the levee after it is allowed to settle for 3-5 years. The levee crest was constructed at elevation 8 feet. When the levee crest settles to elevation 6.5 feet (3-5 years after construction), the levee will be raised to elevation 8.5 feet. Analyses (Geomatrix Consultants 1998) indicate that another 80-100 years will be required for the levee crest to subside to elevation 6.5 feet a second time.

The weight and lateral extent of dredged soil placed against the levee will increase settlement of the levee. Analysis indicates that dredged soil brought to elevation 8 feet within 3-5 years after construction of the levee would increase settlement of the levee crest from 0.5 foot to 1 foot over 50-100 years. Although the increased settlement of the levee is not considered to be excessive, the settlement would require raising the levee an additional time to keep the crest at or above elevation 6.5 feet. In this regard, there would be additional cost for levee maintenance over the present schedule to keep the levee crest at or above elevation 6.5 feet.

In its analysis, Geomatrix Consultants also calculated settlement, with and without dredged soil against the levee, at a point 20 feet beyond the inboard toe of the levee. This point was selected as representing the rear wall of future residential structures. The placement of dredged soil against the levee was found to also cause increased settlement 20 feet beyond the inboard toe of the levee. The increase in settlement is dependent on the height of fill placed against the levee. If 10 feet of fill is placed against the levee, the increase in settlement 20 feet from the inboard toe of the slope is estimated to be 1-2 inches over 50 years. If the thickness of fill is reduced to 6 feet, the increase in settlement is estimated to be about 0.5 inch.

To aid in evaluating how reducing the height of dredged material or moving the dredged material away from the levee would affect settlement of the levee, Geomatrix Consultants evaluated both of these conditions (Figure 4-4). Condition A assumes that new dredged material would be placed directly against the levee. The analysis was performed for fill heights of 6, 8, and 10 feet. Condition B assumes that 10 feet of new fill would be placed but that the edge of the dredged material would be moved away from the top of the levee. The analysis was performed for distances of 20, 40, and 60 feet between the levee and dredged material (distance X in Figure 4-4). The slope of the dredged material was assumed to be 3:1 (horizonal to vertical).

The results of the settlement analysis for the conditions A and B are summarized in Table 4-1. The results of the analysis indicate that reducing the height of fill placed directly against the levee would be beneficial in terms of settlement. Also, moving the fill away from the levee would reduce settlement.

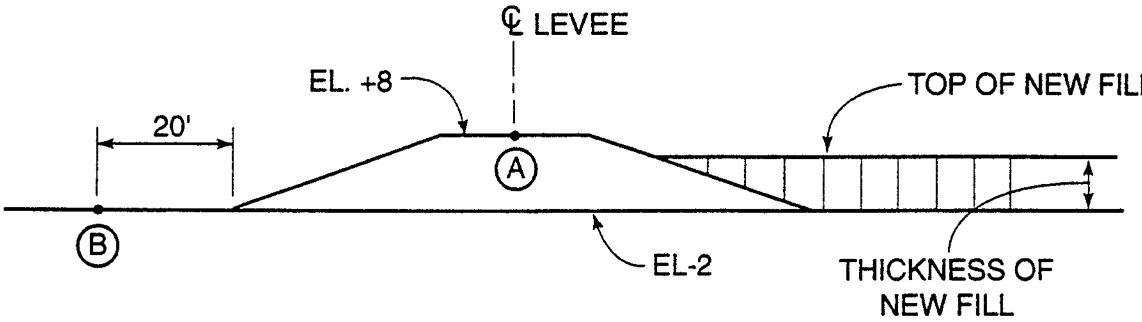
Because placing dredged material against the New Hamilton Partnership levee would cause settlement of this levee and possibly of adjacent properties and this issue is not addressed or anticipated sufficiently in the conceptual plan, this impact is considered significant.

Mitigation Measure 4.6: Limit the Height of Dredged Material to 4 Feet. To reduce settlement at residential sites to acceptably small values, the surface of the dredged material placed against the levee should not extend above elevation 4 feet. This will limit the thickness of fill to about 6 feet. To bring the dredged material surface to elevation 8 feet (approximately 10 feet of fill), the fill should be moved at least 60 feet from the top of the levee (distance X in Figure 4-4). The area between the levee and dredged material would need to be sloped to an outlet to prevent water from ponding. The height of fill placed to provide drainage between the levee and dredged material should not exceed elevation 2 feet. The actual limits on the amounts of dredged material should be determined during the final design phase of the project.

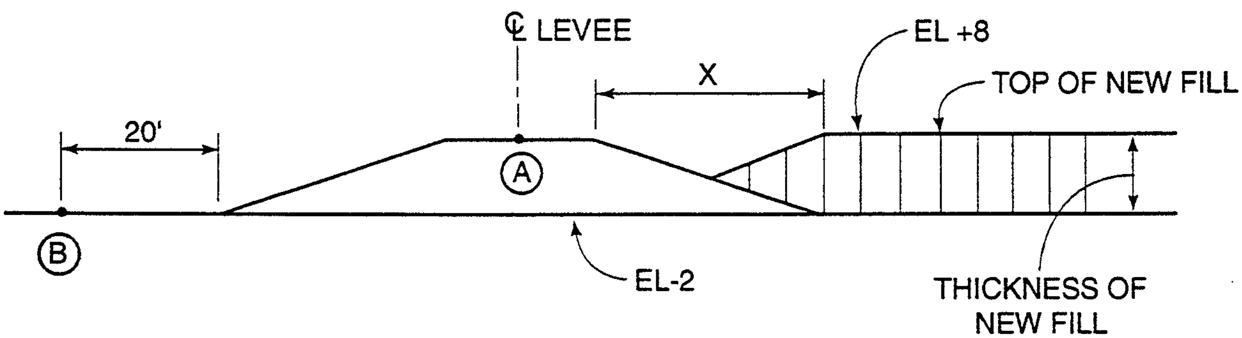
In areas where structures are not located adjacent to the levee, the dredged material could be placed against the levee.

Impact 4.7: Potential for Levee Failure Resulting from Low Strength of Underlying Bay Mud

With regard to stability of the levee, the dredged soil eliminates the outboard slope and any stability considerations for the slope. Also, considerations of seepage through and beneath the levee and wave erosion of the outboard slope are eliminated. The only stability consideration is the inboard slope. Stability analyses undertaken during design of the levee (Geomatrix Consultants 1998) indicated that the factor of safety against slope failure decreased about 10% when the crest was increased from 20 feet to 40 feet in width. Although no stability analysis was undertaken for the dredged soil condition, increasing the crest width beyond 40 feet (which would be the situation if dredged soil is placed directly against the levee) may decrease the factor of safety against slope stability by not



CONDITION A - FILL PLACED AGAINST THE LEVEE



CONDITION B - FILL PLACED AWAY FROM THE LEVEE

Source: Geomatrix Consultants 1998.

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Figure 4-4
Conditions Analyzed for Levee Settlement

Table 4-I.
Conditions of Settlement Analysis

Elevation at Top of New Fill	Thickness of New Fill (feet)	Distance X (feet)*	Settlement (feet)	
			Point A	Point B
Condition A—Fill Placed against the Levee				
-2	0	--	3.4	0.3
+4	6	--	3.6	0.3
+6	6	--	3.7	0.3
+8	10	--	4.0	0.4
Condition B—Fill Placed away from Levee				
0	0	--	3.4	0.3
+8	10	60	3.5	0.3
+8	10	40	3.6	0.3
+8	10	20	3.8	0.4

Note: The results of the settlement analysis are intended to indicate the general magnitude of levee settlement resulting from placing dredged material on or adjacent to the levee. Although single settlement values are given, it is more correct to assume a range of settlement values for each condition analyzed. A range of ±20% from the calculated values is reasonable for estimating long-term settlement. The final design-level investigation that will be conducted for this alternative shall also confirm these limits.

* Distance X refers to Figure 4-4.

more than an additional 10%. A 10-20% reduction in the factor of safety is not a concern except for the seismic loading condition.

Because a thorough evaluation of the seismic stability of the inboard slope will be undertaken in conjunction with the design-level geotechnical investigation and recommendations implemented (see Impacts 4.3 and 4.5), this impact is considered less than significant.

Impacts and Mitigation Measures Unique to Alternative 4

No impacts are unique to Alternative 4.

Impacts and Mitigation Measures Unique to Alternative 5

Impacts and mitigation measures for this alternative are the same as those described for Alternative 3.

Potential Issues and Resolutions under the Bel Marin Keys V Scenario

Potential issues and resolutions under this scenario are the same as the impacts and mitigation measures described for Alternative 3.

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Chapter 5. Surface Water Hydrology and Water Quality

Affected Environment

Data Sources

The evaluation of hydrology is based on information contained in the Draft Hamilton Wetlands Conceptual Restoration Plan (Woodward-Clyde 1998) and in the following other principal sources:

- ✦ Flood and Drainage Baseline Study for Hamilton Army Airfield (Bissell & Karn/Greiner 1993);
- ✦ Perimeter Drainage Ditch Engineering Evaluation Report, BRAC Property, Hamilton Army Airfield (U.S. Army Corps of Engineers 1997); and
- ✦ unpublished hydrologic analyses by Philip Williams & Associates, prepared in 1998 as supporting documentation for the Draft Hamilton Wetlands Conceptual Restoration Plan.

The evaluation of water quality is based on information presented in the Hamilton Army Airfield disposal and reuse EIS (U.S. Army Corps of Engineers 1996a) and the San Francisco Bay Region RWQCB's Water Quality Control Plan (Basin Plan) (California Regional Water Quality Control Board, San Francisco Bay Region 1997).

The project site is at the base of the coastal mountains on the edge of San Pablo Bay. Numerous small creeks carry runoff from the mountains to the tidal lowlands along the bay. Drainage patterns in the HAAF, SLC, and BMKV parcels have been substantially altered by human activity since the mid-1800s and presently depend on the operation of drainage infrastructure, including levees, culverts, ditches, and pumping stations.

Climate

The regional climate is characterized as Mediterranean, with warm, dry summers and cool, wet winters. Average summer temperatures range from 52°F to 78°F, and average winter temperatures range from 41°F to 55°F (National Oceanic and Atmospheric Administration 1997).

Rainfall in the San Francisco Bay region is strongly influenced by geographic features and varies significantly with elevation and by location within the region. Average annual rainfall at HAAF and in the Pacheco and San Jose Creek watersheds varies from approximately 24 to 30 inches, and average annual precipitation at HAAF is 26 inches (U.S. Army Corps of Engineers 1996a; National Oceanic and Atmospheric Administration 1997). Approximately 90% of the average annual rainfall occurs in the period between November and March.

Wind data are available for a 31-year period of record (California Department of Water Resources 1978). Winds are predominantly from the northwest and southeast, aligned with the HAAF runway. Mean wind speeds are less than 10 knots.

Tides and Levees

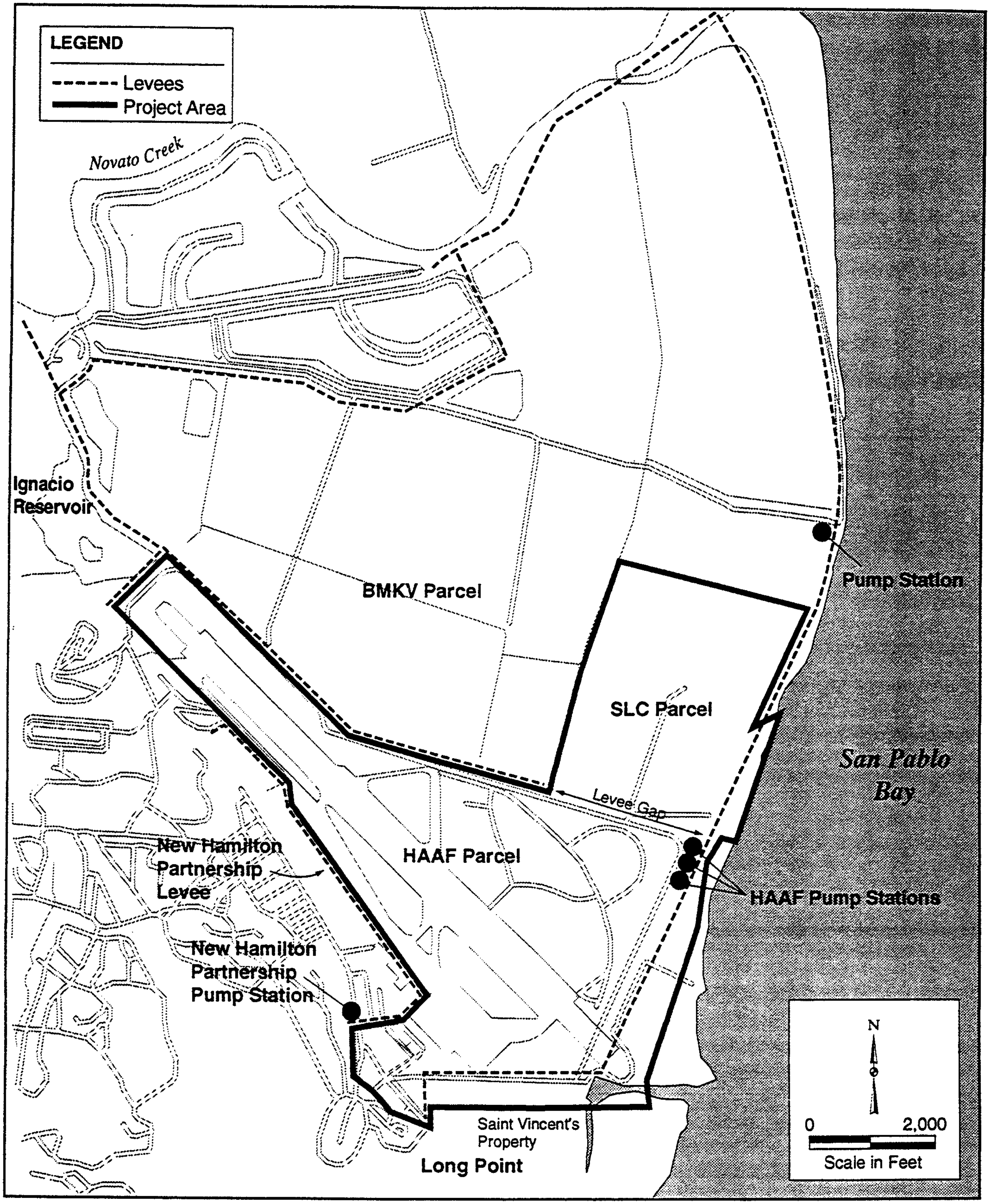
Tidal characteristics at HAAF are summarized in Table 5-1 based on Tide Gage #941-5252 at the mouth of the Petaluma River. Lands in the vicinity of HAAF are deeply subsided, with elevations as low as -7 feet NGVD. Protection of these lands from inundation by San Pablo Bay requires a system of perimeter and interior levees, and drainage must be collected from the interior areas and pumped to San Pablo Bay.

Table 5-1.
Tidal Characteristics at HAAF

Tide	Elevation (NGVD)
100-year high tide	7.0 feet*
Mean higher high water	3.4 feet
Mean tide	0.6 foot
Mean lower low water	-2.6 feet

* Federal Emergency Management Agency 100-year tide.

The Corps recently surveyed the levees near the site to determine their top elevations (unpublished Corps data). Figure 5-1 shows the location of levees in the vicinity of the site. HAAF is surrounded on the north, east, and south by approximately 15,000 linear feet of levees except in a 2,575-foot gap on the northeastern corner of the property, where the levees were removed sometime between 1968 and 1972 (unpublished Corps data). The external levee protecting HAAF from San Pablo Bay has top elevations between 5.3 and 8.8 feet, with most of the crest near 7.0 feet in elevation. The external levee along San Pablo Bay protecting the SLC and BKMV parcels varies in elevation between 5.6 and 9.9



SOURCE:
U.S. Army Corps of Engineers 1996a.

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Figure 5-1
Levee Locations

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feet, with the crest heights predominantly in the range of 6.5 to 8.5 feet. The external levee protecting the St. Vincent's property has crest elevations between 6.6 feet and 10.0 feet, with most of the crest elevations in the range of 7.5 to 8.5 feet.

The internal levees in the vicinity of HAAF are generally lower than the perimeter levees; the crest heights are shown in Table 5-2.

Table 5-2.
Internal Levee Crest Heights in the Vicinity of HAAF

Location	Range of Crest Elevations (NGVD)
Ignacio Reservoir/HAAF parcel	8.5 to 10.0 feet
Ignacio Reservoir/BKMV parcel	8.0 to 10.7 feet
BKMV/HAAF parcels	0.8 to 4.7 feet (except gap); -3.3 to -5.9 feet (in gap)
St. Vincent's property/HAAF parcel	3.0 to 4.4 feet
New Hamilton Partnership development	8.0 feet, with a splash wall at 12.0 feet

Source: Unpublished Corps data.

Based on the surveyed levee heights, none of the external levees in the vicinity of HAAF provide 100-year tidal protection. Figure 5-2 shows the estimated 100-year tidal floodplains in the vicinity of HAAF.

Surface Water Drainage Patterns

Surface water runoff from the areas west of the project site is carried by Pacheco Creek and Arroyo San Jose. Historically, these streams were part of a network of natural channels that drained through the low-lying area where Ignacio Reservoir is now located to Novato Creek. Pacheco Creek and Arroyo San Jose both have their headwaters on Big Rock Ridge, at elevations of 1,300–1,600 feet NGVD. Pacheco Creek has a watershed area of approximately 1.9 square miles and Arroyo San Jose has a watershed area of approximately 5.4 square miles, which is tributary to Ignacio Reservoir. Ignacio Reservoir drains to Novato Creek through a leveed channel with a flap gate outlet (Bissell & Karn/Greiner 1993 and unpublished Corps data). Figure 5-3 shows regional drainage features in the area.

The HAAF, SLC, and BMKV parcels and the St. Vincent's property (located south of the HAAF parcel) are all served by local drainage facilities, including drains, channels, culverts, and pump stations with outfalls into San Pablo Bay. Ground elevations in these areas are generally from 0 to -4 feet NGVD, several feet below the mean higher high water elevation of 3.4 feet. The general pattern of drainage on and near the project site is shown in Figure 5-3.

Major drainage features and hydrologic resources in the project area are described briefly below.

Pacheco Creek

Pacheco Creek originates on Big Rock Ridge approximately 3 miles west of HAAF at an elevation of approximately 1,300 feet. The creek crosses U.S. Highway 101 near the Alameda del Prado/Nave Drive, and crosses Nave Drive, Marin Valley Road, Bolling Drive, Main Entrance Road, and State Access Road in a series of culverts. The creek has a watershed with an area of approximately 1.9 square miles. The computed 10-year and 100-year peak discharges for Pacheco Creek are 470 and 770 cubic feet per second (cfs), respectively (Bissell & Karn/Greiner 1993). With the exception of low-lying areas near Ammo Hill, the 10-year peak discharge is contained within the creek banks, culverts, and road crossings in the vicinity of the project site. The capacity of Pacheco Creek is substantially lower near the southern and western sides of Ammo Hill than it is upstream, resulting in overflow of the banks during even low flows near Ammo Hill.

The peak 100-year discharge exceeds the channel and culvert capacities in several locations, including Bolling Road, Main Entrance Road, and the area near Ammo Hill. The 100-year peak discharge would also flood the areas between Bunker Hill and Ammo Hill that are at elevations less than 10 feet. The Army recently completed construction of a berm around a portion of Landfill 26. The purpose of the berm is to protect the landfill from overflow from Pacheco Creek up to the 100-year flood. ~~This flood overflow passes around the Landfill 26 area and into the northwestern part of the HAAF parcel. The creek passes between Ammo Hill and Bel Marin Keys Industrial Park before discharging into Ignacio Reservoir (Pacheco Pond).~~

Arroyo San Jose

Arroyo San Jose also originates on Big Rock Ridge approximately 5 miles west of the HAAF parcel at an elevation of approximately 1,600 feet. The creek crosses U.S. Highway 101 near the Ignacio Boulevard/Bel Marin Keys Boulevard interchange and discharges into Ignacio Reservoir. Arroyo San Jose has a watershed of approximately 5.4 square miles, and the computed 10-year and 100-year peak discharges are 1,200 and 2,300 cfs, respectively (Bissell & Karn/Greiner 1993). The 10-year peak discharge is contained within the channel banks and road crossings between U.S. Highway 101 and Ignacio Reservoir. High tides on San Pablo Bay raise the water surface elevation in Ignacio Reservoir and affect water surface elevations in the lower portion of Arroyo San Jose and Pacheco Creek. The 100-year peak discharge would cause flooding in the Los Robles Mobile Home Park and the Bel Marin Keys Industrial Park if accompanied by a high tide on San Pablo Bay (Bissell & Karn/Greiner 1993). At lower tides, the 100-year peak discharge is not expected to cause flooding in these areas.

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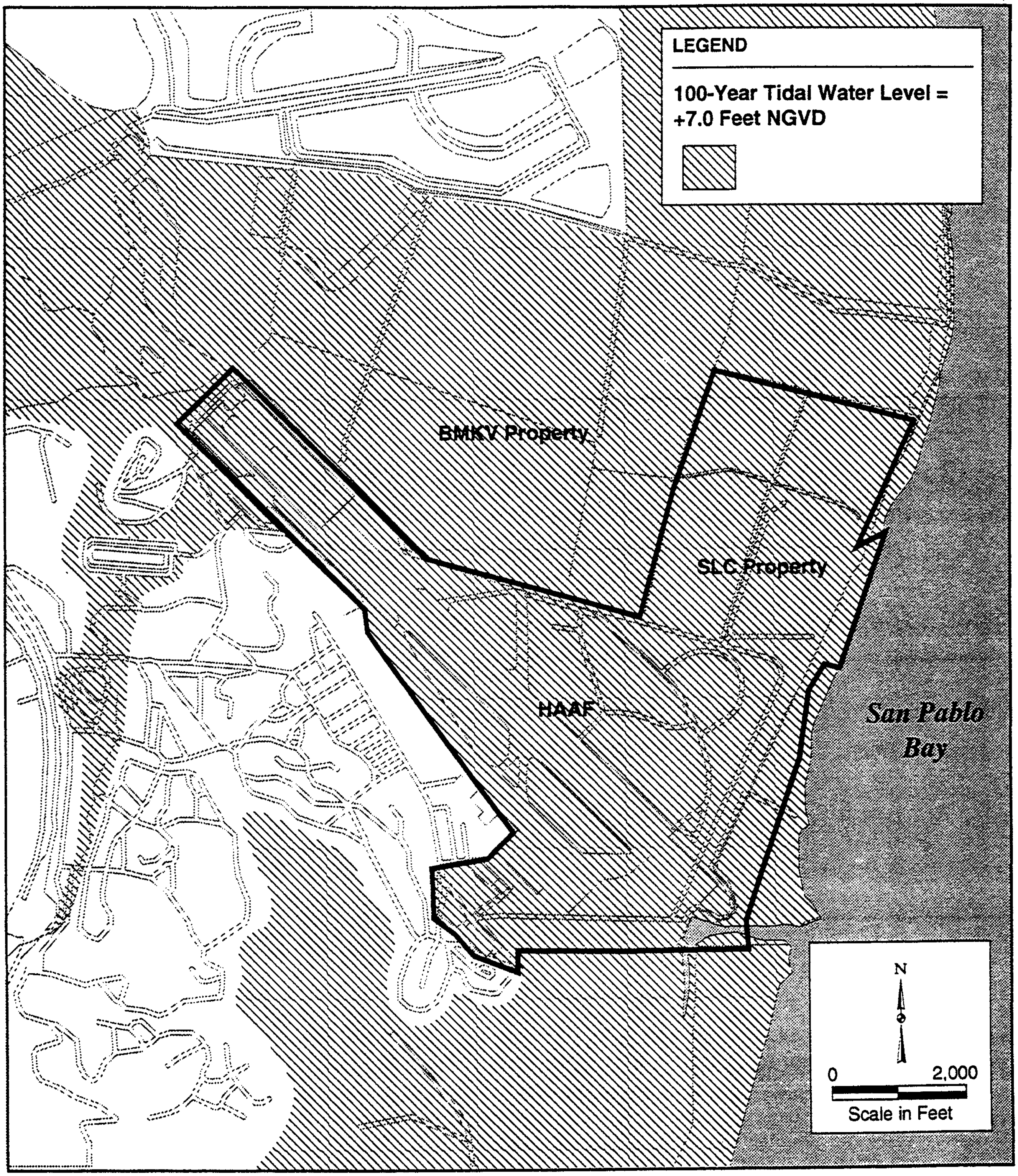

SOURCE:
Bissel & Karn/Greiner 1993.

Jones & Stokes Associates, Inc.

Figure 5-2
Estimated 100-Year Tidal Floodplain

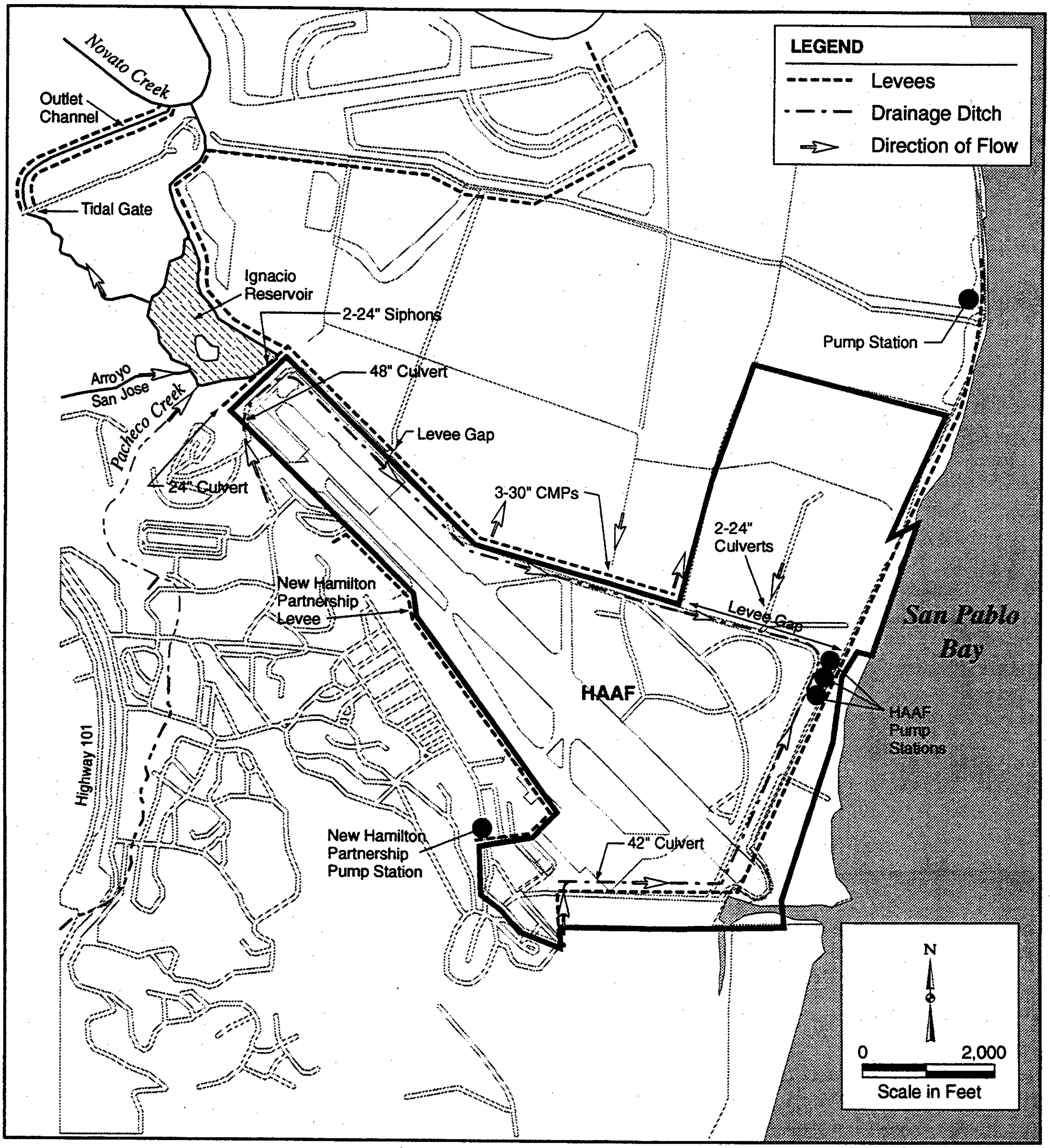

Figure 5-3
Regional Drainage Features

Ignacio Reservoir

Both Pacheco Creek and Arroyo San Jose discharge into Ignacio Reservoir (also called Pacheco Pond). This reservoir was built by the Marin County Flood Control and Water Conservation District (MCFCWCD) and is operated jointly by MCFCWCD and the California Department of Fish and Game. The reservoir occupies approximately 120 acres and has a storage capacity of 480 acre-feet (unpublished Corps data). The reservoir discharges to Novato Creek through a leveed channel with a flap gate at the outlet. The outlet is located at the Bel Marin Keys Boulevard bridge. High tides in San Pablo Bay prevent outflow from Ignacio Reservoir and may cause flow reversal in the outlet channel if the flap gates do not operate properly (Bissell & Karn/Greiner 1993). Ground elevations near the reservoir are near mean sea level.

The reservoir was constructed to provide flood protection by providing storage for discharges from Pacheco Creek and Arroyo San Jose. However, the storage capacity of the reservoir is ~~inadequate~~ not always adequate to provide 100-year flood protection and prevent overflow of the reservoir. ~~At~~ For example, during a high tide of 7 feet, the reservoir would need a capacity of approximately 600 acre-feet to accommodate 100-year inflows from Pacheco Creek and Arroyo San Jose (unpublished Corps data). The reservoir is also operated to provide freshwater wetland and wildlife habitat. Flashboards are used at the outlet to control water levels during nonflood periods.

~~High flows in Pacheco Creek and Arroyo San Jose cause the reservoir level to rise.~~ Two 24-inch siphons were installed by the U.S. Air Force to provide an overflow from the ~~pond~~ reservoir onto the HAAF parcel (Bissell & Karn/Greiner 1993). The siphons were designed to prevent overtopping and damage to the airfield levee, but they are no longer operational. According to the draft restoration plan, the reservoir instead overtops levees to flow into agricultural fields north of the reservoir, into Novato Creek, and into the BMKV parcel. Low points in the levees between Ignacio Reservoir and Novato Creek, and between the reservoir and agricultural lands to the ~~north~~ northeast, are ~~given in the draft restoration plan as~~ 6.2 feet and ~~5.6~~ 8.0 feet, respectively.

Bel Marin Keys V

The BMKV parcel is currently in agricultural use and is drained by a system of channels. Under normal runoff conditions, most of the runoff from the parcel drains to a pump station at the northeast corner of the property that discharges to San Pablo Bay. Approximately 100 acres drain to the channel system on the SLC parcel to the east, and these flows are conveyed by gravity to the HAAF perimeter ditch system through two 24-inch culverts (described above).

Under flood conditions (greater than approximately 10-year events, according to the draft restoration plan), the BMKV parcel receives overflows from Ignacio Reservoir and from the HAAF parcel through a levee gap approximately 2,000 feet southeast of the northwest corner of the HAAF property. Flood overflows cause ponding on the BMKV parcel under current conditions and leave the property ~~either~~ by overflowing the drainage divide between the BKMV and SLC parcels ~~or through three 30-inch culverts through the HAAF perimeter levee~~. Recent investigation by the Army concluded that the three 30-inch culverts between the HAAF and BMKV parcels are not operational.

SLC Parcel

The SLC parcel presently drains to the HAAF perimeter ditch system through a network of channels on the SLC parcel. Flows in the channel system are conveyed to the HAAF perimeter ditch system near the NSD dechlorination facility in two 24-inch pipes. The HAAF perimeter ditch system conveys these flows to HAAF pump stations that discharge to San Pablo Bay.

St. Vincent's Property

The St. Vincent's property south of HAAF is served by a system of drainage channels that discharge through a pump station to San Pablo Bay. In general, ground elevations on the St. Vincent's property drain away from HAAF, and most of this property does not contribute flows to the perimeter ditch system. However, a channel along the northern boundary of the St. Vincent's property intercepts flows from the western portion of the DoD housing and Long Point peninsula area. A portion of the St. Vincent's property also drains to this channel. In addition, overflows from the drainage system on the St. Vincent's property may flow to this channel during periods of high runoff. The channel carries flows to a culvert crossing of the HAAF perimeter levee near the southwestern corner of the airfield and then into the perimeter ditch (unpublished Corps data). The channel carrying flows from the DoD housing area may also overtop onto the St. Vincent's property, where these flows are intercepted by the St. Vincent's property drainage system and conveyed to the associated pump station.

HAAF Drainage

Drainage from the HAAF parcel is collected in a perimeter ditch system and conveyed to three pump stations on the margin of San Pablo Bay. The drainage system is described in detail in an engineering evaluation of the ditch system prepared by International Technology Corporation for the Corps (U.S. Army Corps of Engineers 1997). Drainage subareas for the HAAF parcel are delineated in the Flood and Drainage Baseline Study (unpublished Corps data).

The perimeter ditch system is served by three pump stations on the margin of San Pablo Bay: Buildings 35, 39, and 41. These three pump stations have a combined capacity of approximately 230 cfs and are equipped with both diesel-powered and electric motor-driven pumps (unpublished Corps data).

In addition to the HAAF parcel, the perimeter ditch system receives drainage from several adjacent areas:

- drainage flows through a 42-inch gated culvert through the perimeter levee near the southwest corner of HAAF on the St. Vincent's property, which carries flows from the western portion of the DoD housing and Long Point peninsula upland areas adjacent to the airfield, and from a portion of the St. Vincent's property;

- drainage from the New Hamilton Partnership development, the eastern portion of the DoD housing area, and other areas adjacent to the west side of the airfield that are conveyed to the ditch in two outfalls—one near Reservoir Hill (west outfall) and one near the southwest corner of the airfield (east outfall);

- drainage from the area of Landfill 26 and Ammo Hill that is conveyed to the ditch system through 48-inch and 24-inch flap-gated culverts, respectively;

- flood overflows from Pacheco Creek that are conveyed into the ditch system through the 48-inch and 24-inch flap-gated culverts that serve the Landfill 26, Ammo Hill, and POL Hill areas;

- flood overflow (under some conditions) from Ignacio Reservoir and the BKMV parcel through a levee gap approximately 2,000 feet southeast of the northwest corner of the HAAF parcel; and

- ~~flood overflow (under some conditions) from Ignacio Reservoir and the BMKV parcel through three 30-inch culverts through the perimeter levee (located high on the slope); and~~

- flood overflow and normal drainage through two 24-inch gated culverts on the SLC parcel.

In addition, flood overflow from Ignacio Reservoir could be conveyed from the reservoir to HAAF through the two 24-inch siphons (these siphons are currently not operational).

Existing Water Quality Conditions

The existing soil conditions are important in determining water quality at the Hamilton wetland restoration site. The site is a former tidal salt marsh and mudflat. 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 the historic salt marsh and the subsequent natural processes that occurred with the oxidation of sediments that had previously been submerged and under anaerobic (oxygen-deprived) conditions. Acid-sulfate soil conditions may affect the quality of runoff because low pH levels can lead to water quality problems such as release of sulfuric acid, aluminum toxicity and the potential for release of other metals, and fluctuations in nutrient levels.

As described in detail in Chapter 10, "Hazardous Substances, Waste, and Site Remediation", the facilities in the HAAF and SLC parcels have been surveyed for the presence of hazardous materials. Specific areas of potential concern are the inactive petroleum, oils, and lubricants line; revetment area; east levee landfill; aircraft maintenance areas; burn pits; pump stations; and areas of DDT in the outboard marsh. However, the transfer or sale of property or other activity resulting in construction or rehabilitation involving wetland creation could take place only after cleanup activities were completed by the Army and certified by the issuance of a Finding of Suitability for Transfer. These issues are discussed further in Chapter 10.

Urban Runoff

Urban runoff from the adjacent properties is collected by a series of storm sewers and drainage channels around the perimeter of the airfield that drain to pump stations discharging into San Pablo Bay. Surface water quality data for these areas of the HAAF parcel are limited.

Natural areas have been disturbed over the years by grading and construction. Runoff from paved areas such as the airfield is generally rapid. Water quality of runoff from the remaining natural, wooded or grassy areas is likely to be good. Urban runoff from paved areas and other impervious surfaces can contain a variety of pollutants that can degrade water quality. The airfield area is most likely the greatest contributor of pollutants to the drainage system. Activities such as aircraft and vehicle maintenance can contribute a substantial amount of the pollutant load in runoff to the drainage channels. Pollutants commonly found in urban runoff include heavy metals and petroleum hydrocarbons.

The historic discharge of urban runoff from the former HAAF has affected the upper intertidal zone of the salt marsh near the pump station outfall. Elevated levels of metals, including high lead levels, and petroleum hydrocarbons have been found in sediments in this area. The solvent trichloroethylene and metals have been found in the perimeter drainage channel.

San Pablo Bay

San Pablo Bay is the receiving water for all drainage from the Hamilton wetland restoration site, including Novato Creek and Pacheco Pond. The bay receives substantial inflow from the Sacramento and San Joaquin Rivers as well as smaller amounts of inflow from the Petaluma and Napa Rivers and Sonoma Creek. Water quality is maintained by circulation and flushing as a result of tidal action and freshwater inflow. Water quality and salinity in the bay are determined by the relative mix of these water sources. Turbidity can be high because of the relatively shallow depths of water and the substantial currents that resuspend bottom sediments. Tidal flows nourish and sustain the saltmarsh habitat along the levee at the east end of the HAAF parcel adjacent to San Pablo Bay.

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Water quality in San Pablo Bay has been evaluated as part of a study of San Francisco Bay (Aquatic Habitat Institute 1990). San Pablo Bay is listed as a "water quality limited segment" in the Basin Plan. Preliminary data from the Aquatic Habitat Institute study indicate that levels of some pollutants may be lower than indicated by previous data; however, several pollutants are still present at levels of concern in San Pablo Bay and San Francisco Bay as a whole. The EPA water quality criterion for copper has been exceeded in San Pablo Bay. Water quality is impaired because of mercury, and a health advisory has been issued for the entire San Francisco Bay estuary (California Regional Water Quality Control Board, San Francisco Bay Region 1997) because of mercury levels in aquatic life. Selenium is also a concern and is contributing to the "water quality limited" designation.

Groundwater

The shallow groundwater at the Hamilton wetland restoration site has a high salinity because of the historic influence of San Pablo Bay. Groundwater 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, runoff is unlikely to recharge the deeper groundwater under the Hamilton wetland restoration site (EIP Associates 1993). Groundwater is influenced by freshwater levels in Pacheco Pond and may be less saline in this area. The general direction of groundwater flow is to the east (Woodward-Clyde 1985). However, the low transmissivity of bay muds greatly reduces the movement of shallow groundwater into San Pablo Bay. Groundwater also discharges to the stormwater drainage channel located around the perimeter of the airfield and may contain pollutants from contaminated areas.

Groundwater quality in the HAAF and SLC parcels has been affected by contaminants. The main contaminants of concern that have been found in groundwater are petroleum hydrocarbons, such as gasoline and oils, and solvents. These contaminants are discussed in more detail in Chapter 10, "Hazardous Substances, Waste, and Site Remediation".

Wetland Water Quality

Wetland water quality is influenced by wetland depth and morphology and the relationship of the wetland to the upstream watershed. The hydrologic regime determines the frequency, depth, and duration of the water's influence on vegetation and the aquatic functions that the wetland provides. Wetlands with little flushing and high nutrient and contaminant loading rates can become stagnant, resulting in low dissolved oxygen content, decreased aquatic habitat quality, and adverse effects on fish and wildlife. These conditions can also promote excess algal growth and increase mosquito breeding potential. An adequate supply of fresh water to the wetland improves the capacity for removal of nutrients and contaminants. In a salt marsh environment, adequate tidal flushing maintains good water quality by reducing the potential for development of these conditions.

Wetlands can improve the quality of source waters by decreasing water velocity, inducing sediment deposition, and removing excess nutrients and contaminants. Nutrients and contaminants can adsorb (attach themselves) to sediments in a wetland and be removed by deposition, chemical breakdown, and assimilation into plant and animal tissues.

Water Quality Regulations

Basin Plan

The Basin Plan (California Regional Water Quality Control Board, San Francisco Bay Region 1997) and its subsequent amendments establish water quality objectives that apply to all inland surface waters, including enclosed bays and estuaries. Narrative and numerical objectives are presented in the Basin Plan that would protect beneficial uses in the region. These objectives include limits on levels of general water quality constituents (pH, dissolved oxygen, salinity, turbidity, and total dissolved solids), heavy metals, and certain toxic organic compounds. EPA's water quality criteria are also applicable for certain heavy metals and organic compounds in surface waters upstream of San Pablo Bay. Beneficial uses protected by the Basin Plan that would be applicable to the Hamilton wetland restoration project include wildlife and fish habitat, estuarine habitat, and preservation of rare and endangered species.

In establishing these objectives, the San Francisco RWQCB considers the potential impact on beneficial uses within the area of influence of a discharge and the existing quality of receiving waters based on the appropriate water quality objectives. A finding regarding the beneficial uses to be protected would be made by the San Francisco RWQCB, which would establish waste discharge requirements (WDRs) to protect those uses. WDRs issued for a project, based on water quality objectives, may contain more or less restrictive conditions that take into account not only actual and potential beneficial uses, but also factors such as economic considerations. Because San Pablo Bay is considered to be a "water quality limited segment" in the Basin Plan, more stringent water quality objectives and treatment levels could be required for any discharge to this area. WDRs typically address turbidity, suspended solids, and other water quality issues.

Enclosed Bays and Estuaries Plan

The Enclosed Bays and Estuaries Plan (EBEP) (California State Water Resources Control Board 1990) set forth new objectives for the protection of aquatic life and human health. The water quality objectives in this plan were developed to apply statewide, and they apply to all estuarine waters in the project region. The plan contains objectives for regulating priority toxic pollutants, as listed under the Clean Water Act.

The EBEP has been the subject of a recent lawsuit brought against the California State Water Resources Control Board by a group of municipalities and one private company, alleging that the plan violated provisions of the Porter-Cologne Water Quality Act and

CEQA. On October 15, 1993, a tentative decision was issued that overturned the plan, leaving the state technically without enforceable numerical objectives for those toxic pollutants regulated in the plan. It is unknown at this time when the plan will be readopted, how the current objectives will change, and how this could affect the development of wetlands.

Discharge of Waste to Land Regulations

The disposal of dredged material to land is regulated by the California Code of Regulations (CCR), Title 23, Division 3, Chapter 15, "Discharge of Waste to Land Regulations", and is under the authority of the San Francisco RWQCB. Disposal of dredged material to augment existing levees or create upland habitat is considered upland disposal, and project approval by the San Francisco RWQCB would be based on the concentration of constituents of concern in the dredged sediment and on site-specific conditions.

Clean Water Act

Wetland creation using dredged material is considered aquatic disposal under Section 404 of the Clean Water Act and is regulated by the California State Water Resources Control Board and the San Francisco RWQCB under Section 401 of the Clean Water Act. The San Francisco RWQCB is responsible for ensuring that water quality objectives in the Basin Plan are not exceeded by a dredged material disposal project. WDRs issued by the San Francisco RWQCB could require that discharge from a project comply with screening criteria and testing guidelines for wetland creation and upland beneficial reuse to ensure that disposal does not result in degradation of the existing site.

Environmental Consequences and Mitigation Measures

Approach and Methods

Hydrologic resources and surface water drainage patterns in the project area have been documented extensively in previous work (U.S. Army Corps of Engineers 1989 and 1997, Bissell & Karn/Greiner 1993, unpublished Corps data, and Woodward-Clyde 1998 and associated background information). The potential environmental consequences of the project alternatives on hydrologic resources have been evaluated primarily through review and analysis of available information. Based on an understanding of present hydrologic conditions, the potential mechanisms through which the project alternatives may have an impact on existing resources have been identified. Potential impacts are identified based on impact mechanisms, and additional required technical analysis is identified where required to quantify or mitigate for project impacts.

Potential water quality impacts were identified by comparing the Hamilton wetland restoration plan (Woodward-Clyde 1998) to the applicable laws and regulations regulating water quality in California. The water quality analysis also relies on other chapters in this EIR/EIS, especially Chapter 4, "Geology and Soils"; Chapter 6, "Tidal Hydraulics"; and Chapter 10, "Hazardous Substances, Waste, and Site Remediation".

Impact Mechanisms

Hydrology

The proposed action would convert existing leveed lowlands in the HAAF parcel (and the SLC property under some alternatives) to tidal wetland. Levees around the perimeter of the proposed tidal wetland would be constructed to protect adjacent lands from tidal flooding. These parcels would be subject to the tidal elevations characteristic of San Pablo Bay.

Before property transfer, most drainage and flooding issues will be resolved by the Army (see Chapter 3, "Project Alternatives under Consideration"). ~~The impact mechanisms for the restoration project include the effects of placing fill on existing or proposed drainage facilities for adjacent property.~~ The Army's goal is to resolve flooding and drainage issues with surrounding parcels and therefore ensure that the flooding and drainage characteristics of surrounding parcels are not adversely affected by base closure. This includes the St. Vincent's and Las Gallinas Sanitary District properties, Landfill 26, and the SLC and BMKV parcels. In addition, the Army has indicated that it will prepare environmental documentation for modification of the flood and drainage facilities on the surrounding parcels. The impacts of making these modifications are not analyzed in this EIR/EIS.

The impact mechanisms for the restoration project include the effects of placing fill on existing or proposed drainage facilities for adjacent property. During construction, existing drainage facilities would be decommissioned or their operation disrupted. Interim drainage facilities will be in place to prevent ponding, maintain site access, and protect adjacent land uses.

Exceedance of Water Quality Objectives

The presence of contaminants in dredged material in the HAAF and SLC parcels is of concern if these areas are to be flooded for a wetland creation project. Water quality issues associated with wetlands created without dredged material (Alternatives 2 and 4) are related to maintaining adequate flow and circulation. The primary water quality concern associated with disposal of dredged material (Alternatives 3 and 5) is the potential for formation of acid-sulfate soils. During the drying process, sulfides formed under anaerobic conditions while submerged are oxidized to sulfate, which then forms sulfuric acid on contact with water from runoff or rain. The acidic conditions and low pH (<5.5) can adversely affect aquatic life and wetland vegetation.

Other water quality issues associated with wetlands created with dredged material include the following:

- ✦ increasing concentrations of sulfide, ammonia, and phosphorus in brackish water and freshwater environments to levels exceeding those permitted by water quality objectives, both in drainage water from recently placed dredged material and in leached runoff after placement, and
- ✦ increasing concentrations of heavy metals in drainage water from dredged material after placement as a result of the conversion of soil chemistry from anaerobic (reducing) to aerobic (oxidizing) conditions, which increases the dissolved, readily soluble concentration of many heavy metals.

Dredged material could contain contaminants and other chemical constituents that pose a threat to water quality. Figure 5-4 depicts the upland and aquatic pathways by which contaminants can threaten water quality in a wetland environment. The five contaminant pathways are:

- ✦ effluent discharge;
- ✦ runoff;
- ✦ leachate runoff;
- ✦ seepage by soluble diffusion and soluble convection through tidal pumping and capillary action; and
- ✦ bioturbation, which includes both plant uptake through roots and animal uptake through soil consumption or contact.

These pathways also indicate the biotic resources potentially affected by the mobilization and accumulation of toxic contaminants. Water quality degradation could occur initially in surface water that comes into contact with levees or wetland slopes. As seepage of surface water and leachate from sediment occurs, degradation of shallow groundwater could also occur.

Dredged sediment with chemical concentrations less than the concentrations listed in Chapter 10 is acceptable for potential use in all wetland creation projects at any depth within the wetland (Wolfenden and Carlin 1992). Dredged material at lower concentrations is also acceptable for levee restoration and maintenance, landfill daily cover, and upland creation. The wetland restoration project would accept only dredged material that meets cover material criteria.

Dredged material with sediment concentrations within the ranges listed in Chapter 10 is acceptable for wetland creation noncover material, as long as a minimum of 3 feet of cover material or native material is placed on the top and sides of the noncover material. Noncover material would then be isolated by the cover material from exposure to biological communities. For tidal wetland systems, a greater amount of side coverage may be necessary because of tidal fluctuations.

Thresholds of Significance

For this EIR/EIS, a proposed action is considered to have a significant impact on surface water hydrology if it would:

- substantially alter drainage patterns, flow rates, or volumes;
- increase the risk of flood peaks or volumes that would damage infrastructure or property or endanger public safety;
- result in hydrologic changes that could adversely affect existing or planned biological communities;
- result in the need for new drainage facilities and capital expenditures; or
- increase the potential for erosion or sediment deposition.

Thresholds identified in this chapter apply primarily to surface water hydrology of lands adjacent to the proposed action. Potential impacts on the project site and San Pablo Bay related to tidal hydraulics are addressed in Chapter 6.

According to Appendix G of the State CEQA Guidelines, applicable regulations, and professional judgment, a project is considered to have a significant impact on water quality if it would:

- increase the frequency or severity of exceedances of the water quality objectives for San Pablo Bay or other water bodies or
- impair the quality of shallow groundwater.

Impacts and Mitigation Measures of Alternative I: No Action

Under Alternative 1, the HAAF parcel would remain in Army ownership and drainage facilities would continue to be operated and maintained by the Army or a new owner. Existing drainage and flood control characteristics of the HAAF, SLC, and surrounding parcels would remain unchanged. Because drainage and flood control facilities would continue to be operated and maintained, the level of protection afforded the HAAF parcel

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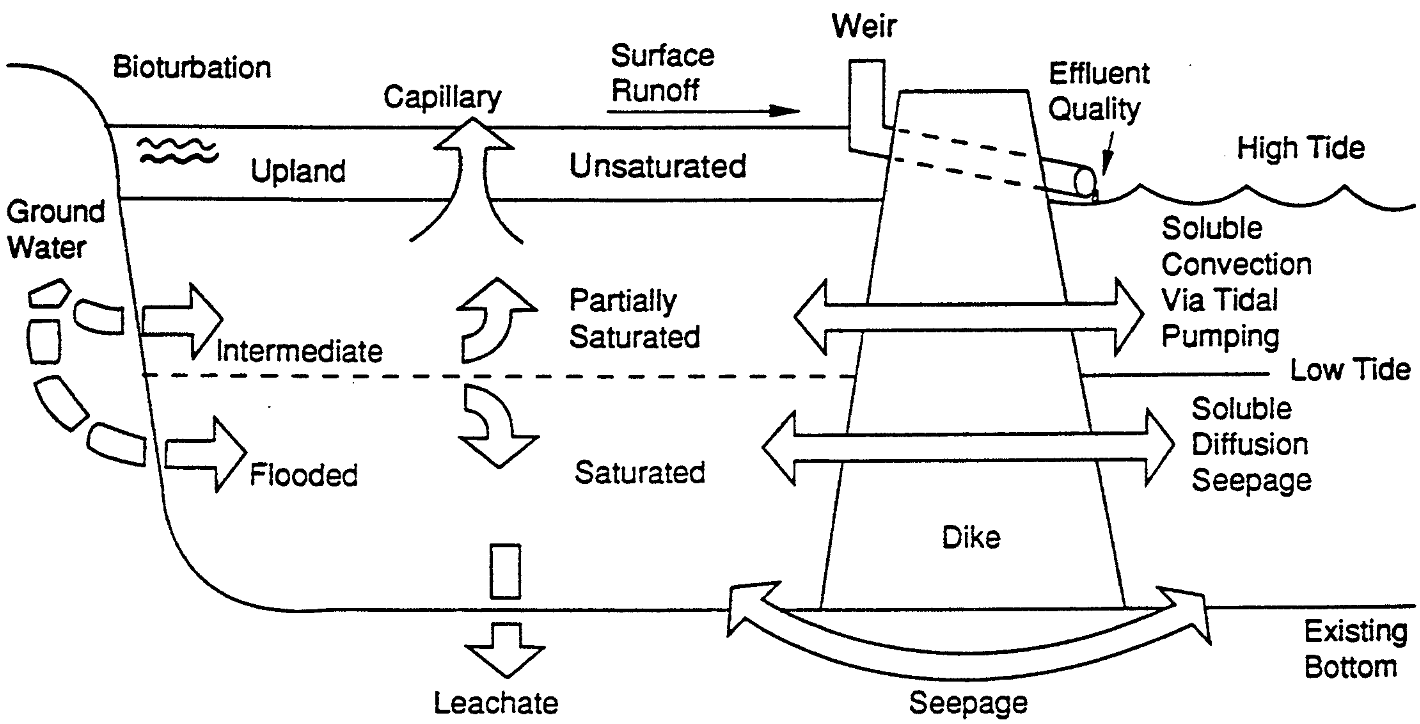

Source: Wolfenden and Carlin 1992.

Jones & Stokes Associates, Inc.

Figure 5-4
Potential Contaminant Mobility Pathways

and surrounding parcels would not change. Therefore, Alternative 1 would have no hydrologic or water quality effects.

Impacts and Mitigation Measures Common to Alternatives 2, 3, 4, and 5

Impact 5.1: Loss of Drainage Capacity from New Hamilton Partnership Development

Drainage from the lands adjoining the western side of the HAAF parcel is collected in a system of pipes and channels. The New Hamilton Partnership has recently constructed a stormwater pumping station near the southwest corner of the HAAF parcel to serve a portion of this drainage that is operated by the City, and plans to construct a second outfall in the area of Reservoir Hill. The New Hamilton Partnership has also constructed a levee to protect its development from tidal floodwaters (top elevation of 8.0 feet with a splash wall to 12.0 feet). The conversion of the HAAF parcel to tidal wetlands would encroach on the outlet channel for the New Hamilton Partnership outfalls and exposure of the levee to risk from tidal flooding. However, the New Hamilton Partnership has already accounted for potential conversion of the HAAF parcel in the design of facilities constructed to date and in its plans for additional facilities. Because the conceptual restoration plan does not allow for drainage for the second outfall facilities, this impact is significant. To reduce this impact to a less-than-significant level, the Corps and Coastal Conservancy or successors in interest shall implement Mitigation Measure 5.1.

Mitigation Measure 5.1: Provide Allowance for Drainage Similar to Design Specified for New Hamilton Partnership East Outfall. The Corps and Coastal Conservancy or successors in interest shall provide allowance for drainage similar to the design specified for the New Hamilton Partnership east outfall. This can be accomplished by not filling above the invert of the outfall. The drainage channel must allow for free drainage into the wetland.

Impact 5.2: Potential Exceedance of Water Quality Objectives

As described under "Impact Mechanisms", implementation of the proposed action could create a water body with inadequate freshwater or tidal flushing, resulting in stagnation, depressed dissolved oxygen concentrations, and algal bloom, which may lead to offensive odors. Assuming adequate flow and the absence of hazardous materials, water quality in created wetlands would probably be similar to that of incoming water sources such as Novato Creek, Pacheco Creek, and San Pablo Bay. This impact is considered less than significant and no mitigation is required.

Impact 5.3: Potential for Degradation of Water Quality in Restored Wetlands

NSD releases treated wastewater through a 54-inch reinforced-concrete pipe into San Pablo Bay. The outfall line follows the boundary between the SLC and HAAF parcels and discharges through a diffuser into the bay. Before the treated wastewater is released into the bay, the NSD dechlorination plant performs final treatment of the wastewater discharge stream. Treated wastewater is released only during winter and spring months because the treated wastewater is reclaimed and used for irrigation purposes during dry months.

The overall NSD discharge flow rate is approximately 0.01% of the average tidal flow discharge in San Pablo Bay. Diffusion and mixing by the tidal and wind-driven circulation in the bay provide ample opportunity for dilution of the wastewater discharge stream. Because of the high degree of dilution that the discharge stream undergoes upon release into San Pablo Bay and the relative separation of the diffuser from the entrance channels of the proposed tidal wetlands, the impact of return flows from the NSD facilities entering the proposed tidal wetlands is considered less than significant and no mitigation is required.

Impact 5.4: Potential Degradation of Groundwater Quality

Inundation of the project area could degrade shallow groundwater through saltwater intrusion or leaching of hazardous materials. However, the shallow groundwater in the project area already has a high salinity because of the historic influence of San Pablo Bay. Because bay water is of poor quality, it is not used as a potable water source. Because of the presence of bay muds at the site, surface water and shallow groundwater are unlikely to recharge deeper groundwater; therefore, saltwater leaching and intrusion of hazardous materials are unlikely to occur. This impact is considered less than significant and no mitigation is required.

Impacts and Mitigation Measures Unique to Alternative 2

No impacts and mitigation measures are unique to Alternative 2.

Impacts and Mitigation Measures Unique to Alternative 3

Impact 5.5: Potential Degradation of Surface Water Quality

Runoff. Disposal of dredged sediments at the site would increase the amount of vegetation and soils cover, which would decrease the rapid runoff that presently occurs on the mostly paved site. In addition, runoff of accumulated pollutants (e.g., oil, grease, heavy metals, pesticide residues, fertilizers, and coliform bacteria) from roadways, parking lots, rooftops, and other surfaces would decrease. This reduction in water quality degradation could be substantial, thereby producing beneficial impacts. (U.S. Army Corps of Engineers and Port of Oakland 1998a.)

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 determined by circulation. Decant water released from dredged materials would have no effect on local salinity because the discharged water would have virtually the same salt concentration as the bay water. (U.S. Army Corps of Engineers and Port of Oakland 1998a.)

Acid-Sulfate Soils. Disposal of dredged sediments would result in the saturation of existing acid-sulfate soils. Such conditions could 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 be discharged to San Pablo Bay or leach through onsite soils to groundwater. However, the procedure used to create wetlands would include surface flooding of onsite 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 could 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. (U.S. Army Corps of Engineers and Port of Oakland 1998a.) Because surface flooding would be used, impacts with respect to acid-sulfate soils are considered less than significant.

Leaching of Contaminants from Dredged Sediments. The project could result in potential leaching of contaminants from levees or berms constructed on dredged sediments, physical erosion and transport of the sediment by surface water currents and runoff, and selective uptake and biomagnification of contaminants in plants and animals. However, the sediments selected for use as cover material for tidal and seasonal wetland restoration at the project site would need to meet the RWQCB screening criteria, which would minimize the potential for bioaccumulation. Maintaining wet, anoxic sediment conditions would minimize pH changes and increases in leachability of heavy metals and other substances. Restricting disposal of sediments to those passing the cover screening criteria would ensure that no adverse impacts on surface water quality would occur. This would be enhanced by the site design, which would promote sedimentation as a physical sink for incoming tidal sediment. (U.S. Army Corps of Engineers and Port of Oakland 1998a.)

Increased Turbidity, Erosion, and Sedimentation. 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 substantial offsite transport is anticipated. The impacts of increased turbidity and sedimentation would be short term, and offsite transport would eventually be eliminated when equilibrium is established in the restored tidal marsh and tidal sloughs. This localized, short-term impact is considered less than significant because high turbidity is characteristic of the water in dynamic tidal marsh environments. (U.S. Army Corps of Engineers and Port of Oakland 1998a.)

Short-term increases in erosion and sedimentation would occur during construction because of the removal of topsoil and associated vegetation in some areas. Most 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 temporary and is considered a less-than-significant impact.

In addition, the following actions that would occur as part of the project would further reduce any impacts on 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 would be monitored and discharged only after meeting state water quality standards.

- Vegetation would be established to further reduce contaminant concentrations in surface runoff during the dry oxidized stage.

In summary, the area of dredged material would not result in any significant adverse water quality impacts.

Water Quality Monitoring Program. A water quality monitoring program would be developed to ensure adequate wetland hydrologic and biological functions, including circulation, proper conditions for plant growth, and high-quality habitat for aquatic organisms and wildlife. Before the construction phase of the project, water quality monitoring and reporting requirements for the project site will be established by the San Francisco RWQCB in the project-specific WDRs. The WDRs will require sampling and analysis to provide background water quality information on the project's discharge. These data will be used to evaluate water quality of the discharge and determine compliance with the WDRs. Monitoring and reporting requirements will be based on site-specific conditions such as beneficial uses, existing water quality, quality of dredged material, and wetland management goals.

The monitoring program shall be initiated before implementation of the project to determine background concentrations of constituents of concern, will continue during construction to identify any adverse impacts.

Water samples should be collected and analyzed at frequencies ranging from monthly to quarterly and during both high and low tides after placement of dredged material.

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Monitoring frequency may be reduced if data indicate that the created wetland is in compliance with WDRs and is not adversely affecting water quality. During dredged material placement, daily and/or weekly monitoring should be required for key constituents of concern, such as nitrate, ammonia, phosphorus, and heavy metals. Other water quality parameters to be monitored will include salinity, temperature, pH, dissolved oxygen, and suspended solids.

Exceedance of monitoring standards may require temporary delays in material placement or the installation of turbidity curtains or other physical measures to control the flow of water and sediments.

Impacts and Mitigation Measures Unique to Alternative 4

No impacts and mitigation measures are unique to Alternative 4.

Impacts and Mitigation Measures Unique to Alternative 5

Impact 5.6: Potential Degradation of Surface Water Quality

This impact is the same as Impact 5.5 described above for Alternative 3. This impact is considered less than significant.

Potential Issues and Resolutions under the Bel Marin Keys V Scenario

Potential Issue: Loss of Drainage Capacity from New Hamilton Partnership Development

This issue is similar to Impact 5.1 described above for Alternatives 2-5. A potential resolution to this issue would be similar to Mitigation Measure 5.1.

Potential Issue: Potential Exceedance of Water Quality Objectives

This issue is similar to Impact 5.2 described above for Alternatives 2-5 and is not considered to be significant.

Potential Issue: Potential for Degradation of Water Quality in Restored Wetlands

This issue is similar to Impact 5.3 described above for Alternatives 2-5 and is not considered to be significant.

Potential Issue: Potential Degradation of Groundwater Quality

This issue is similar to Impact 5.4 described above for Alternatives 2-5 and is not considered to be significant.

Potential Issue: Potential Degradation of Surface Water Quality

This issue is similar to Impact 5.5 described above for Alternative 3 and is not considered to be significant.

Chapter 6. Tidal Hydraulics

This chapter describes the existing tidal hydraulic regime of the project area, the impacts of the alternatives on circulation and sedimentation in San Pablo Bay, the ability of the proposed tidal channels to transport sediment and create the tidal marsh, and the effects of wind and wave action on perimeter levees.

Affected Environment

Data Sources

Information presented in this section is based on the following sources:

- Clarification of Wetland Design Issues for Hamilton Marsh Restoration Project (Baye pers. comm.);
- Suspended Particle Transport and Circulation in San Francisco Bay: An Overview, in Estuarine Processes—Volume II (Conomos and Peterson 1977);
- Wind in California (California Department of Water Resources 1978);
- Sacramento—San Joaquin Delta Atlas (California Department of Water Resources 1993);
- Sediment Budget Study for San Francisco Bay (U.S. Army Corps of Engineers 1992);
- Review of Model Plans for the John F. Baldwin Ship Channel Project (U.S. Army Corps of Engineers 1996c);
- U.S. Geological Survey (USGS) 7.5-minute quad sheets for Petaluma Point, California (printed 1951, photorevised 1968, photorevised 1980) and Novato, California (printed 1954, photorevised 1968, photorevised 1980); and
- tidal benchmark data (Tide Gage 941-5252).

Existing Tidal Hydraulic Regime

Unless otherwise cited, all information in this section is developed from or reported in Conomos and Peterson (1977).

San Pablo Bay is the northernmost embayment of the San Francisco Bay system. At high tide, the surface area of the bay is approximately 64,000 acres. Tidal circulation in San Pablo Bay is determined by the bay's connection with San Francisco Bay to the south. San Pablo Bay directly receives most of the freshwater inflow entering the San Francisco Bay system. This freshwater inflow has an extensive influence on current patterns, vertical mixing, and constituent transport patterns within San Pablo Bay. During periods of high inflow, the bay becomes well mixed, and salinity stratification and intrusion are diminished.

More than 90% of the freshwater inflow to San Pablo Bay arises from the Sacramento and San Joaquin River systems and enters the bay through Carquinez Strait. The combined flow of these rivers averages approximately 32,000 cfs during the winter months and average approximately 6,000 cfs during the summer months (California Department of Water Resources 1993). The remainder of the freshwater inflow to San Pablo Bay enters through numerous tidal creeks and pump station outfalls that drain the bay's tributary watersheds. The largest of these watersheds draining into San Pablo Bay enter along the bay's northern shoreline, including the Napa River, Sonoma Creek, and the Petaluma River.

Currents in San Pablo Bay are dominated by tidal circulation. Based on measurements of tidal stage fluctuation and the tidal prism volume upstream of a given point, the average tidal discharges at Chipps Island, just downstream of the confluence of the Sacramento and San Joaquin Rivers, is estimated to be 170,000 cfs and increases to more than 2,300,000 cfs at the Golden Gate (California Department of Water Resources 1993). Average tidal discharges in San Pablo Bay increase with increasing tidal prism volume; thus, the greatest tidal discharge on San Pablo Bay occurs on its southern boundary with central San Francisco Bay.

Tidal stage in San Pablo Bay follows a mixed semi-diurnal pattern, meaning that there are two distinct high tides of different elevations and two distinct low tides of different elevations in any given lunar day. The mean lower low water elevation at the Petaluma River entrance tide gage is -2.63 feet NGVD. The mean higher high water elevation is 3.43 feet NGVD. Storm surge and wind setup can increase tidal water surface elevations well in excess of the mean higher high water elevation. Peak 100-year tidal flood elevations are reported as 7.0 feet NGVD in the draft restoration plan.

Sediment inflow to the bay from the Delta system is highly variable, with values as high as 3.8 million tons per year. Sediment inflow is projected to decrease to approximately 1.6 million tons per year by 2035 as a result of increased flow diversions from the Delta (U.S. Army Corps of Engineers 1992). The sand/silt/clay ratio of sediment reaching the San Francisco Bay system is estimated at 15%, 30%, and 55%, respectively. Sediment input to the bay is directly linked to the quantity of water entering the bay and primarily derives from winter flood runoff events. The Sacramento and San Joaquin River system contributes more than 80% of their combined sediment load during winter storm events. Suspended sediment concentrations within the waters of San Pablo Bay vary with the intensity of wind mixing and the quantity entering from freshwater inflows.

The morphology of San Pablo Bay is characterized by extensive mudflat and subtidal mud surfaces and a primary 30- to 40-foot-deep subtidal channel extending from the confluence with San Francisco Bay to Carquinez Strait. This subtidal channel is periodically dredged by the Corps for deep draft navigation to the ports of Richmond, Mare Island, Pittsburg, Antioch, Stockton, and Sacramento (U.S. Army Corps of Engineers 1996c). A smaller subtidal channel approximately 8 feet deep at mean lower low water traverses the mudflats from the mouth of the Petaluma River to the primary subtidal channel. The mudflats outside of the subtidal channels slope gently upwards through the tidal range to the bay's shoreline. Average depths are less than 6 feet over much of the mudflat and subtidal mud surfaces. The shoreline fringe is tidal marsh, whose width varies from less than 100 feet in many locations to several hundred feet along the bay's northern shoreline.

Wind speeds over San Pablo Bay are light and variable. Winds exceed 13 mph only 10% of the time. Median wind speeds are less than 7 mph (California Department of Water Resources 1978). Wind-generated waves develop in response to the wind patterns, with resultant wave height and wave period being a function of fetch length and water depth. Resultant wave periods of 2–5 seconds are reported as typical for conditions in San Pablo Bay.

The restoration site is on the western shoreline of San Pablo Bay. Historically, the project site was a tidal marsh and hydraulically connected to San Pablo Bay. Placer mining in the middle to late 1800s introduced tremendous amounts of sediment to the San Pablo Bay, causing extensive deposition and progradation of the shoreline. Levees and drainage facilities constructed in the late 1800s eliminated tidal exchange into the historical marsh area.

Comparison of USGS quad sheets (Petaluma Point, 7.5-minute series, 1951, 1959, 1980) of the study area indicate that marsh accretion is occurring in the outboard marsh adjacent to San Pablo Bay. This observation indicates that sufficient suspended sediment is transported to the marsh front and is deposited to create new marsh plain on the western shoreline of San Pablo Bay.

Environmental Consequences and Mitigation Measures

This section describes methods used to analyze potential impacts of the project alternatives compared to conditions under Alternative 1: No Action. Potential impacts and impact mechanisms of each project alternative are described, and recommended mitigation measures to reduce significant impacts to a less-than-significant level are provided.

Approach and Methods

Potential impacts on the tidal hydraulic regime and morphology of San Pablo Bay and its environs were determined by comparing the magnitude of the relevant tidal hydraulic parameters under existing conditions with the expected magnitude of the tidal hydraulic parameters after implementation of the various project alternatives.

Impact Mechanisms

The following types of activities and processes associated with implementation of the project alternatives could result in changes in tidal hydraulic circulation or morphologic processes in San Pablo Bay or the restored tidal wetlands on the HAAF, SLC, and BMKV parcels.

Circulation and Morphology of the San Pablo Bay

Tidal and Residual Circulation in San Pablo Bay. Creation of additional tidal prism on the western shoreline of San Pablo Bay would induce tidal currents into and out of the tidal prism of the restored tidal wetland. This action may alter circulation patterns within San Pablo Bay.

Morphology of San Pablo Bay and Shoreline. The project would involve construction of tidal outlet channels through the existing outboard salt marsh and mudflats. Additional morphologic adjustments and changes within San Pablo Bay may develop over time.

San Pablo Bay Sediment Budget. The project is designed to trap suspended sediment from San Pablo Bay. Sediment deposition within the restored wetlands may affect the overall sediment budget and existing sediment deposition patterns within San Pablo Bay.

Circulation and Morphology of Proposed Tidal Wetlands

Tidal and Residual Circulation in Proposed Tidal Wetlands. The project would create tidal circulation and inundation on properties that are presently protected by levees and drained by the existing HAAF pump stations and perimeter drainage ditch.

Internal Peninsulas and Perimeter Levees. The project would create tidal currents adjacent to internal peninsulas intended to dissipate wave action and the project perimeter levee. Tidal inundation would allow for wind-wave action on these structures that could induce erosion or morphologic change over time.

Thresholds of Significance

In this analysis, a project alternative is considered to have a significant impact on the tidal hydraulic environment if it would:

- alter the magnitude and direction of tidal circulation outside the immediate zone of subtidal and outboard marsh channels constructed for the project;
- alter the large-scale morphology of mudflats and subtidal channels outside the immediate zone of subtidal and outboard marsh channels constructed for the project;
- cause erosion of the perimeter levees, thus increasing the risk of tidal flooding on adjacent properties;
- induce or aggravate erosion of the existing outboard salt marsh; and
- cause insufficient sediment deposition within the tidal marsh to develop morphologically, as described in the draft restoration plan~~; and~~.
- ~~cause persistence of internal peninsulas.~~

Impacts and Mitigation Measures of Alternative 1: No Action

Maintaining the HAAF and SLC parcels in their present uses would have no impact on the tidal hydraulic environment in San Pablo Bay or the properties on which tidal wetlands are proposed to be created. The DoD would continue to maintain the properties in caretaker status. Continued operation and maintenance of the interior drainage system and San Pablo Bay levee would continue. The existing outboard tidal marsh, San Pablo Bay mudflats, and subtidal channels would be unaffected.

Impacts and Mitigation Measures Common to Alternatives 2, 3, 4, and 5

Impact 6.1: Modification to Circulation in San Pablo Bay

Tidal fluctuations into and out of the restored tidal wetland would generate tidal currents in and adjacent to the subtidal channels that connect the restored tidal wetland with San Pablo Bay. This would affect the area around the outboard marsh and subtidal channels because flow momentum in the subtidal channels would be rapidly dissipated by tidal waters outside the subtidal channels. This impact is considered less than significant because large-scale circulation patterns within San Pablo Bay would not be affected by the proposed action.

Impact 6.2: Modification to Sedimentation Processes and Morphology in San Pablo Bay

The HAAF tidal basin is designed to be a sink for sediments carried by tidal exchange, and thus could affect sedimentation and morphology in San Pablo Bay. The sediment sources include bay muds resuspended by wave activity and fine suspended sediment carried from upland sources draining into San Pablo Bay. This impact is considered less than significant because the total amount of suspended sediment deposition within the proposed tidal wetland over the 50-year project horizon is, at most, 7% of the annual suspended sediment (3.8 million tons per year) inflow to San Pablo Bay.

Impact 6.3: Changes in Circulation and Morphologic Evolution in Tidal Wetland

For the tidal marsh to evolve as described in the draft restoration plan, adequate conveyance must be provided by the connecting subtidal inlet and levee breach channels to allow full tidal exchange with the constructed tidal basins. For channel widening to occur in the subtidal channel, adequate shear stress must be developed to erode the consolidated bay mud sediments. As presented in the draft restoration plan, a subtidal connection channel would be excavated through the existing outboard marsh. The invert of the subtidal channel would be equivalent to the invert elevation of the levee breach channel; however, the subtidal channel would be narrower and shallower than the proposed ultimate levee breach channel for the tidal prism volume of the restored wetland. This channel configuration would create a choke through the undersized channel, resulting in a net vertical range of tidal fluctuation in the constructed wetlands that may be less than the vertical tide range in San Pablo Bay. Limited tidal exchange could inhibit the ability of tidal currents to develop the required shear stress to erode and transport the channel boundary materials. This sediment transport feedback process may inhibit morphologic evolution of the proposed wetlands to such a degree that project objectives may not be achieved; therefore, the loss of biological resources (described in Chapter 8) may not be offset by the proposed project. Therefore, this impact is significant. To mitigate this impact to a less-than-significant level, the Coastal Conservancy, Corps, or successors in interest shall implement Mitigation Measure 6.3.

Mitigation Measure 6.3: Ensure Adequate Tidal Exchange and Develop and Implement a Monitoring Program to Assess Project Evolution. To identify and develop effective mitigation measures for unexpected or undesirable tidal hydraulic and morphologic response within the restored tidal wetland, the Coastal Conservancy, Corps, or successors in interest shall ensure that a monitoring program is developed that is tied to the project goals and objectives (described in Chapter 2) and implemented to assess project evolution. The monitoring program should include, at a minimum, the following elements:

- **Time period:** Until criteria are met, with annual review of monitoring results; the monitoring period may be discontinued, or monitoring and review intervals lengthened, if the results indicate successful evolution of the wetlands toward the targets of the draft restoration plan

- **Parameters to be monitored:** Tidal stage, tidal current, wind speed and direction, wave characteristics, suspended sediment concentrations, marsh elevation, mudflat elevation, characteristics of subtidal channel and marsh surface sediments, and San Pablo Bay shoreline characteristics

- **Locations to be monitored:** Tidal wetland interior, tidal wetland perimeter, subtidal channels, and existing San Pablo Bay marsh shoreline

- **Frequency of monitoring:** To be recommended in monitoring program

Monitoring of morphologic evolution will allow the state and federal governments to assess the success of creating the target habitat characteristics and make corrective actions for achieving the desired habitat types. Potential corrective actions include changing the breach and subtidal channel dimensions, altering perimeter levee berm morphology, and modifying channel characteristics within the restored tidal wetlands to ensure adequate morphologic evolution.

In addition to this monitoring program, a quantitative assessment of subtidal channel shear stress and resultant subtidal channel widening should be completed before project construction to ensure that adequate tidal exchange within the restored wetlands would occur. One potential method for completing this assessment includes ~~laboratory measurements of the critical shear stress for erosion of the bay muds, and use of these parameters in numerical modeling analysis. This numerical modeling can be combined with determination of long-term "effective" suspended sediment concentrations in San Pablo Bay by collection of sediment cores in existing accreting marsh surfaces in the project area, and calculating the required concentration to develop the sediment accumulation rates determined from the core samples. This will provide a more accurate assessment of the time frame required for sediment deposition and the resultant tidal habitat to develop within the restored wetland.~~ :

- obtaining a few undisturbed cores of the tidal muds to determine critical shear stress for particle and mass erosion of the cohesive muds (critical shear stress of muds is a function of the degree of consolidation, the clay mineral types, and other geochemical factors; it is not purely a function of grain diameter as it is for noncohesive sands and gravels) and

- completing a two-dimensional (depth-averaged) hydrodynamic analysis of the proposed tidal wetland and tidal mudflats in the vicinity of the tidal wetland;

the modeling analysis would determine whether the conveyance provided in the entrance channel and subtidal mudflat channel is sufficient to scour the cohesive bay muds; the analysis completed to date has not addressed the effects of the mudflat entrance conditions and thus neglects a critical link in the system: flow over the mudflat (through subtidal mudflat channels) must be adequate to reach the outboard marsh entrance channel; if the entrance and mudflat channel are too small, the tidal flushing and sediment input to the wetland will be limited, and the marsh plain will not develop as projected.

Impact 6.4: Inception of or Increase in Outboard Marsh Shoreline Erosion

Tidal circulation between the restored tidal marsh and San Pablo Bay is not expected to induce or aggravate erosion of existing tidal marsh shoreline along San Pablo Bay. However, the project would involve excavation of a channel or channels through the existing outboard marsh. Additional erosion of the outboard marsh surface can be expected if the channel or channels widen in response to the tidal exchange to the restored wetlands. The loss of existing tidal marsh is considered a less-than-significant impact because a primary purpose of the proposed action is the creation of new and additional tidal marsh habitat. The project is designed to create tidal marsh habitat over and above the amount lost by excavation and erosion of the connecting outboard marsh channel.

Impact 6.5: Excessive or Unexpected Erosion of Perimeter Levee

The perimeter and New Hamilton Partnership levees would be subject to erosion from current or wave forces. Currents generated by tidal fluctuations adjacent to levee structures within the proposed wetlands are not expected to pose a significant erosion risk to the structures. Final design studies completed before project implementation are recommended to quantify tidal currents within the wetland and determine erosion risk from tidal currents.

Wind-generated waves pose a more significant erosion risk than tidal currents on the perimeter and New Hamilton Partnership levees. The size of wind generated waves is primarily a function of the wind speed, wind fetch, wind duration, and water depth. Wave height generally increases in magnitude with each of these parameters. Erosion from wind-generated waves can be minimized or eliminated by adequately providing for wave dissipation and erosion protection structures on the levee structures or minimizing the opportunity for wind waves to develop. The design presented in the conceptual plan utilizes a combination of levee berms for providing wave dissipation and erosion protection and methods for and internal peninsulas for lowering wave fetch and resultant wave height.

Philip Williams & Associates (1998) developed unpublished information regarding storm-generated wind waves in the proposed tidal wetlands. Their analysis of wind-generated waves with a 100-year recurrence interval within the proposed tidal wetlands indicates wave heights of 1.7, 1.9, and 2.0 feet for fetch lengths of 2,000, 4,000, and 8,000 feet, respectively. Fetch lengths were determined by utilizing internal peninsulas within the tidal wetland. Wave runup elevations for these three wave heights differed by no more than 0.3 foot for a variety of berm and levee slope conditions. For practical purposes, the difference in wave heights for the different internal peninsula configurations, and the resultant wind fetch lengths, are very small. Nearly equivalent erosion protection measures would be required for the three different wave heights. The small differences in wave runup could be accounted for by constructing a levee with a slightly higher final crest elevation, indicating that internal peninsulas may not be required as part of the levee erosion protection measures. Material for constructing levees approximately 0.3 foot higher could be obtained by eliminating internal peninsulas and utilizing these embankment materials to increase levee and levee berm dimensions.

A submerged berm and wildlife corridor are proposed for installation on the perimeter levees and New Hamilton Partnership levees, respectively. Properly designed, these types of structures can be effective measures for providing wave dissipation, erosion protection, and a substrate for vegetation establishment. Berm erosion would expose the perimeter and New Hamilton Partnership levees to wave erosion, threatening levee integrity. Design details to ensure adequate berm performance, including berm topslope, berm length, and elevation, would be determined during final design studies of the wetland restoration project.

The conceptual plan recommends that levee erosion monitoring and maintenance be part of the project design. The monitoring and maintenance program could include surveying levee berm topography and assessing vegetation establishment annually after project construction. The monitoring could be accomplished by surveying berm and levee cross sections annually at a maximum spacing of 2,500 feet. The levee erosion monitoring program should be incorporated into any additional monitoring required for ensuring geotechnical stability and adequate crest elevations of the levee structure. Adverse erosion identified by the monitoring program could be corrected by placement of additional berm material, installation of acceptable erosion control features such as fiber mats, planting of vegetation, or installation of riprap. A properly designed and executed monitoring and repair program, in conjunction with properly sized levees and levee erosion protection measures, would prevent any significant impacts caused by levee erosion; therefore, the impact of perimeter levee erosion is considered less than significant.

Potential Issues and Resolutions under the Bel Marin Keys V Scenario

One possible future scenario is that the BMKV property could be converted to tidal and nontidal wetlands connected to the HAAF and SLC parcels. This conversion would increase the tidal prism of the wetland and could have a cumulative effect on circulation, sedimentation, and morphologic evolution in San Pablo Bay and in the HAAF and SLC parcel wetlands.

The additional tidal prism is not considered to be large enough to have cumulative impacts on San Pablo Bay. Issues regarding the BKMV conversion on the proposed project in the HAAF and SLC parcels would need to be addressed in BKMV project design and environmental documentation.

Chapter 7. Public Health

Public health issues evaluated for the proposed alternatives are public nuisances associated with mosquitos and diseases transmitted to humans by mosquitos. This chapter describes mosquito breeding conditions and production levels present in the HAAF, SLC, and BMKV parcels and potential impacts on public health and safety associated with mosquitos that may occur with implementation of project alternatives.

Information presented in this chapter and used to conduct the analysis of potential project impacts is based on the following data sources:

- draft Hamilton Wetlands Conceptual Restoration Plan (Woodward-Clyde 1998),
- revised draft final Bel Marin Keys Unit 5 EIR/EIS (Environmental Science Associates 1993),
- draft EIR/EIS for the Delta Wetlands project (Jones & Stokes Associates 1995),
- literature on mosquito ecology and control methods, and
- unpublished information from and conversations with representatives of the Marin-Sonoma Mosquito Abatement District.

Affected Environment

Mosquito Breeding Conditions

All species of mosquitos require standing water to complete their growth cycle; therefore, any body of standing water represents a potential mosquito breeding site. Because areas that pond surface water that are flushed by daily tides are not stagnant for periods sufficient for mosquito larvae to mature, such areas are not mosquito production sources (Keith pers. comm.).

Water quality affects the productivity of a potential mosquito breeding site. Typically, greater numbers of mosquitos are produced in water bodies with poor circulation, higher temperatures, and higher organic content (and therefore with poor water quality) than in water bodies having good circulation, lower temperatures, and lower organic content (Collins and Resh 1989). Additionally, irrigation and flooding practices may influence the level of mosquito production associated with a water body: Typically, greater numbers of mosquitos are produced in water bodies with water levels that slowly increase or recede than in water bodies with water levels that are stable or that rapidly fluctuate (Jones & Stokes Associates 1995).

Mosquito larvae prefer stagnant water and the protected microhabitats provided by stems of emergent vegetation. Therefore, if not properly maintained, ditches can be major producers of mosquitos. Periodic dredging of ditches substantially reduces mosquito production by enhancing water circulation and preventing encroachment of emergent vegetation into ditch channels. Mosquitos are adapted to breed during periods of temporary flooding and can complete their life cycles before water evaporates and predator populations become well established. Poor drainage conditions that result in ponding water and water management practices associated with agriculture and creation of seasonal wetlands for waterfowl use result in the types of flooding that can produce problem numbers of mosquitos. (Jones & Stokes Associates 1995.)

Permanent bodies of open water that have good water quality (good circulation, low temperatures, and low organic content) typically sustain stable nutrient content and support rich floral and faunal species diversity, including mosquito predators and pathogens. Wave action across larger bodies of water physically retards mosquito production by inhibiting egg laying and larval survival (Jones & Stokes Associates 1995).

Two broad types of mosquito production sources are present in the project areas: habitats where water ponds permanently and habitats where water ponds seasonally.

Habitats in the project areas where water ponds permanently include the Landfill 26 mitigation wetland borrow pit pond, a portion of Pacheco Pond, and low-lying portions of the perimeter drainage ditch in the HAAF parcel and portions of drainage ditches in the BMKV parcel. However, these habitat areas support populations of mosquitofish and probably other mosquito predator populations, such as backswimmers and dragonflies, that assist in suppressing mosquito production by feeding on mosquito larvae at the water's surface (Environmental Science Associates 1993).

Habitats that seasonally pond water in the project area include brackish marsh, seasonal wetlands, borrow pit ponds, drainage ditches, and portions of cultivated fields that may pond water during the wet season. Table 7-1 shows the estimated acreages of potential mosquito breeding habitat in these areas. (Environmental Science Associates 1993).

In the project areas where mosquitos breed, mosquito production diminishes substantially during the cool season (typically late October through April) (Jones & Stokes Associates 1995).

Table 7-1. Estimated Acreages of Existing Potential Mosquito Breeding Habitat in the Project Areas

Habitat Type	HAAF	SLC	Subtotal	BMKV	Total
Brackish marsh	4.1	0.0	4.1	27.0	31.1
Seasonal wetland	19.5	16.0	35.5	2.0	37.5
Agriculture	0.0	0.0	0.0	1,314.0	1,314.0
Total	**23.6**	**16.0**	**39.6**	**1,343.0**	**1,382.6**

Marin-Sonoma Mosquito Abatement District

The project area is in the jurisdiction of the Marin-Sonoma Mosquito Abatement District (MSMAD). Mosquito abatement districts (MADs) are governmental organizations formed at the local level that are responsible for controlling specific disease vectors within their jurisdiction. MADs receive most of their revenue from property taxes and are primarily responsible for controlling mosquitos as pest species and as disease vectors. California law requires that if a problem source of mosquito production exists as a result of human-made conditions, the party responsible for those conditions is liable for the cost of abatement. The law is enforced at the discretion of the responsible MAD (Cal. Health and Safety Code Section 2200 et seq.).

Because MADs do not have jurisdiction on state and federal lands, MSMAD does not have jurisdiction in the HAAF and SLC parcels but does have jurisdiction in the BMKV parcel.

Criteria for Determining the Need for Control at a Mosquito Source

State laws and regulations require that mosquitos be controlled if diseases transmitted by mosquitos are identified in or near human populations, or if surveillance of mosquito populations for the incidence of mosquito-transmitted diseases indicates the likelihood of transmission (Jones & Stokes Associates 1995). The decision to control mosquitos as a nuisance to human populations is at the discretion of each MAD. Factors influencing this decision may include the number of service calls received from a given locality, the proximity of mosquito sources to population centers, the availability of funds for abatement, the density of mosquito larvae present in a mosquito production source, and the number of adult mosquitos captured per night in light traps (Jones & Stokes Associates 1995). Once a recurring mosquito production source has been identified, abatement schedules are often adopted and maintained for that source (Jones & Stokes Associates 1995).

Mosquito Control Methods

Compared with the historical levels of mosquito-borne diseases in humans, levels of mosquito-borne diseases in California are low. These diseases, including encephalitis and malaria, however, are still present or could be readily reintroduced. (Bohart and Washino 1978, Sacramento-Yolo County Mosquito Abatement and Vector Control District 1990.)

To reduce mosquito populations and, consequently, the likelihood of disease transmission to humans, MADs use a combination of various abatement procedures, each of which may have maximum effectiveness under specific habitat conditions or periods of the mosquito life cycle (Jones & Stokes Associates 1995). Mosquito control methods used by MADs include use of biological agents (e.g., mosquitofish, which are predators on mosquito larvae) in mosquito breeding areas, source reductions (e.g., drainage of water bodies that produce mosquitos), pesticides, and ecological manipulations of mosquito breeding habitat.

Mosquito Habitat Conditions and Abatement Requirements in the Project Areas

In the project areas, MSMAD mosquito abatement efforts are primarily focused on controlling mosquitos that can transmit malaria and several types of encephalitis or cause a substantial nuisance in surrounding communities. Three mosquito species that are found in the project area potentially are vectors of these diseases.

The encephalitis mosquito (*Culex tarsalis*) breeds in areas that pond fresh water. This species is the primary carrier in California of western equine encephalitis, St. Louis encephalitis, and California encephalitis and is considered the most important disease vector in the state (Sacramento-Yolo County Mosquito Abatement and Vector Control District 1990).

The mosquito *Aedes dorsalis* breeds in intertidal marshes and is a suspected vector of California encephalitis (Bohart and Washino 1978). *Aedes squamiger* also breeds in intertidal marsh; however, it is unknown whether the species is a vector of mosquito-borne diseases to humans. These mosquito species, however, tend to be present in very low numbers and have not been of sufficient concern to MSMAD to warrant the implementation of abatement actions (Keith pers. comm.).

Of the wetland habitats in the project areas, only brackish marsh and seasonal wetlands are considered to have the potential to produce problem numbers of mosquitos. Table 7-1 summarizes the acreage of wetlands in the project areas with the potential to produce problem numbers of mosquitos. On average for the past 5 years, MSMAD has annually treated approximately 91 acres of land in and near the project areas, requiring an average of approximately 65 hours of effort to inspect potential mosquito breeding sites and control mosquitos at problem production sources (Table 7-2). MSMAD's abatement efforts are focused on controlling mosquito larvae at breeding sites using several types of approved pesticides (Keith pers. comm.).

Table 7-2.
Area of Mosquito Breeding Habitat Treated and Level of Abatement Effort Expended by MSMAD to Control Mosquitos in the Project Areas from 1993 through 1997

Year	Area Treated to Control Mosquito Larvae (acres)	Effort Expended on Mosquito Abatement Activities (hours)
1993	2.2	23
1994	24.9	51
1995	60.0	51
1996	226.3	84
1997	141.3	116
Average	90.9	65

Environmental Consequences and Mitigation Measures

Approach and Methods

Analytical Methods

Changes in mosquito abatement requirements for the project areas were evaluated through comparison of predictions of future mosquito breeding conditions under the project alternatives with existing mosquito abatement requirements. Predictions of future mosquito breeding conditions are based on predicted future habitat conditions, which are described in Chapter 8, "Biological Resources".

Impact Mechanisms

Impact mechanisms include conversion of areas that do not provide breeding habitat for problem numbers of mosquitos (e.g., grasslands and developed areas) to wetland habitats that have characteristics suitable for producing problem numbers of mosquitos, and changes in water management practices resulting from implementation of project alternatives.

Thresholds of Significance

In this analysis, an alternative would be considered to have a significant impact if habitat changes would necessitate increasing levels of mosquito abatement programs to maintain mosquito populations at preproject levels. Habitat changes that could result in a substantial decline of available mosquito breeding habitat or greater efficiency of MSMAD's abatement program would be considered beneficial impacts.

Impacts and Mitigation Measures of Alternative I: No Action

No impacts on the level of mosquito production or MSMAD's abatement program would occur under Alternative 1 because the HAAF and SLC parcels would remain in caretaker status. The Army would continue to maintain existing facilities, flood control operations, and security systems in the HAAF parcel. The SLC would continue with its current management and operation of the SLC parcel.

Impacts and Mitigation Measures Common to Alternatives 2, 3, 4, and 5

Tables 7-3 and 7-4 compare the predicted acreages of habitats that could produce problem numbers of mosquitos to be restored under Alternatives 2, 3, 4, and 5 with acreages under Alternative 1: No Action 50 years after project implementation.

All public health impacts of Alternatives 2, 3, 4, and 5 are common to the four alternatives.

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Table 7-3.
Estimated Acreages of Potential Problem Mosquito Breeding Habitats under Alternative I: No Action and Potential Breeding Habitats Restored 50 Years after Project Implementation

Habitat Type	Alternative I: No Action (HAAF and SLC Parcels)	Alternative 2[a]	Alternative 3[a]	Alternative 4[a]	Alternative 5[a]
Brackish marsh	4.1	0.0[b]	0.0[b]	0.0[b]	0.0[b]
Seasonal wetland	35.5	134.0[c]	145.0[c]	118.0[c]	129.0[c]
Tidal pannes[d]	0.0	0.0	33.0	0.0	33.0
Total	39.6	134.0	178.0	118.0	162.0

Note: The alternatives are defined as follows:

- Alternative 2: Restoration of wetlands in the HAAF parcel through natural sedimentation
- Alternative 3: Restoration of wetlands in the HAAF parcel using dredged material
- Alternative 4: Restoration of wetlands in the HAAF and SLC parcels through natural sedimentation
- Alternative 5: Restoration of wetlands in the HAAF and SLC parcels using dredged material

[a] Acreages of restored habitats derived or estimated from Woodward-Clyde 1998.

[b] An unknown quantity of brackish marsh will develop as inclusions within restored seasonal wetland habitat areas.

[c] Will include an unknown quantity of brackish marsh habitat area.

[d] Tidal pannes are located at the highest elevations in coastal salt marshes and are shallow depressions that pond shallow water received during periods of extreme high tides and from freshwater runoff.

Table 7-4.
Estimated Net Change in Potential Problem Mosquito Breeding Habitat Acreages 50 Years after Project Implementation

Habitat Type	Acreage under Alternative I: No Action (HAAF and SLC Parcels)	Net Change in Acreage from No Action			
		Alternative 2	Alternative 3	Alternative 4	Alternative 5
Brackish marsh	4.1	-4.1[a]	-4.1[a]	-4.1[a]	-4.1[a]
Seasonal wetland	35.5	+98.5[b]	+109.5[b]	+82.5[b]	+93.5[b]
Tidal pannes[c]	0.0	0.0	+33.0	0.0	+33.0
Total	39.6	+94.4	+138.4	+78.4	+122.4

Note: The alternatives are defined as follows:

- Alternative 2: Restoration of wetlands in the HAAF parcel through natural sedimentation
- Alternative 3: Restoration of wetlands in the HAAF parcel using dredged material
- Alternative 4: Restoration of wetlands in the HAAF and SLC parcels through natural sedimentation
- Alternative 5: Restoration of wetlands in the HAAF and SLC parcels using dredged material

[a] An unknown quantity of brackish marsh will develop as inclusions within restored seasonal wetland habitat areas.

[b] Will include an unknown quantity of brackish marsh habitat area.

[c] Tidal pannes are located at the highest elevations in coastal salt marshes and are shallow depressions that pond shallow water received during periods of extreme high tides and from freshwater runoff.

Impact 7.1: Increase of Potential Mosquito Breeding Habitat

Approximately 134, 145, 118, and 129 acres of brackish marsh and seasonal wetlands would be restored with implementation of Alternatives 2, 3, 4, and 5, respectively. These acreages would represent an increase of approximately 94, 138, 78, and 122 acres, respectively, of potential mosquito breeding habitat from the acreage under Alternative 1: No Action. During construction, but before the perimeter levee is breached to establish tidal flow to portions of the site, surface water may pond in depressions created in portions of the work site as a result of excavation, filling, and grading activities. Areas that pond water for periods sufficient to allow production of adult mosquitos could also be temporary sources of mosquito production. Therefore, an increase in mosquito production would likely occur with implementation of Alternative 2, 3, 4, or 5.

The adjacent New Hamilton Partnership housing development would also increase the number of people potentially exposed to mosquitos produced on the site. Therefore, this impact is considered significant.

To reduce this impact to a less-than-significant level, the Coastal Conservancy and the Corps shall implement Mitigation Measure 7.1.

Mitigation Measure 7.1: Coordinate Project Activities with MSMAD. The Coastal Conservancy and the Corps shall consult and coordinate with MSMAD during design, implementation, and operations phases of the project. The Coastal Conservancy will be responsible for coordination with MSMAD regarding mosquito control measures for the project area following completion of project construction. Consultation and coordination with MSMAD shall include the following actions:

- Consult with MSMAD during the project design phase to incorporate design elements of nontidal wetland habitats to reduce the mosquito production potential of the project. Measures considered should include designing water delivery and drainage systems in nontidal habitats to allow for rapid manipulation of water levels in wetlands.
- Consult with MSMAD to develop and implement feasible measures to reduce the likelihood of ponding of surface water on the project area during the construction period and to implement other mosquito abatement measures that are compatible with construction activities.
- Permit MSMAD to have access to the project area to monitor or control mosquito populations.
- Regularly consult with MSMAD to identify mosquito management problems, mosquito monitoring and abatement procedures, and opportunities to adjust water management practices in nontidal wetlands to reduce mosquito production during problem periods.

- ~~Consult with MSMAD to identify annual mosquitofish stocking requirements in nontidal wetlands.~~

- If it is necessary for MSMAD to increase mosquito monitoring and control programs beyond preproject levels, consult with MSMAD to identify opportunities for the Coastal Conservancy to share costs or otherwise participate in implementing mosquito abatement programs.

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Potential Issues and Resolutions under the Bel Marin Keys V Scenario

The Coastal Conservancy and Corps are considering this alternative at a programmatic level in the event that the BMKV parcel could be acquired for restoration before one of the other project alternatives could be implemented. Conceptually, the habitat types to be restored and the methods used to restore the habitats would be same as proposed under Alternative 5.

Table 7-5 compares the predicted quantities of habitats restored under the BMKV Scenario with Alternative 1: No Action 50 years after project implementation.

Potential issues and resolutions under the BMKV Scenario are the same as those described for Alternative 5, except that approximately 203 acres of additional potential mosquito breeding habitat would be created.

Table 7-5.
Estimated Acreage of Potential Problem Mosquito Breeding Habitats Restored and Net Change in Habitat Acreages under the BMKV Scenario 50 Years after Project Implementation

		BMKV Scenario	
Habitat Type	**Acreage in HAAF, SLC, and BMKV Parcels**	**Estimated Acreage of Restored Habitat Area**	**Net Change in Acreage from Alternative I: No Action**
Brackish marsh	31.1	0[a]	-31.1[a]
Seasonal wetland	37.5	313.5[b]	+276[b]
Tidal pannes[c]	0	80.3	+80.3
Total	68.6	393.8	+325.2

a An unknown quantity of brackish marsh will develop as inclusions within restored seasonal wetland habitat areas.

b Will include an unknown quantity of brackish marsh and brackish open water habitat area.

c Tidal pannes are located at the highest elevations in coastal salt marshes and are shallow depressions that pond shallow water received during periods of extreme high tides and from freshwater runoff.

PA-01 0569

Chapter 8. Biological Resources

Introduction

Biological resources evaluated for the proposed alternatives include native and non-native aquatic and terrestrial habitats, special-status communities, special-status plant and animal species, and species groups of high recreational interest. This chapter describes existing biological resources present in the HAAF, SLC, and BMKV parcels and potential impacts on biological resources that may occur with implementation of project alternatives.

Affected Environment

Data Sources

Information presented in this section is based on the following data sources:

- Environmental Impact Statement—Hamilton Army Airfield Disposal and Reuse (U.S. Army Corps of Engineers 1996a) and
- Bel Marin Keys Unit 5 Final Environmental Impact Report/Environmental Impact Statement (Environmental Science Associates 1993).

Common and scientific names of plant and animal species mentioned in the text are presented in Appendix D.

Biological Communities

Subtidal aquatic, intertidal, wetland, and grassland communities and developed areas are the habitats present in the HAAF, SLC, BMKV parcels. A substantial portion of the BMKV parcel is agricultural land. These habitats and the associated plant and wildlife species are described below. The distribution of habitat types within each area is presented in Figure 8-1, and the acreage of each habitat type in each area is presented in Table 8-1. Habitat types and acreages are derived from the results of previous habitat inventories conducted of the project area.

Aquatic Communities

Aquatic communities include subtidal (i.e, aquatic habitats that are never exposed during low tide) and intertidal aquatic (i.e., emergent marsh habitat and mudflats that are exposed during low tides) habitats. Each of these is described below.

Subtidal Aquatic Habitat. Subtidal aquatic habitats are areas of continuous open water that are submerged during even the lowest tide; as a result, these areas are too deep to support the types of vegetation found in emergent (i.e., occasionally exposed) marsh habitat. Phytoplankton; zooplankton; and fish such as longfin smelt, northern anchovy, speckled sanddab, and staghorn sculpin occupy subtidal aquatic habitat. Benthic organisms such as worms and clams can be found in the sandy, muddy bottom. Many species of waterfowl and diving birds use subtidal aquatic habitat for feeding areas.

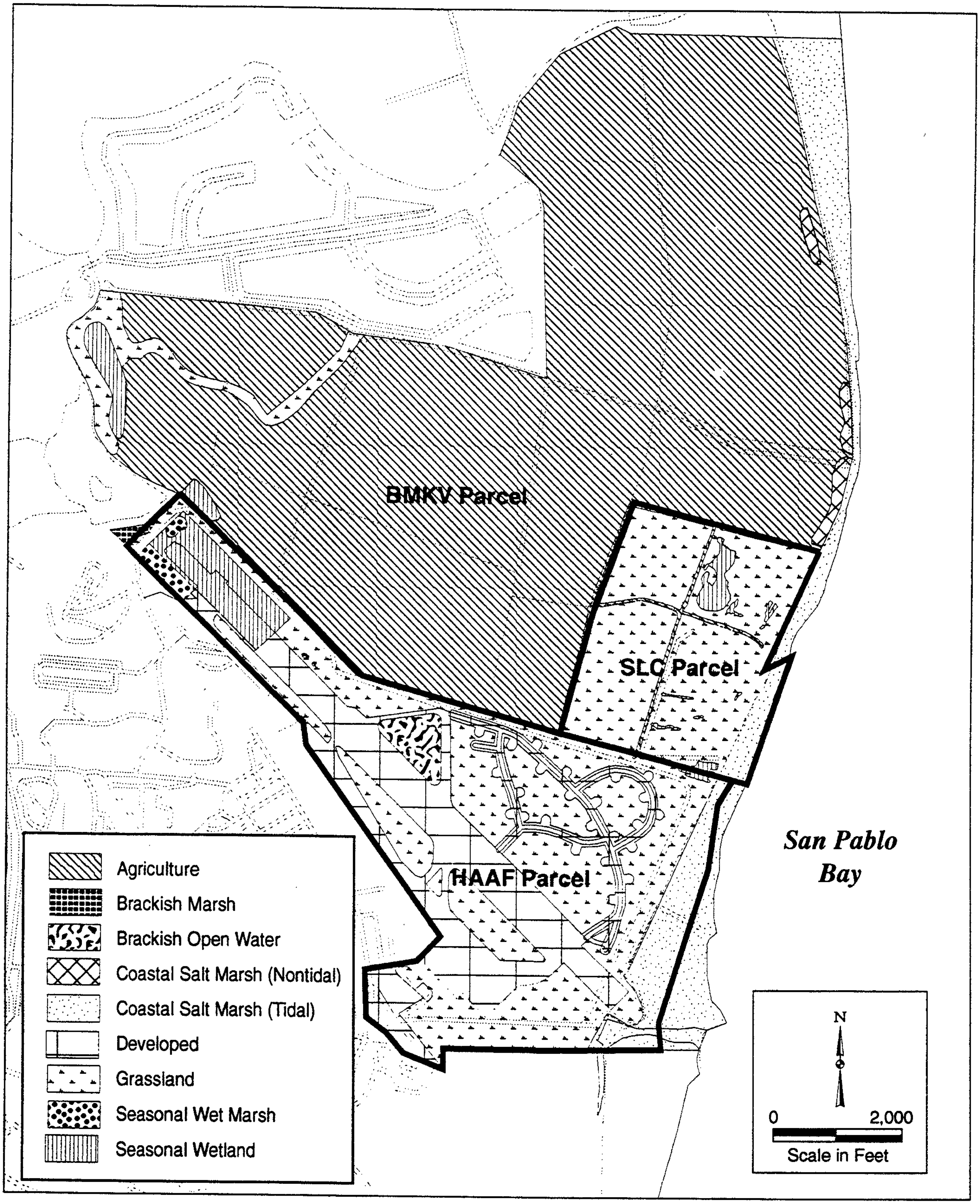
Intertidal Aquatic Habitat. Intertidal aquatic habitat comprises two subtypes of habitat, intertidal mudflats and coastal salt marsh. Intertidal mudflats are made up of unconsolidated, muddy bottom areas without vegetation and are present along the bay side of coastal salt marshes that are outboard (on the bay side) of the perimeter levee. Mudflats are exposed twice daily during low tide and extend to the extreme low water elevation (Figure 8-2). Narrow bands of mudflat are also found at the same elevations along the margins of subtidal channels in tidal marshes. Mudflats are highly productive and support large populations of benthic (bottom-feeding) organisms, including aquatic worms, crustaceans, and mollusks that are important elements of the estuarine foodweb. When exposed or covered by shallow water, mudflats provide important foraging areas for migrant and wintering shorebirds, wading birds, and gulls.

Coastal salt marsh contains persistent, rooted herbaceous vegetation dominated by cordgrass and pickleweed. The vegetation in the marsh habitat is used as direct cover and sources of food by rearing juvenile and adult fish such as longfin smelt, chinook salmon, and steelhead. Because emergent marsh habitat is within the tidal zone, it drains frequently and, for this reason, is not used for spawning. Benthic organisms use this habitat in the same way they use intertidal mudflats. Emergent marsh habitat also provides nesting, foraging, and escape cover for various songbirds and wading birds.

Wetland Communities

Five types of wetland communities are present in the project area: coastal salt marsh (tidal), coastal salt marsh (nontidal), brackish marsh, brackish open water, and seasonal wetland. All of these wetland types except brackish open water are considered jurisdictional wetlands by the U.S. Army Corps of Engineers (Corps) in accordance with the federal Clean Water Act and as sensitive natural communities by the California Department of Fish and Game (DFG).

Boundaries of wetland communities in the HAAF parcel were established during a delineation of potential jurisdictional wetlands in 1991 (Jones & Stokes Associates 1991). The delineation was initially verified by the San Francisco District of the Corps in 1992



Jones & Stokes Associates, Inc.

Figure 8-1
Habitat Types at the Hamilton Wetland Restoration Project Site

Table 8-1.
Acreage of Each Habitat Type in the HAAF, SLC, and Bel Marin Keys V Parcels

Habitat Type	HAAF	SLC	Subtotal	Bel Marin Keys V	Total
Coastal salt marsh (tidal)	88.0[a]	32.0[b]	120.0	0.0	120.0
Coastal salt marsh (nontidal)	0.0	0.0	0.0	11.0	11.0
Brackish marsh	4.1	0.0	4.1	27.0	31.1
Brackish open water	13.0	0.0	13.0	0.0	13.0
Seasonal wetland	19.5	16.0	35.5	2.0[c]	37.5
Grassland	258.7	234.0[d]	492.7	4.0[c]	496.7
Agriculture	0.0	0.0	0.0	1,314.0[e]	1,314.0
Developed areas	283.6	0.0	283.6	0.0	283.6
Total	666.9	282.0	948.9	1,358.0	2,306.9

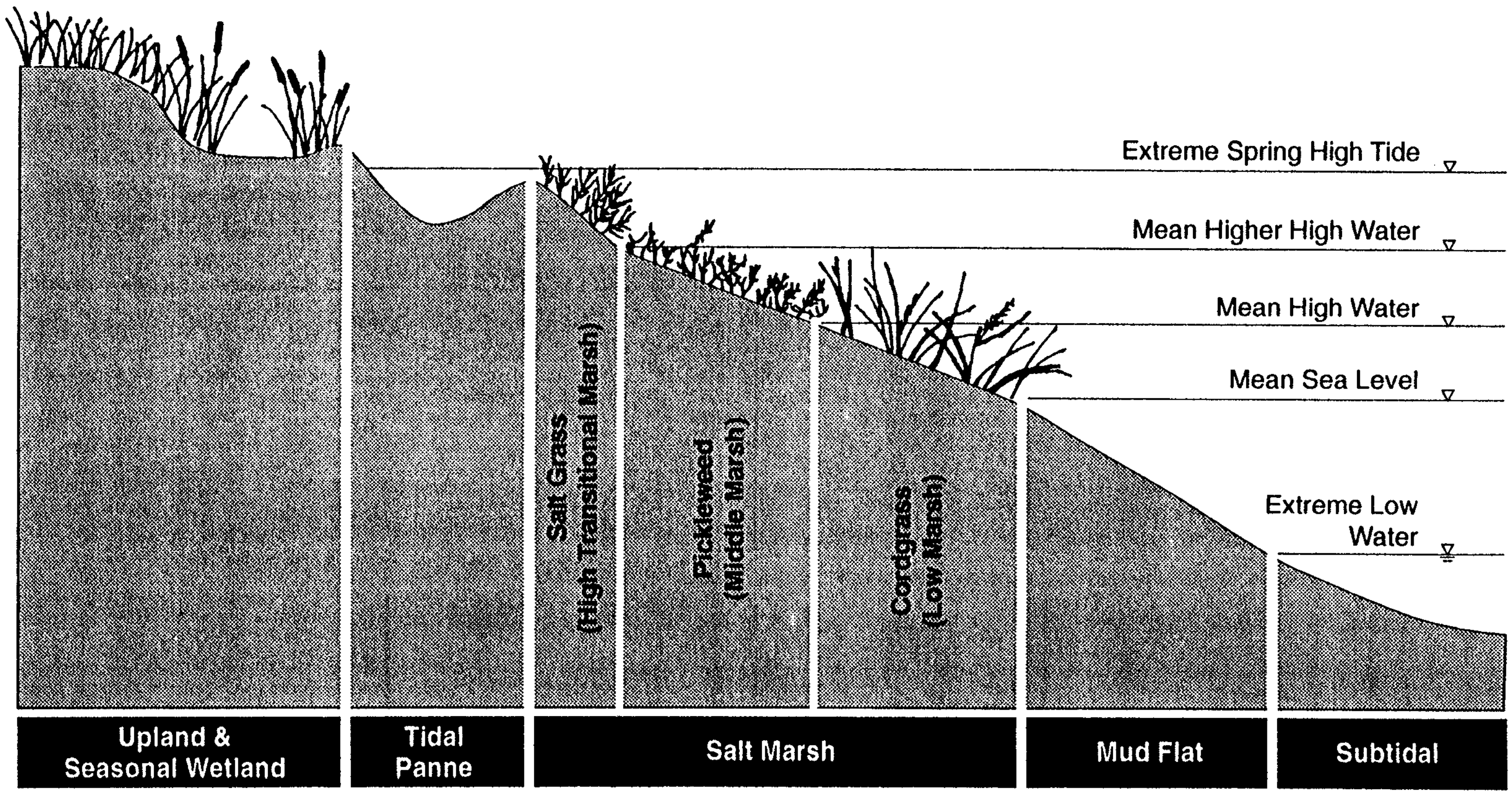
[a] Includes 21.7 acres of offsite habitat contiguous with 66.3 acres of onsite habitat.

[b] Habitat area is offsite but contiguous with the SLC parcel.

[c] Includes some small developed areas such as outbuildings and antennas.

[d] Estimated from Environmental Science Associates 1993. Includes some small developed areas such as outbuildings and antennas.

[e] Includes small stands of eucalyptus.



Source: Woodward-Clyde 1998.

Jones & Stokes Associates, Inc.

Figure 8-2
Schematic of Habitats by Tide Levels

and, following its expiration, was reverified (U.S. Army Corps of Engineers 1996a). Since the initial delineation, a 12.4-acre jurisdictional seasonal wetland was constructed on the site as mitigation for wetlands affected by the Corps' Landfill 26 closure project (Figure 8-1). In addition, approximately 13 acres of brackish open water wetland was created by removal of material for the Landfill 26 closure project; because the Landfill 26 closure project is ongoing, this wetland is not considered jurisdictional by the Corps.

Wetland delineations of potential jurisdictional wetlands have been completed for the SLC parcel (U.S. Army Corps of Engineers 1998) and BMKV parcel (LSA Associates 1997) but have not yet been verified by the Corps.

Coastal Salt Marsh (Tidal). Coastal salt marsh under tidal influence is located between the levee at the eastern end of the project area and the open water of San Pablo Bay. This habitat can be divided into three distinct zones based on the frequency and duration of tidal inundation (Figure 8-2):

- Low marsh occupies the elevations between mean tide level and mean high water and, as such, is inundated daily. In the project area, low marsh is adjacent to the open waters of San Pablo Bay and is dominated by California cordgrass.

- Middle marsh habitat occupies the elevations between mean high water and mean higher high water and is dominated by common pickleweed. Middle marsh is predominant outboard of the perimeter levee and is inundated frequently throughout each month, although for shorter periods than is low marsh.

- High transitional marsh habitat occupies the elevations between mean higher high water and the highest tide level; this habitat is inundated infrequently and for short periods. A narrow strip along the bayside of the levee supports high marsh and supports plant species that are tolerant of saline conditions but not adapted to frequent, long-term inundation, including saltgrass, alkali heath, fat-hen saltplant, and gumplant.

Tidal pannes and marsh ponds are features that are sometimes associated with coastal salt marshes. Tidal pannes are depressional basins that receive freshwater runoff from uplands and saltwater inflow during spring high tides. Pannes generally pond shallow water (less than 6 inches) and, because they often have extremely high salt concentrations, typically are devoid of vegetation. Tidal marsh ponds are similar to pannes, but they do not receive freshwater runoff and, because they are located in the interior of marshes on drainage divides, they are more frequently inundated by tides.

The tidal salt marsh community provides food, cover, and breeding habitat for many wetland-dependent wildlife species. The dense vegetation and large invertebrate populations typically associated with salt marshes provide ideal nesting and foraging conditions for a variety of bird species, including rails, egrets, herons, waterfowl, and shorebirds. In addition to being important habitat for wetland-associated wildlife, the salt marsh community is also a crucial component of the San Pablo Bay ecosystem, providing nutrients and organic matter to the mudflats and open water of the bay. These, in turn, are important habitats for a variety of waterfowl, shorebirds, and other water birds. Wildlife species observed in the HAAF parcel during field surveys conducted in 1994 include double-crested cormorant, great blue heron, great egret, American coot, killdeer, northern harrier, and San Pablo song sparrow. Other species expected to use tidal salt marsh include the raccoon, mallard, sora, Virginia rail, and willet.

Coastal Salt Marsh (Nontidal). Small areas of coastal salt marsh vegetation that are not inundated by tides are located along the interior slopes and base of levees along Novato Creek and San Pablo Bay in the BMKV parcel. Dominant species include pickleweed, saltgrass, brass buttons, ryegrass, and coyote brush. These habitat areas may provide important refugia for wildlife associated with tidal salt marsh during periods of extreme high tides (Environmental Science Associates 1993).

Brackish Marsh. Brackish marsh occurs along portions of the perimeter drainage ditch in the HAAF parcel and along drainage ditches and the margins of borrow pits in the BMKV parcel.

Brackish marsh vegetation associated with borrow pits in the BMKV parcel is dominated by saltgrass and pickleweed along pond margins that have open water or exposed mud at the lowest elevations. Portions of the pits are seasonally inundated, and deep areas pond water year round. Open water in the ponds is used by water birds during migration and provides foraging areas for resident waterfowl (Environmental Science Associates 1993).

Dominant emergent wetland plants along drainage ditches are alkali bulrush and cattail. Because marsh vegetation associated with ditches occurs in narrow linear bands, these habitat areas typically support a lower diversity of wildlife than do larger, more contiguous units of brackish marsh. Drainage ditch banks and channels also provide foraging habitat and cover for some species, such as herons, egrets, and dabbling ducks, and movement corridors for striped skunks, raccoons, and other species. Common species observed using the HAAF perimeter ditch include the threespine stickleback, mosquito fish, and red-winged blackbird.

Brackish Open Water Habitat. Approximately 13 acres of brackish open water habitat was created by excavation of the Landfill 26 cap borrow pit in the HAAF parcel. Water depth in the pit averages about 4 feet and pit margins support relatively little vegetation. The pit pond provides relatively low-quality wildlife habitat because water depth is marginal for the establishment of emergent vegetation, which provides cover and foraging areas for many wetland-associated species. The pit pond, however, provides suitable resting habitat for waterfowl and other water birds.

Seasonal Wetland. Areas of seasonal wetland are present in all three areas. The HAAF parcel includes a 12.4-acre seasonal wetland created as mitigation for the Landfill 26 closure project. Plant species that may dominate in seasonal wetland habitat are saltgrass, alkali heath, salt marsh bulrush, fat-hen saltplant, western goldenrod, sheep sorrel, six-weeks fescue, tall fescue, sedge, rush, and creeping wildrye (Environmental Science Associates 1993).

Seasonal wetlands in all three areas potentially provide high-tide refugia for associated species that use tidal marshes; seasonal foraging and resting habitat for migratory shorebirds, waterfowl, and other water birds; and foraging habitat for raptors, herons, egrets, red-winged blackbirds, raccoons, striped skunks, and aquatic garter snakes (Environmental Science Associates 1993).

Seasonal wetlands in the HAAF parcel are considered low-quality habitat for wildlife, however, because they occur as small, scattered areas, pond water for only a short duration, and provide little cover for wildlife. Consequently, these habitat areas do not have sufficient continuous acreage to meet the breeding and foraging habitat needs of many wetland-dependent wildlife species.

Grassland Communities

Two types of grassland communities, fescue grassland and annual grassland, are present in the project area, although annual grassland is more widespread in the HAAF and SLC parcels.

Annual grassland vegetation in the project site is ruderal (i.e., grows in disturbed areas) and is dominated by weedy non-native annual grasses and forbs, such as ripgut brome, wild oats, Mediterranean barley, perennial ryegrass, yellow star-thistle, curly dock, bristly ox-tongue, and black mustard. Fescue grassland is found mostly in low areas around the southeastern and northwestern margins of the airfield in the HAAF parcel. Vegetation in the fescue grassland is dominated by tall fescue, a non-native, perennial bunchgrass, in association with annual grassland species. Scattered shrubs and non-native trees, such as coyote brush, blackberry, and eucalyptus, are also present in some grassland areas (Environmental Science Associates 1993).

Annual grassland provides important habitat for various wildlife species. The grassland in the HAAF parcel is considered only moderate-quality wildlife habitat because the area is fragmented by the runway and service roads. Representative wildlife species observed using grasslands at the project site are the gopher snake, western fence lizard, turkey vulture, red-tailed hawk, American kestrel, California quail, ring-necked pheasant, savannah sparrow, western meadowlark, Brewer's blackbird, California vole, black-tailed hare, desert cottontail, black-tailed deer, coyote, striped skunk, and raccoon (Environmental Science Associates 1993).

Agriculture

Most of the BMKV parcel comprises agricultural fields that are planted and harvested annually. Approximately 75% of these lands are managed for oat hay production. Following the harvest, fields remain fallow until the following planting season. When fallow, the fields typically support non-native invasive plants such as star thistle (Environmental Science Associates 1993).

Cultivated fields, particularly when fallow, provide habitat values similar to grasslands and provide habitat for raptors, song birds, and small mammals. During winter, some fields become saturated or seasonally flooded with runoff from precipitation. Flooded fields provide foraging and resting habitat for a wide diversity of wintering and migrant shorebirds, waterfowl, and other water birds during winter.

Developed Areas

Developed areas associated with the HAAF and SLC parcels include hangars, buildings, drainage pump stations, utility infrastructure, antenna installations, aboveground fuel tanks and fuel lines, and paved runway and revetment areas. Developed areas support a low diversity of wildlife compared to vegetated habitats. Species commonly associated with developed areas include the barn swallow, northern mockingbird, American crow, and European starling.

Special-Status Species

Special-status species are plants and animals that are legally protected under the state and federal Endangered Species Acts or other regulations, and species that are considered sufficiently rare by the scientific community to qualify for such listing. Special-status plants and animals are species in the following categories:

- species listed or proposed for listing as threatened or endangered under the federal Endangered Species Act (50 CFR 17.12 [listed plants], 50 CFR 17.11 [listed animals], and various notices in the Federal Register [FR] [proposed species]);
- species that are candidates for possible future listing as threatened or endangered under the federal Endangered Species Act (61 FR 7596-7613, February 28, 1996);
- species listed or candidates for listing by the State of California as threatened or endangered under the state Endangered Species Act (14 California Code of Regulations [CCR] 670.5);
- species that meet the definitions of rare, threatened or endangered under CEQA (State CEQA Guidelines, Section 15380);
- plants listed as rare or endangered under the California Native Plant Protection Act (California Fish and Game Code, Section 1900 et seq.);

- plants considered by the California Native Plant Society (CNPS) to be rare, threatened, or endangered in California (Lists 1B and 2 in Skinner and Pavlik 1994);

- plants listed by CNPS as plants about which more information is needed to determine their status and plants of limited distribution (Lists 3 and 4 in Skinner and Pavlik 1994), which may be included as special-status species on the basis of local significance or recent biological information;

- animal species of special concern to DFG (Remsen 1978 [birds], Williams 1986 [mammals], Jennings and Hayes 1994 [amphibians and reptiles], and Moyle et al. 1995 [fish]); and

- animals fully protected in California (California Fish and Game Code, Section 3511 [birds], 4700 [mammals], and 5050 [reptiles and amphibians]).

Special-status plant and animal species that occur or have potential to occur in or near the project site and their likely status in these areas are presented in Appendix D.

Plants

Fourteen special-status plant species have potential to occur in or near the project areas (Appendix D); however, they are not present in the HAAF and BMKV parcels and are unlikely to be present in the SLC parcel. No special-status plant species have previously been reported from any of the project areas (Natural Diversity Data Base 1997).

Potentially suitable habitat is present for only three of those species: soft bird's-beak, Point Reyes bird's-beak, and Marin knotweed (Environmental Science Associates 1993). Potential habitat for these species is associated with the transitional zone at the upper margins of coastal salt marshes. These species were not found during rare plant surveys conducted in the HAAF parcel in 1993 or during surveys conducted in 1980, 1985, 1988, and 1991 in the BMKV parcel (Environmental Science Associates 1993). Special-status plant surveys have not been conducted in the SLC parcel; however, special-status plants are assumed not to be present because none have been located in similar habitats in adjoining areas. Therefore, this analysis assumes that no special-status plant species are present in the project area or will be affected by the project.

Animals

A total of 42 special-status animal species have potential to occur in or near the project site (Appendix D). Fifteen of these species are unlikely to use the project site because suitable habitat is not present, available habitat is only marginally suitable, or the project site is outside of the species' known range. An additional 15 species of fish, birds, and bats would likely make only incidental use of the project site during migration or when foraging. Twelve special-status fish and wildlife species are known to occur or are assumed to use suitable habitat within diked portions of the project sites or in marshes and aquatic habitats bayside of the perimeter levees:

- longfin smelt,
- Central Valley steelhead,
- chinook salmon,
- double-crested cormorant,
- California brown pelican,
- California clapper rail,
- California black rail,
- northern harrier,
- burrowing owl,
- saltmarsh common yellowthroat,
- San Pablo song sparrow, and
- salt marsh harvest mouse.

Environmental Consequences and Mitigation Measures

This section describes methods used to analyze potential impacts of the project alternatives compared to Alternative 1: No Action, potential impacts and impact mechanisms of each project alternative, and recommended mitigation measures to reduce significant impacts to a less-than-significant level.

Approach and Methodology

Analytical Methods

Potential impacts on aquatic, wetland, and grassland habitats were evaluated by comparing the quantity and quality of each type of habitat predicted to develop over time under the project alternatives with habitat conditions under Alternative 1: No-Action. Fish and wildlife species that occur or have potential to occur at the project site were presumed to be indirectly affected by implementation of an alternative if the quantity or quality of habitats with which they are typically associated would be affected. Direct impacts on individual species were assessed qualitatively based on the likely sensitivity or susceptibility of the species to disruption as a result of activities that may be associated with implementation of an alternative (e.g., noise associated with equipment operation).

A major assumption used in this analysis is that conditions predicted to result with implementation of project alternatives will actually develop within 50 years of project implementation. Predictions of future conditions are largely based on predicted rates of sediment accumulation, subsidence of dredged and other fill material, and colonization of plants, as well as predictions of the effects of wave action on plant colonization. The actual rate at which nontidal and tidal wetland habitats will evolve and their distribution on the project site, however, is somewhat speculative because of uncertainties regarding the actual function and interaction of these parameters in tidal systems. Other assumptions used to conduct this analysis include the following:

- ✦ Restored habitats and supporting hydrology will have stabilized by 50 years after project implementation.
- ✦ All potential sources of surface and subsurface hazardous materials on the project sites will be removed or isolated before the selected project alternative is implemented.
- ✦ All dredged material and other fill material from offsite sources used for project construction will be free of potentially hazardous materials.

Impact Mechanisms

The following types of activities associated with implementation of the project alternatives could result in loss of or disturbance to aquatic, wetland, and grassland habitats and associated species:

- ✦ operating equipment and other construction activity, including constructing internal and perimeter levees, grading, and excavating channels and levee breaches;
- ✦ operating ~~a~~ two hydraulic off-loaders and placing the dredged material pipeline across a portion of San Pablo Bay and in tidal coastal salt marsh;
- ✦ placing dredged material for restoration of wetland and upland habitat areas (under Alternatives 3 and 5 and the BMKV Scenario);
- ✦ reintroducing tidal flow to currently nontidal lands;
- ✦ installing drainage and other water control infrastructure (under Alternatives 2 and 4); and
- ✦ performing management and maintenance activities necessary to maintain target habitats (e.g., activities associated with control of noxious weeds), maintain operation and integrity of infrastructure (e.g., water drainage and control structures), and control mosquito populations.

Thresholds of Significance

A project alternative was considered to have a significant impact on biological resources if it would:

- decrease the acreage or quality of intertidal and subtidal aquatic habitats;
- decrease the acreage or quality of tidal or nontidal wetlands;
- substantially decrease the acreage or quality of waterfowl breeding or wintering habitat;
- substantially decrease the acreage or quality of migrant and wintering shorebird habitat; or
- result in the permanent loss of occupied special-status species habitat or the direct mortality of individuals of special-status species.

An alternative was considered to have a beneficial impact if it would result in a substantial increase in the quantity or quality of subtidal and intertidal aquatic, wetland, and grassland communities or of habitat for wintering waterfowl, migrant and wintering shorebirds, or special-status species.

Impacts and Mitigation Measures of Alternative 1: No Action

Under Alternative 1, no wetland restoration would occur and the HAAF and SLC parcels would remain in caretaker status. The Army would continue to maintain existing facilities, flood control operations, and security systems in the HAAF parcel. The SLC would continue with its current management and operation of the SLC project site.

Impact 8.1: Potential Improvement in the Quality of Grasslands

Under Alternative 1, activities on the HAAF parcel associated with closure that have affected the composition and structure of grasslands would be completed. Consequently, grassland vegetation would be allowed to mature, increasing forage production (by allowing plants to mature and produce seeds). Increasing the density and height of vegetation would improve the quality of cover for some wildlife species. Therefore, this impact is considered beneficial.

Impacts and Mitigation Measures Common to Alternatives 2, 3, 4, and 5

Because the extent of impacts on biological resources would differ under each alternative, no common impacts are described in this chapter.

Impacts and Mitigation Measures Unique to Alternative 2

Figures 8-3 through 8-5 illustrate the predicted development and distribution of restored habitats at year 0 (i.e., completion of initial construction), year 10, and year 50 following implementation of Alternative 2. Table 8-2 presents a comparison between the acreages of habitats estimated to be restored under Alternative 2 and other alternatives at year 50. Table 8-3 presents the expected net change in habitat acreages under Alternative 2.

Impact 8.2: Increase in Subtidal Aquatic Habitat for Resident and Anadromous Fish

Subtidal aquatic habitat is expected to increase under Alternative 2. As sediment deposition occurs, the open water habitat created initially by breaching the levees would decrease. Stable, vegetated channels would develop, and the habitat value of open water would increase as these channels become deeper and wider. These channels could be used as rearing habitat by longfin smelt and other estuarine and marine fish species. The channels could also provide habitat for phytoplankton, zooplankton, and benthic invertebrates, which provide important food sources for fish. Juvenile chinook salmon and steelhead may temporarily rear in the slough channels during their seaward migration. The increase in aquatic habitat would result in a beneficial impact on resident and anadromous fish.

Impact 8.3: Short-Term Loss of or Disturbance to and Long-Term Increase in Intertidal Mudflats

A small area of intertidal mudflats may be lost or disturbed near the bayside terminus of the excavated subtidal channel as a result of channel scour from tidal flow through the channel. The loss of intertidal mudflat habitat resulting from scour would be substantially offset, however, by intertidal mudflat habitat that would develop along the channel margins following excavation and along the margins of levees following introduction of tidal flows to the restoration site. Intertidal mudflats would develop between mean sea level and extreme low water (Figure 8-2). As sediments are deposited and the site develops, intertidal mudflats would be present in varying amounts. When the wetlands are fully functioning at year 50, intertidal mudflats would be limited to the slough channels and along the margins of subtidal channels. The short-term loss of intertidal mudflats is considered less than significant because only a small area would be disturbed and this would be rapidly replaced. Alternative 2 would result in a long-term beneficial impact on intertidal mudflats as a result of increased acreage.

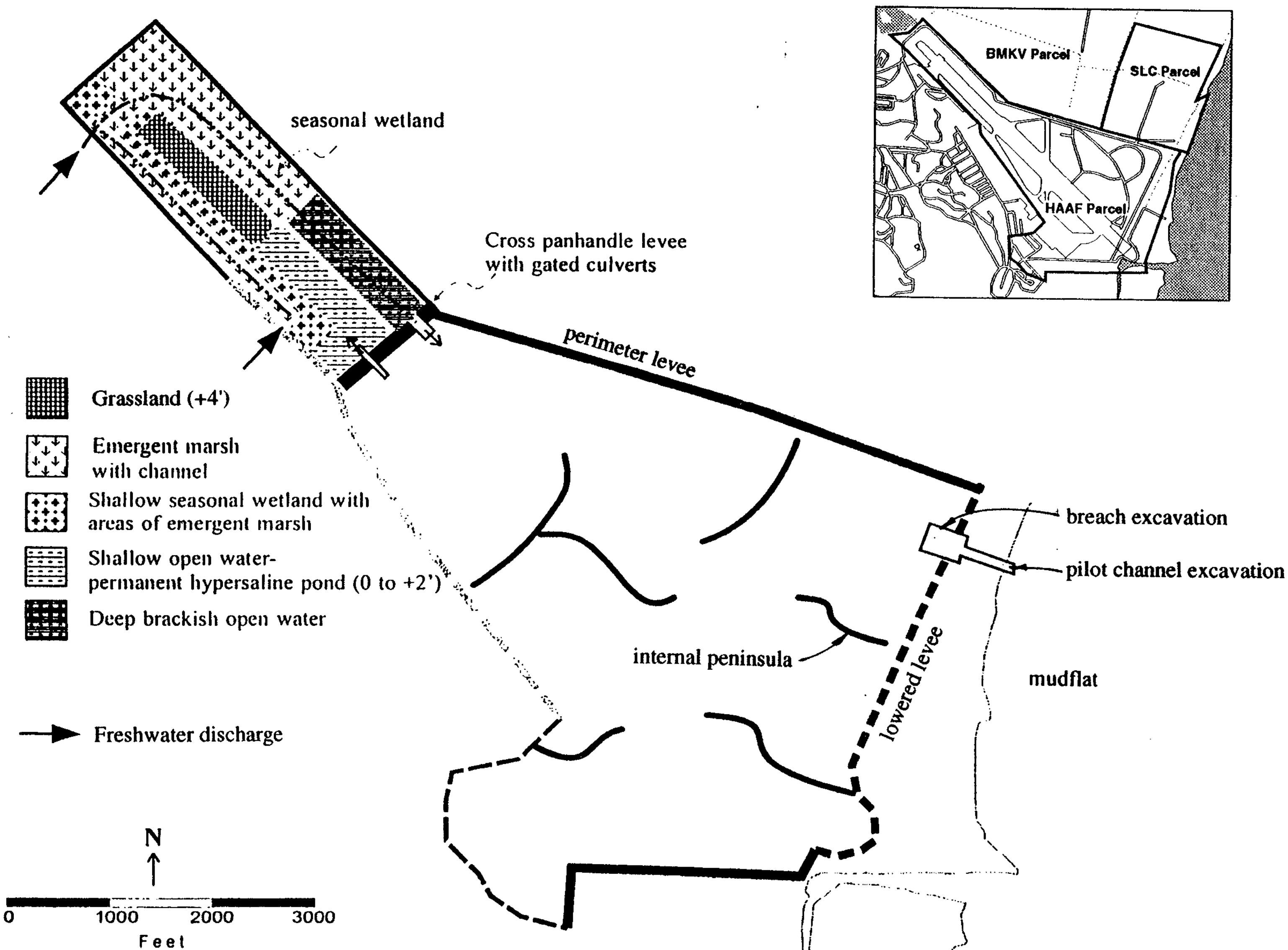
Impact 8.4: Loss of Tidal Coastal Salt Marsh

Excavation of the 800-foot-long subtidal channel through the tidal marsh would result in the direct loss of approximately 3 acres of high, middle, and low tidal coastal salt marsh. Tidal marsh vegetation, however, is expected to gradually colonize mudflats between the elevations of extreme spring high tide and mean sea level. Sites at these elevations could be colonized by tidal marsh vegetation following introduction of tidal flows, including portions of the lowered bayward levee, margins of the internal peninsulas, and perimeter levees. In the early years of the project, vegetation would most likely establish in locations sheltered from waves. The acreage suitable for establishing tidal coastal salt marsh (the zone between extreme high tide and mean sea level) is expected to increase as a result of sediment deposition. In addition, as the site aggrades and the extent of vegetated area increases, the effects of wave action on the ability of vegetation to establish will reduce because established vegetation will attenuate wave energy across the site.

The loss of 3 acres of tidal coastal salt marsh habitat is expected to be offset by coastal salt marsh habitat developing on the site at a 2:1 in-kind replacement ratio within 10 years following project implementation. At maturity, an estimated 400 acres of tidal coastal salt marsh are expected to be restored on the site (Table 8-3). This represents approximately 133 acres of coastal salt marsh habitat restored for every acre of habitat affected by the project. If coastal salt marsh habitat develops as designed, this impact would be beneficial; however, because of uncertainties regarding the rate of sedimentation and the associated rate of establishment native salt marsh vegetation, marsh habitat of sufficient quality and quantity may not establish rapidly enough to offset losses that occurred during construction of the channel. Therefore, this impact is considered significant. To reduce this impact to a less-than-significant level, the Coastal Conservancy, Corps, or successors in interest shall implement Mitigation Measure 8.4.

Mitigation Measure 8.4: Monitor Site Development and Implement Actions to Increase the Rate of Marsh Development if Required. The Coastal Conservancy, Corps, or successors in interest shall develop and implement a 15-year monitoring program to measure the rate of coastal salt marsh establishment and the quantity and quality of established coastal salt marsh. Restored coastal salt marsh will be monitored annually for the first 5 years and in years 10 and 15 following project implementation. The monitoring program will be designed to determine if coastal tidal marsh is developing and its primary supporting physical processes (i.e., tidal exchange and sedimentation) are occurring at a rate estimated during the first 15 years of project implementation. Major elements of the monitoring program will include the following:

- measure sedimentation rates and distribution of sedimentation,
- measure the volume and velocity of tidal exchange,
- measure the areal extent and locations of established or colonizing salt marsh vegetation,



Note: Tidal wetland design features will be comparable to alternative A at years 10 and 50

Jones & Stokes Associates, Inc.

Figure 8-3
Development and Distribution of Restored Habitat under Alternative 2 at Year 0

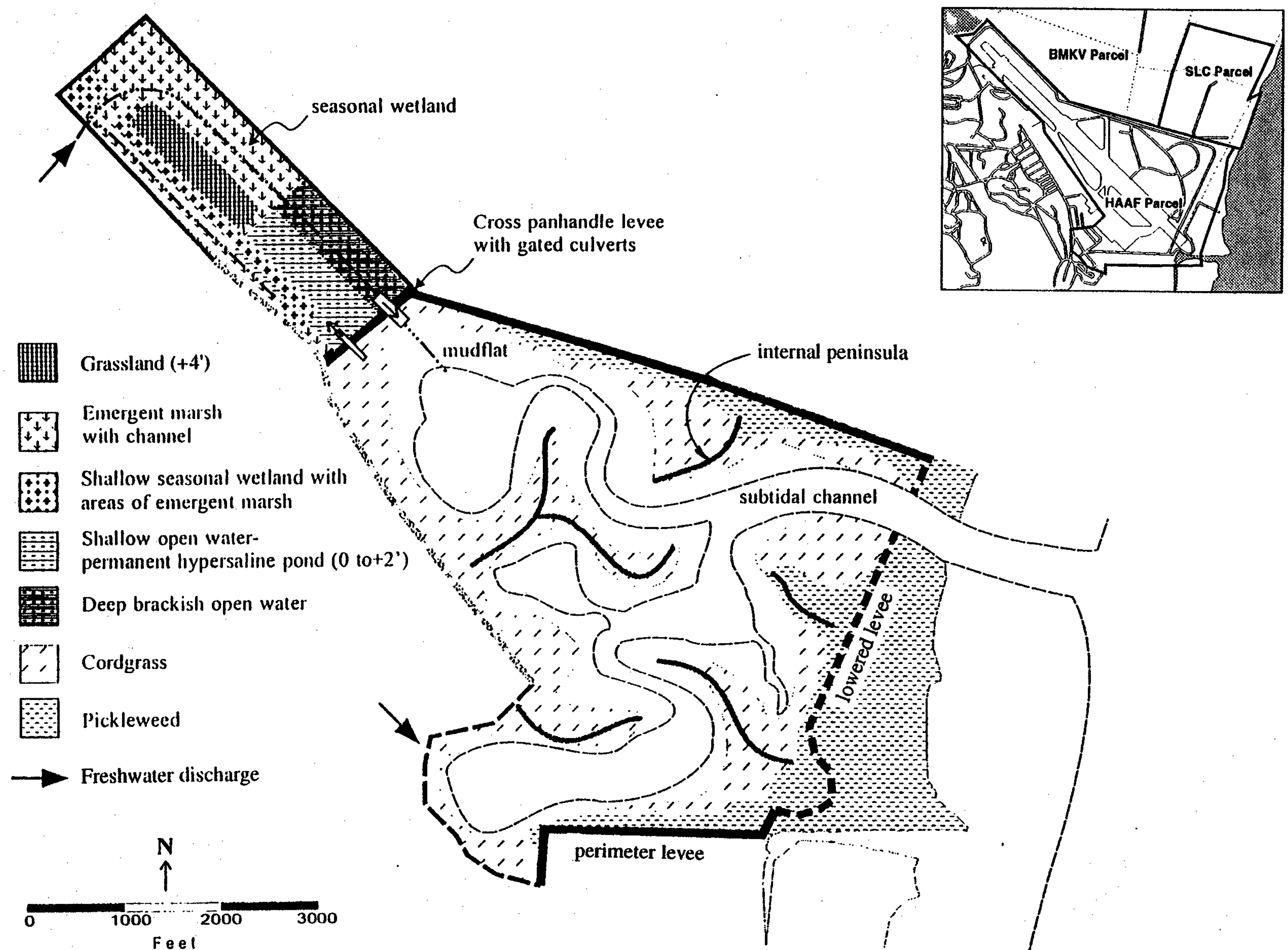


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Figure 8-4
Development and Distribution of Restored Habitat under Alternative 2 at Year 10

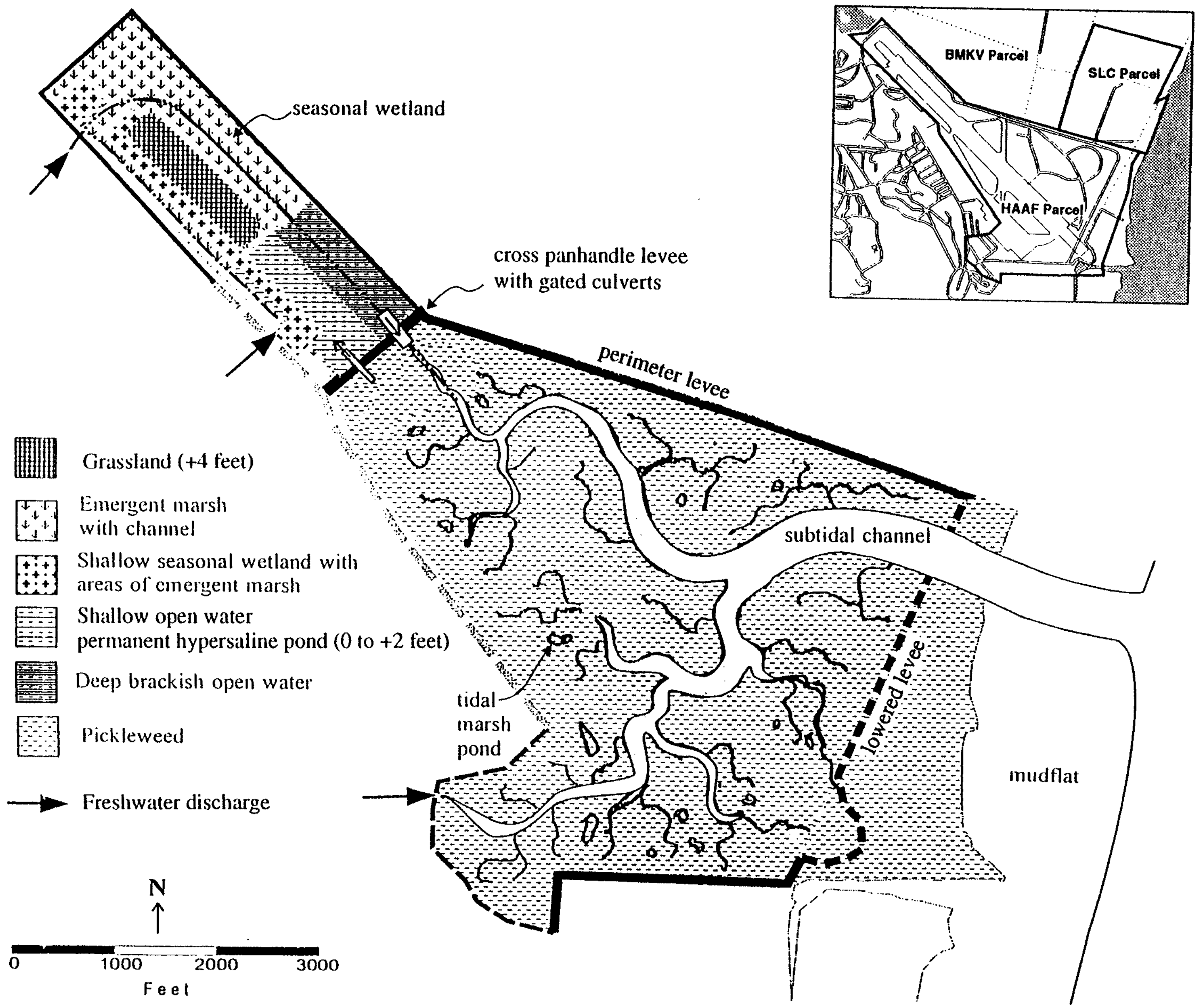

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Figure 8-5
Development and Distribution of Restored Habitat under Alternative 2 at Year 50

Table 8-2.
Estimated Acreage of Each Habitat Type under Alternative l: No Action and Alternatives 2-5 at Year 50 after Project Implementation

	HAAF Parcel Only			HAAF and SLC Parcels		
Habitat Type	Alternative l: No Action	Alternative 2[a]	Alternative 3[a]	Alternative l: No Action	Alternative 4[a]	Alternative 5[a]
Subtidal channel/open water	0	26	26	0	44	44
Intertidal channel/mudflat	0	14	14	0	22	22
Coastal salt marsh	88	480	485	120	698	690
Tidal pannes	0	0	33	0	0	41
Tidal ponds	0	3	3	0	4	4
Nontidal wetlands						
Seasonal wetlands/ponds	20	13	62	36	13	62
Perennial emergent marsh	4	65	2	4	65	2
Perennial hypersaline pond	0	13	0	0	13	0
Perennial brackish pond	13	17	0	13	17	0
Grassland	259	36	41	493	74	85
Developed area	284	0	0	284	0	0

[a] Acreages of restored habitats were derived or estimated from Woodward-Clyde 1998.

Note: The alternatives are defined as follows:
- Alternative 2: Restoration of wetlands in the HAAF parcel through natural sedimentation
- Alternative 3: Restoration of wetlands in the HAAF parcel using dredged material
- Alternative 4: Restoration of wetlands in the HAAF and SLC parcels through natural sedimentation
- Alternative 5: Restoration of wetlands in the HAAF and SLC parcels using dredged material

Table 8-3.
Estimated Net Change in Habitat Acreage Compared to Alternative 1: No Action at 50 Years after Project Implementation

Habitat Type	HAAF Parcel Only			HAAF and SLC Parcels		
	Alternative 1: No Action	Alternative 2	Alternative 3	Alternative 1: No Action	Alternative 4	Alternative 5
Subtidal channel/open water	0	+26	+26	0	+44	+44
Intertidal channel/mudflat	0	+14	+14	0	+22	+22
Coastal salt marsh	88	+392	+397	120	+578	+570
Tidal pannes	0	0	+33	0	0	+41
Tidal ponds	0	+3	+3	0	+4	+4
Nontidal wetlands						
Seasonal wetlands/ponds	20	-7	+42	36	-23	+26
Perennial emergent marsh	4	+61	-2	4	+61	-2
Perennial hypersaline pond	0	+13	0	0	+13	0
Perennial brackish pond	13	+4	-13	13	+4	-13
Grassland	259	-223	-218	493	-419	-408
Developed area	284	-284	-284	284	-284	-284

Note: The alternatives are defined as follows:
- Alternative 2: Restoration of wetlands in the HAAF parcel through natural sedimentation
- Alternative 3: Restoration of wetlands in the HAAF parcel using dredged material
- Alternative 4: Restoration of wetlands in the HAAF and SLC parcels through natural sedimentation
- Alternative 5: Restoration of wetlands in the HAAF and SLC parcels using dredged material

- measure composition and density of established and colonizing plant species,
- compare predicted and measured site development and function,
- analyze monitoring data to identify possible reasons for differences between observed and predicted conditions, and
- recommend remedial actions that could be implemented if the restoration is not proceeding as designed.

Monitoring reports will be submitted by the Coastal Conservancy or successors in interest to the Corps, DFG, and USFWS by November 1 of each monitoring year.

At the end of the initial 5-year monitoring period, if the development rate of the coastal salt marsh and the habitat quality of establishing coastal salt marsh do not appear sufficient to restore 6 acres of contiguous, in-kind habitat within 10 years of project implementation, the Coastal Conservancy or successors in interest will review the project with representatives of the Corps, DFG, and USFWS to determine if additional actions or project modifications are necessary to ensure that the functions and values of the affected coastal salt marsh habitat will be replaced. Similar reviews of marsh development may be conducted following completion of monitoring in years 10 and 15 if it appears that additional actions or project modifications are necessary to meet restoration goals.

Impact 8.5: Loss of Approximately 1.2 Acres of Brackish Marsh

Establishing tidal exchange at the project site would result in the direct loss of approximately 1.2 acres of brackish marsh associated with the perimeter drainage ditch. This loss would be offset by the planned restoration of 98.5 acres of seasonal wetland, seasonal pond, brackish marsh, and upland habitats behind the cross panhandle levee (Table 8-3). With the designed change in site hydrology behind the cross panhandle levee, brackish marsh vegetation is expected to colonize gradually and establish along the margins of the existing 13-acre brackish pond, along constructed and existing drainage channels, and interspersed among surrounding seasonal wetlands and uplands that provide the necessary subsurface and surface hydrology.

The loss of 1.2 acres of brackish marsh habitat is expected to be offset by the development of brackish marsh habitat on the site at a 2:1 in-kind replacement ratio within 5 years of project implementation. Although substantially more than 2.4 acres of brackish marsh habitat is expected to be restored, because of uncertainties regarding the development of subsurface and surface hydrology and the associated quantity of brackish marsh vegetation, brackish marsh of sufficient quality and quantity may not establish rapidly enough to offset project impacts that occurred during construction and inundation of the restoration site. The potential loss of brackish marsh is considered significant. To reduce this impact to a less-than-significant level, the Coastal Conservancy, Corps, or successors in interest shall implement Mitigation Measure 8.5.

Mitigation Measure 8.5: Monitor Development of Brackish Marsh Vegetation and Implement Actions to Increase the Area of Brackish Marsh if Required. The Coastal Conservancy, Corps, or successors in interest shall develop and implement a 5-year monitoring program to measure the establishment rate, quantity, and quality of brackish marsh vegetation. Major elements of the monitoring program will include the following:

- measure the areal extent and locations of established or colonizing marsh vegetation,
- measure composition and density of established and colonizing plant species,
- compare predicted and measured site development and function,
- analyze monitoring data to identify possible reasons for differences between observed and predicted conditions, and
- recommend remedial actions that could be implemented if the restoration is not proceeding as designed.

Monitoring reports will be submitted by the Coastal Conservancy or successors in interest to the Corps, DFG, and USFWS by November 1 of each monitoring year.

If the development rate of the brackish marsh and the habitat quality of establishing brackish marsh do not appear sufficient to offset the loss of the 2.4 acres within 5 years of project implementation, the Coastal Conservancy or successors in interest will review the project with representatives of the Corps, DFG, and USFWS to determine if additional actions or project modifications are necessary to ensure that the functions and values of the affected brackish marsh habitat will be replaced.

Impact 8.6: Temporary Disturbance of Approximately 2.9 Acres of Brackish Marsh

Approximately 2.9 acres of brackish marsh associated with a portion of Pacheco Pond could be affected during the construction period. Operation of construction equipment in or immediately adjacent to marsh vegetation and discharge of construction-generated sediments into the marsh could result in the loss or degradation of the 2.9 acres. This potential loss is considered a significant impact. To reduce this impact to a less-than-significant level, the Coastal Conservancy, Corps, or successors in interest shall implement Mitigation Measure 8.6.

Mitigation Measure 8.6: Avoid or Minimize Temporary Construction-Related Impacts on Brackish Marsh Associated with Pacheco Pond. To avoid or minimize potential impacts on brackish marsh vegetation associated with construction activities around Pacheco Pond, the Coastal Conservancy, Corps, or successors in interest shall ensure that the following measures are implemented, where feasible, immediately before and throughout the construction period in the panhandle portion of the site:

- Construction fencing will be placed at least 25 feet from the perimeter of marsh vegetation adjacent to Pacheco Pond and the project site to clearly demarcate the limits of construction.

- Vehicles and other equipment related to construction will not be operated beyond the construction fence.

- Appropriate barriers will be installed to prevent sediment or runoff from being discharged from the construction site into the marsh.

If ground disturbance to marsh vegetation cannot be avoided, the final design planting plan will include appropriate measures to revegetate disturbed areas, including planting and grading if necessary.

Impact 8.7: Loss of Approximately 0.1 Acre of Seasonal Wetlands

Creating tidal exchange at the project site and constructing the cross panhandle levee would result in the loss of four small areas of seasonal wetland habitat, totaling approximately 0.1 acre. These areas, located east of the cross panhandle levee, are very small and occur as inclusions within highly disturbed non-native annual grassland. Because of their size and location, the wetlands provide few of the functions and values of higher quality seasonal wetlands. The loss of 0.1 acre of seasonal wetlands would be offset if at least 0.1 acre of seasonal wetlands develops (1:1 in-kind or out-of-kind replacement ratio) and is maintained on the site within 5 years following project implementation. Under the proposed action, approximately 98.5 acres of seasonal wetland would be restored behind the cross panhandle levee (Table 8-3). The loss of 0.1 acre of wetlands is considered less than significant because of the relative value of the wetlands and because the loss would be offset by the establishment of 98.5 acres of wetlands elsewhere on the project site.

Impact 8.8: Conversion of or Temporary Disturbance to Approximately 19.4 Acres of Seasonal Wetlands

The restoration project would affect approximately 19.4 acres of existing seasonal wetlands located west of the cross panhandle levee as a result of construction-related disturbances to existing areas of seasonal wetland habitat and conversion of existing seasonal wetlands to other types of wetlands (i.e., hypersaline pond, seasonal saline wetland, or brackish marsh). The existing wetland habitat includes 12.4 acres of seasonal wetland constructed as mitigation for the Landfill 26 closure project.

Construction activities that could temporarily affect the Landfill 26 mitigation wetland and other wetland areas include operation of construction equipment in or immediately adjacent to wetland vegetation and discharge of construction generated sediments into wetlands. The grade of some existing wetlands (although not the Landfill 26 mitigation wetland) may be altered to achieve design grades or drainage necessary to restore seasonal wetlands or construct upland habitat areas. This alteration of existing grades and site hydrology could result in the conversion of some existing seasonal wetland areas to other types of wetland.

Temporary disturbance to or type conversion of 19.4 acres of existing seasonal wetlands would be offset if at least 19.4 acres of seasonal wetland develops (1:1 in-kind or out-of-kind replacement ratio) and is maintained on the site within 5 years following project implementation. Approximately 98.5 acres of additional seasonal wetland habitat area will be restored west of the cross panhandle levee. This impact is considered beneficial.

Impact 8.9: Loss of Grassland

Constructing project levees, restoring wetlands, and other features of the proposed action would result in the direct loss of approximately 191 acres of grassland habitat. Loss of grasslands would reduce the available habitat area for western meadowlarks, Brewer's blackbirds, and other regionally abundant songbirds.

Under Alternative 2, the loss of grassland habitat would be partially offset because fewer, higher quality grasslands would be established near restored wetlands. These grassland areas would provide nesting cover for waterfowl and other ground-nesting species, and refugia for small mammals, reptiles, and other wildlife. Restored grassland would be seeded with desirable grasses and forbs that would generally provide higher forage and cover values for wildlife than grassland affected by the project. The short-term impact associated with the loss of grassland is considered less than significant because grassland is regionally abundant, and the short-term loss of grassland habitat is expected to have little or no effect on regional populations of grassland-associated wildlife. The long-term impact is considered beneficial because grassland habitat values associated with the project would be greater than existing values.

Impact 8.10: Temporary Disturbance to the California Clapper Rail and California Black Rail during Construction

Noise, vibration, visual, and proximity-related disturbances associated with project construction could adversely affect the California clapper rail and California black rail during the breeding season. Construction disturbances could cause individuals of these species to abandon their nests or reduce the ability of adults to properly care for their eggs, thereby potentially reducing breeding success. Occupied California clapper rail and California black rail nesting areas are located in salt marshes outboard of the perimeter levee. Therefore, this impact is considered significant. To reduce this impact to a less-than-significant level, the Coastal Conservancy, Corps, or successors in interest shall implement Mitigation Measure 8.10.

Mitigation Measure 8.10: Avoid Construction Activities Near Occupied California Clapper Rail and California Black Rail Habitat Areas during Their Breeding Periods. The perimeter levee would serve as a barrier to reduce the magnitude of visual, noise, and other disturbances potentially associated with construction-related activities that occur landward of the levee before the levee is lowered. To further reduce the potential for adverse effects of construction-related disturbance on nesting California clapper rails and California black rails, the Coastal Conservancy, Corps, or successors in interest, to the extent feasible to successfully complete project construction, shall ensure that construction activities do not occur within 100 feet of the landward toe of the perimeter levee during the nesting period of these species (March 15 to July 30).

The Coastal Conservancy, Corps, or successors in interest, to the extent feasible to successfully complete project construction, shall avoid construction activities associated with lowering the perimeter levee and excavating the pilot channel through the outboard salt marsh during the nesting period of these species (March 15 to July 30). If construction of these project features must occur during the nesting period, surveys will be conducted by a qualified biologist using survey methods approved by USFWS and DFG before construction is initiated to locate clapper rail and black rail nest sites within 300 feet of the limits of construction. Survey results will be submitted to USFWS and DFG. If nests are not located within 300 feet of the limits of construction, construction may proceed. If nest sites are located, the Coastal Conservancy, Corps, or successors in interest will consult with USFWS and DFG to determine what, if any, additional mitigation measures may be required to allow construction to proceed (also see Mitigation Measure 8.13).

Impact 8.11: Temporary Disturbance to the Northern Harrier, Burrowing Owl, Saltmarsh Common Yellowthroat, and San Pablo Song Sparrow during Construction

Noise, vibration, visual, and proximity-related disturbances associated with project construction could adversely affect the northern harrier, burrowing owl, saltmarsh common yellowthroat, and San Pablo song sparrow during the breeding season. If individuals of these species nest in the project area during the project construction period, construction disturbances could cause individuals of these species to abandon their nests or young; the breeding success of these species could be reduced if disturbances reduce the ability of adults to properly care for their eggs or young. Therefore, this impact is considered significant. To reduce this impact to a less-than-significant level, the Coastal Conservancy, Corps, or successors in interest shall implement Mitigation Measure 8.11.

Mitigation Measure 8.11: Conduct Surveys to Locate Northern Harrier, Burrowing Owl, Saltmarsh Common Yellowthroat, and San Pablo Song Sparrow Nest Sites before Construction Is Initiated. The Coastal Conservancy, Corps, or successors in interest shall conduct surveys to locate northern harrier, burrowing owl, saltmarsh common yellowthroat, and San Pablo song sparrow nest sites in suitable breeding habitats in the spring of each construction year. Surveys will be conducted by a qualified biologist using survey methods approved by DFG. Survey results will be submitted to DFG before construction is initiated. If nests or young of these species are not located, construction may proceed. If nest sites or young are located, the Coastal Conservancy, Corps, or successors in interest will consult with DFG to determine what mitigation measures could be implemented to avoid or reduce potential disturbance-related impacts on these species (e.g., establishing buffers around active nest sites or sequencing construction activities to avoid activities near nesting habitats during the breeding season).

Impact 8.12: Potential for Construction-Related Mortality of Salt Marsh Harvest Mice

Breaching and lowering the perimeter levee and excavating the tidal channel in the outboard marsh could result in direct mortality of the salt marsh harvest mouse, a federally listed and state-listed endangered species. This impact is considered significant. To reduce this impact to a less-than-significant level, the Coastal Conservancy, Corps, or successors in interest shall implement Mitigation Measure 8.12.

Mitigation Measure 8.12: Remove Salt Marsh Harvest Mice from the Immediate Vicinity of Operating Equipment. The potential for construction-related mortality of salt marsh harvest mice could be reduced or eliminated by erecting a barrier fence 20 feet from the boundaries of construction areas in and adjacent to coastal salt marsh habitat, live-trapping mice that are found in the construction corridor, and releasing captured mice into suitable habitat areas outside of the fenced construction corridor. The Coastal Conservancy, Corps, or successors in interest will consult with USFWS and DFG to evaluate the feasibility of trapping and releasing mice from construction areas and to identify other appropriate methods for avoiding construction-related mortality of salt marsh harvest mice.

Impact 8.13: Potential for Construction-Related Mortality of California Clapper Rails and California Black Rails

Breaching and lowering the perimeter levee and excavating the tidal channel could result in direct mortality of California clapper rails and California black rails. Nests with eggs or young birds could be crushed by construction equipment operating in the outboard tidal marsh. This impact is considered significant because project activities could result in the direct mortality of individuals of the two special-status species. To reduce this impact to a less-than-significant level, the Coastal Conservancy, Corps, or successors in interest shall implement Mitigation Measure 8.13.

Mitigation Measure 8.13: Avoid Operation of Equipment in the Outboard Tidal Marsh during the Breeding Period of the California Clapper Rail and California Black Rail. The Coastal Conservancy, Corps, or successors in interest, to the extent feasible to successfully complete project construction, shall avoid operating construction equipment in the outboard tidal marsh from March 15 to July 31. If construction equipment must operate in the marsh during this period, surveys will be conducted by a qualified biologist using survey methods approved by USFWS and DFG before construction is initiated to locate clapper rail and black rail nest sites or young of these species within 300 feet of the limits of construction. Survey results will be submitted to

USFWS and DFG. If nests or young are not located within 300 feet of the limits of construction, construction may proceed. If nest sites or young are located, the Coastal Conservancy, Corps, or successors in interest will consult with USFWS and DFG to determine what, if any, additional mitigation measures may be required to allow construction to proceed (also see Mitigation Measure 8.10).

Impact 8.14: Potential for Mortality of San Pablo Song Sparrows

Construction activities in tidal and nontidal marsh habitats and inundation of nontidal wetlands by tidal flow could result in direct mortality of San Pablo song sparrows. Nests with eggs or young birds could be crushed by construction equipment or inundated or toppled by tidal flow. This impact is considered significant because project activities could result in the mortality of individuals of this special-status species. To reduce this impact to a less-than-significant level, the Coastal Conservancy, Corps, or successors in interest shall implement Mitigation Measure 8.14.

Mitigation Measure 8.14: Conduct Surveys to Locate San Pablo Song Sparrow Nest Sites before Construction Is Initiated. The Coastal Conservancy, Corps, or successors in interest shall conduct surveys to locate San Pablo song sparrow nest sites in suitable marsh habitats in the spring of each construction year. Surveys will be conducted by a qualified biologist using survey methods approved by DFG. Survey results will be submitted to DFG before construction is initiated. If active nests are not located, construction may proceed. If nest sites are located, the Coastal Conservancy, Corps, or successors in interest will consult with DFG to determine what mitigation measures could be implemented to avoid or reduce potential mortality of this species (e.g., establishing buffers around active nest sites or sequencing construction activities to avoid potential impacts on the species during the breeding season).

Impact 8.15: Potential for Mortality of Burrowing Owls

Operating equipment in grasslands west of the perimeter levee and introducing tidal flow could result in direct mortality of burrowing owls. Occupied nesting burrows could be crushed or buried by construction equipment or inundated as a result of tidal flow. This impact is considered significant because it could result in the direct mortality of individuals of this special-status species. To reduce this impact to a less-than-significant level, the Coastal Conservancy, Corps, or successors in interest shall implement Mitigation Measure 8.15.

Mitigation Measure 8.15: Conduct Surveys to Locate Burrowing Owl Nest Sites before Construction Is Initiated. The Coastal Conservancy, Corps, or successors in interest shall conduct surveys to locate burrowing owl nest sites in suitable grassland habitats in the spring of each construction year. Surveys will be conducted by a qualified biologist using survey methods approved by DFG. Survey results will be submitted to DFG before construction is initiated. If active nests are not located, construction may proceed. If nest sites are located, the Coastal Conservancy, Corps, or successors in interest will consult with DFG to determine what mitigation measures could be implemented to reduce potential mortality of this species (e.g., establishing buffers around active nest sites or sequencing construction activities to avoid potential impacts on the species during the breeding season).

Impact 8.16: Potential Disturbance to or Mortality of Special-Status Species resulting from Management and Maintenance Activities

Management and maintenance activities such as mosquito abatement, water control structure and levee maintenance, and control of noxious weeds, may be required to ensure project success. These activities could result in disturbance to or mortality of special-status species if special-status species occupy restored habitats. This impact, similar to Impacts 8.8 through 8.12, is considered significant. To reduce this impact to a less-than-significant level, the Coastal Conservancy, Corps, or successors in interest shall implement Mitigation Measure 8.16.

Mitigation Measure 8.16: Develop and Implement a Restoration Management and Maintenance Program Designed to Minimize Potential Impacts on Special-Status Species. The Coastal Conservancy, Corps, or successors in interest will develop a restoration management and maintenance program, in coordination with USFWS and DFG, within 1 year after the completion of project construction. Important elements of the program will be scheduling maintenance activities to avoid periods when special-status species are sensitive to disturbance and implementing management practices that have minimal effects on special-status species to the greatest extent feasible.

Impact 8.17: Loss of Habitat for California Clapper Rail, California Black Rail, Salt Marsh Harvest Mouse, and Saltmarsh Common Yellowthroat

The California clapper rail, California black rail, salt marsh harvest mouse, and saltmarsh common yellowthroat are dependent on coastal salt marsh habitats. As described in Impact 8.2, approximately 3 acres of tidal coastal salt marsh would be lost as a result of construction of project features in the tidal marsh. If restoration performs as predicted, suitable habitat for these species could be increased by approximately 400 acres. However, because of uncertainties regarding the development of project marshes, this analysis must assume that the quality, type, and minimum habitat patch size required by these species may not develop (as described under Impact 8.4). Therefore, this impact is considered significant. To reduce this impact to a less-than-significant level, the Coastal Conservancy, Corps, or successors in interest shall implement Mitigation Measure 8.4.

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Impact 8.18: Loss of Refugia for the California Clapper Rail, California Black Rail, and Salt Marsh Harvest Mouse

Lowering portions of the perimeter levee to elevations approximating that of mean higher high water would result in the loss of suitable refugia for the California clapper rail, California black rail, and salt marsh harvest mouse when the outboard marsh is inundated during high tides. Additional refugia would be provided by transitional and upland habitat areas restored at the upper elevations of restored tidal marshes. These habitat areas would be accessible to rails but could be too distant from the outboard marsh to be used by salt marsh harvest mice. Some portions of the lowered perimeter levee, however, would be at higher elevations that would not be inundated by tides and, therefore, would continue to provide flood refugia for mice and rails. Therefore, this impact is considered less than significant and no mitigation is required.

Impact 8.19: Loss of Nesting Habitat for the San Pablo Song Sparrow

Coastal salt marsh in the project area is potential suitable nesting habitat for the San Pablo song sparrow ~~includes brackish marsh and coastal salt marshes, which are present in the project area~~. As described under ~~Impacts 8.2 and 8.3~~ Impact 8.4, approximately ~~4.2~~ 4.3 acres of ~~brackish marsh and~~ tidal coastal salt marsh would be lost as a result of construction of project features. If restoration performs as predicted, suitable habitat for this species could be increased by more than 400 acres. However, because of uncertainties regarding development of the project marshes, this analysis must assume that the quality, type, and minimum habitat patch size required by this species may not develop (as described under ~~Impacts 8.4 and 8.5~~ Impact 8.4). Therefore, this impact is considered significant. To reduce this impact to a less-than-significant level, the Coastal Conservancy, Corps, or successors in interest shall implement Mitigation ~~Measures 8.4 and 8.5~~ Measure 8.4.

Impact 8.20: Loss of Nesting Habitat for the Burrowing Owl

Construction activities associated with levee and seasonal wetland construction and inundation of grassland habitat by tidal flow would result in the permanent loss of approximately 233 acres of potential burrowing owl nesting habitat. Burrowing owls have nested at the project site in previous years but were not located during wildlife surveys conducted in 1994 (U.S. Army Corps of Engineers 1996a). Because slopes of constructed levees and restored upland habitat areas would provide suitable nesting habitat for this species, this impact is considered less than significant and no mitigation is required.

Impact 8.21: Increase in ~~Suitable~~ Quality of Nesting Habitat for the Northern Harrier

Development of undisturbed grassland, seasonal wetland, and brackish marsh~~, and tidal marsh~~ vegetation, all of which are expected to become established as a result of project implementation, would substantially increase the area of ~~suitable~~ preferred and undisturbed nesting habitat for the northern harrier, a state-listed species of special concern. This impact is considered beneficial.

Impact 8.22: Increase in Suitable Habitat for the Brown Pelican and Double-Crested Cormorant

Breaching the perimeter levee and introducing tidal flow to the project site east of the cross panhandle levee would initially create a large body of open water, which would provide suitable resting habitat for the brown pelican and double-crested cormorant. If tidal flows into the marsh are sufficient to entrain substantial numbers of fish and other prey items, open water areas would also provide suitable foraging habitat for these species. The area of suitable habitat for these species would decrease, however, as the project site aggrades with sedimentation and vegetation becomes established. At project maturity, subtidal channels would continue to provide suitable habitat for these species. This impact is considered beneficial.

Impact 8.23: Increase in Suitable Nesting Habitat for Resident Waterfowl

Development of undisturbed grassland, seasonal wetland, brackish marsh, and tidal marsh vegetation, all of which are expected to become established as a result of project implementation, would substantially increase the area of suitable waterfowl nesting habitat. This impact is considered beneficial.

Impact 8.24: Increase in Suitable Habitat for Wintering Waterfowl

Development of grassland, seasonal wetland, brackish marsh, tidal marsh, and pond habitats, all of which are expected to become established as a result of project implementation, would substantially increase the area of suitable foraging and resting habitat for migrating and wintering waterfowl. Because most of the project area would not be accessible for recreation or other public uses, the project area could serve as an important resting area during the waterfowl hunting season. The quality and quantity of suitable foraging and resting habitat would change over time (e.g., the area of open water and mudflat would be reduced as areas of restored tidal marsh aggrade and become vegetated). This impact is considered beneficial.

Impact 8.25: Increase in Suitable Habitat for Migratory Shorebirds

Mudflats and shallow water (less than 6 inches deep) are important foraging and resting habitat areas for shorebirds that migrate through and winter in coastal and central California. Breaching the outboard levee and introducing tidal flow to the project site east of the cross panhandle levee would initially create areas of tidal mudflat around the edges of and along channels in the tidal marsh restoration area. Tidal mudflats are expected to support large numbers of benthic organisms that are prey for shorebirds. As the site

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aggrades, but before large portions of the tidal marsh become vegetated, the area of tidal mudflat would increase; as the site continues to mature, tidal mudflats would primarily be limited to slough channels and along the margins of subtidal channels.

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

Impacts and Mitigation Measures Unique to Alternative 3

Figures 8-6 through 8-8 (depicting the HAAF parcel only) illustrate the predicted development and distribution of restored habitats at years 0, 10, and 50, respectively, following implementation of Alternative 3. Table 8-2 presents a comparison between the predicted quantities of habitats restored under Alternative 3 and other alternatives at year 50. Table 8-3 presents the expected net change in habitat acreages under Alternative 3.

Impact 8.26: Increase in Subtidal Aquatic Habitat for Resident and Anadromous Fish

This impact is the same as Impact 8.2 described above for Alternative 2, except that, because dredged material would be placed in areas restored to tidal flow, subtidal habitat areas are expected to evolve into intertidal and marsh habitats more rapidly under Alternative 3. This impact is considered beneficial.

Impact 8.27: Short-Term Loss of or Disturbance to and Long-Term Increase in Intertidal Mudflats

This impact is the same as Impact 8.3 described above for Alternative 2, except that, because dredged material would be placed in areas restored to tidal flow, tidal salt marsh vegetation would establish more rapidly because the site is expected to aggrade to elevations that would sustain vegetation earlier in the process of site development. Consequently, tidal mudflats would evolve to tidal coastal salt marsh sooner following introduction of tidal exchange to the site than under Alternative 2. This impact is considered beneficial.

Impact 8.28: Loss of Tidal Coastal Salt Marsh

This impact is the same as Impact 8.4 described above for Alternative 2, except that slightly more habitat area would be affected as a result of placement of the dredged material pipeline in the tidal marsh and slightly less habitat area would be restored under

Alternative 3. This impact is considered significant. To reduce this impact to a less-than-significant level, the Coastal Conservancy, Corps, or successors in interest shall implement Mitigation Measure 8.4.

Impact 8.29: Loss of Approximately 1.2 Acres of Brackish Marsh

This impact is the same as Impact 8.5 described above for Alternative 2, except that approximately 102 acres of seasonal wetlands, seasonal ponds, and upland habitats would be restored. Brackish marsh vegetation is expected to gradually colonize and establish along drainage channels through the wetlands and in seasonal ponds that pond water for a sufficient period to allow establishment of emergent vegetation. Substantially more than 2.4 acres of brackish marsh vegetation are likely to develop on the site.

If brackish marsh develops as designed, this impact would be beneficial; however, because of uncertainties regarding the development and operation of subsurface and surface hydrology and the associated quantity of brackish marsh vegetation, brackish marsh of sufficient quality and quantity may not establish rapidly enough to offset project impacts. Therefore, this impact is considered significant. To reduce this impact to a less-than-significant level, the Coastal Conservancy, Corps, or successors in interest shall implement Mitigation Measure 8.5.

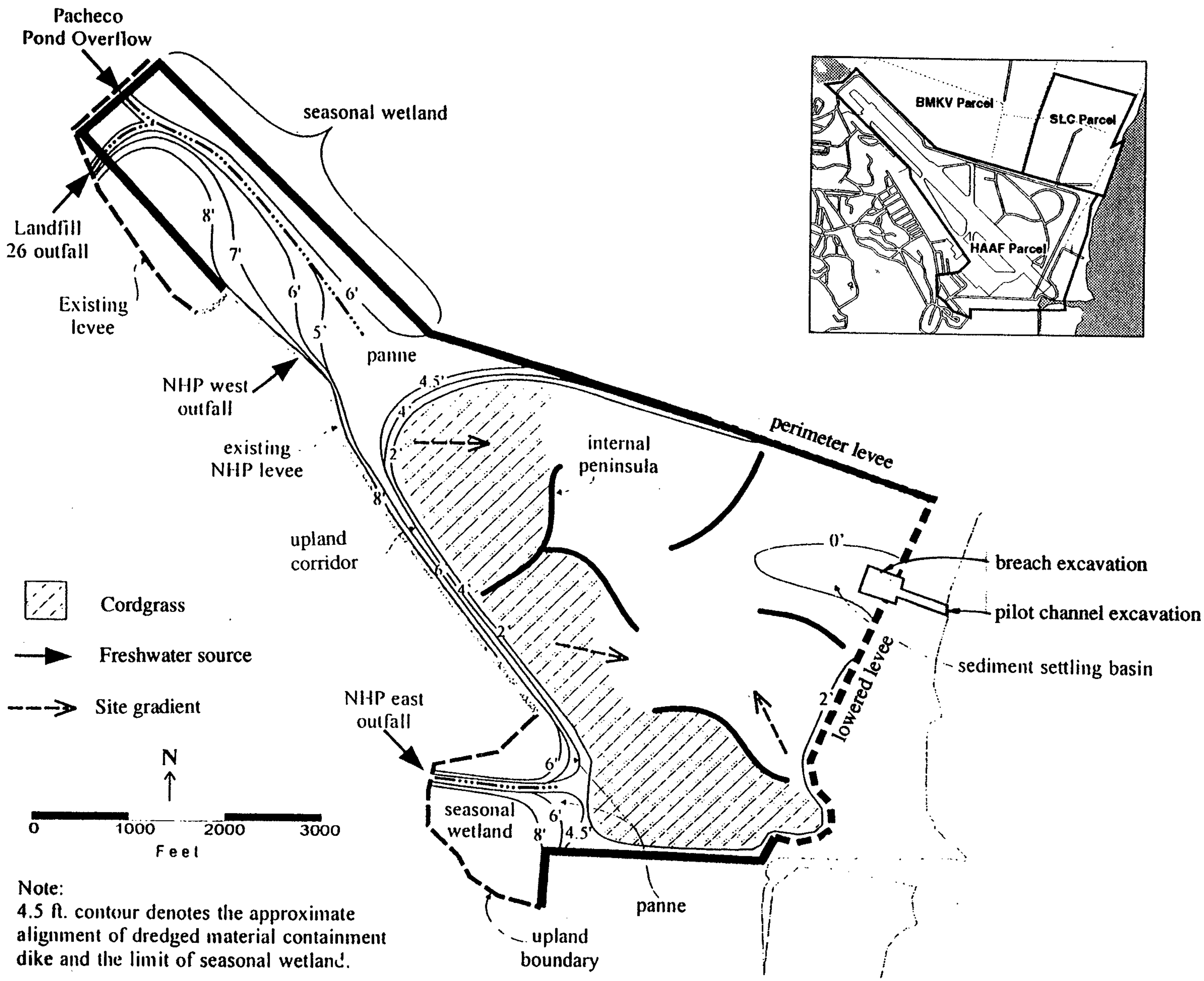
Impact 8.30: Temporary Disturbance of Approximately 2.9 Acres of Brackish Marsh

This impact is the same as Impact 8.6 described above for Alternative 2. This impact is considered significant. To reduce this impact to a less-than-significant level, the Coastal Conservancy, Corps, or successors in interest shall implement Mitigation Measure 8.6.

Impact 8.31: Loss of Approximately 19.5 Acres of Seasonal Wetlands

Restoration of seasonal and tidal wetlands and uplands would result in the loss of approximately 19.5 acres of existing seasonal wetlands. The existing wetland habitat area includes 12.4 acres of seasonal wetland constructed as mitigation for the Landfill 26 closure project. Restoration would result in direct loss of seasonal wetlands from introduction of tidal flows and placement of dredge material in wetlands.

Loss of 19.5 acres of existing seasonal wetlands would be offset if at least 19.5 acres of seasonal wetland develops (1:1 in-kind or out-of-kind replacement ratio) and is maintained on the site within 5 years following project implementation. Under Alternative 3, approximately 102 acres of additional seasonal wetland habitat area would be restored on the site. This impact is considered beneficial.



Note:
4.5 ft. contour denotes the approximate alignment of dredged material containment dike and the limit of seasonal wetland.

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Figure 8-6
Development and Distribution of Restored Habitat under Alternative 3 at Year 0

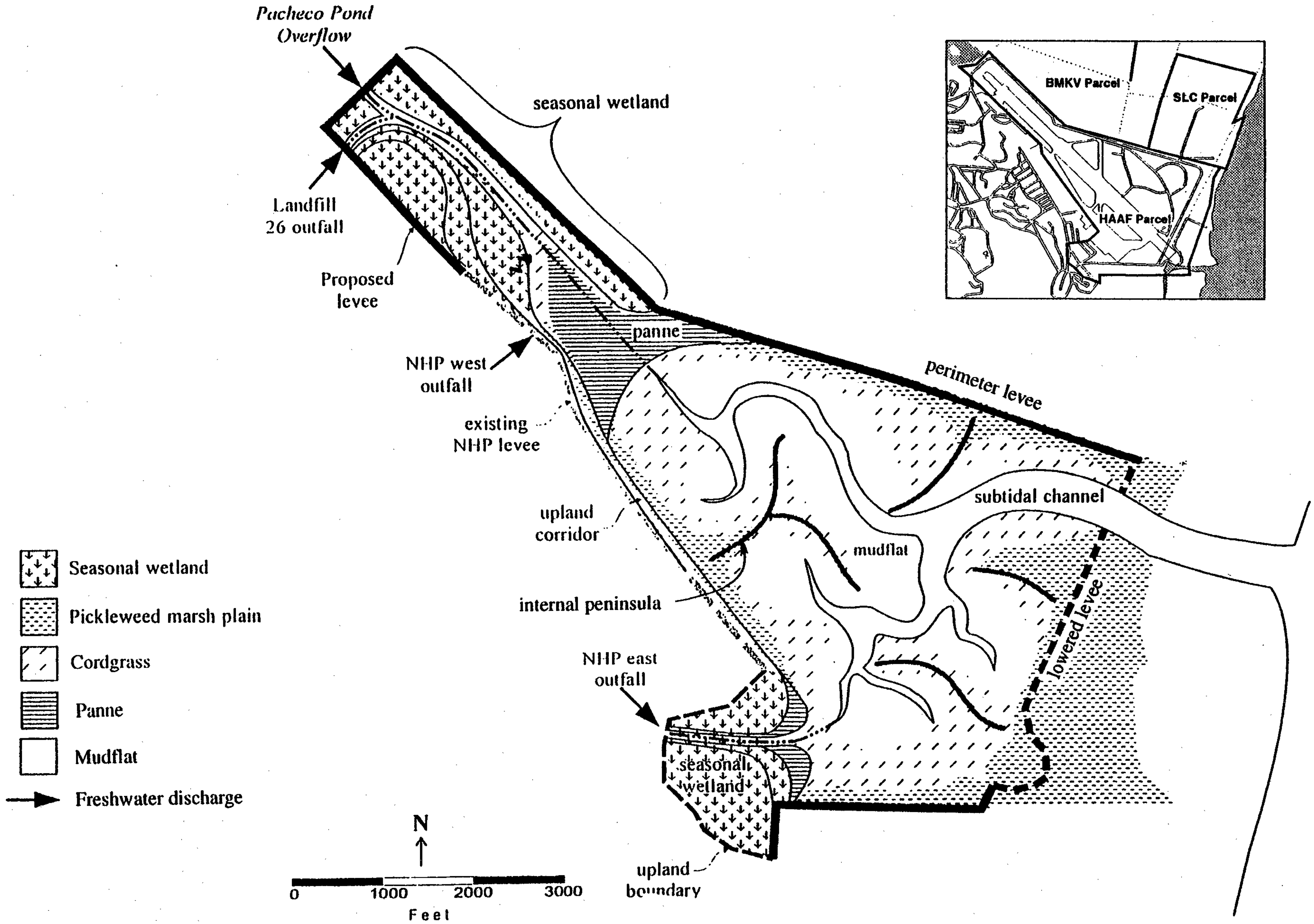

Figure 8-7
Development and Distribution of Restored Habitat under Alternative 3 at Year 10

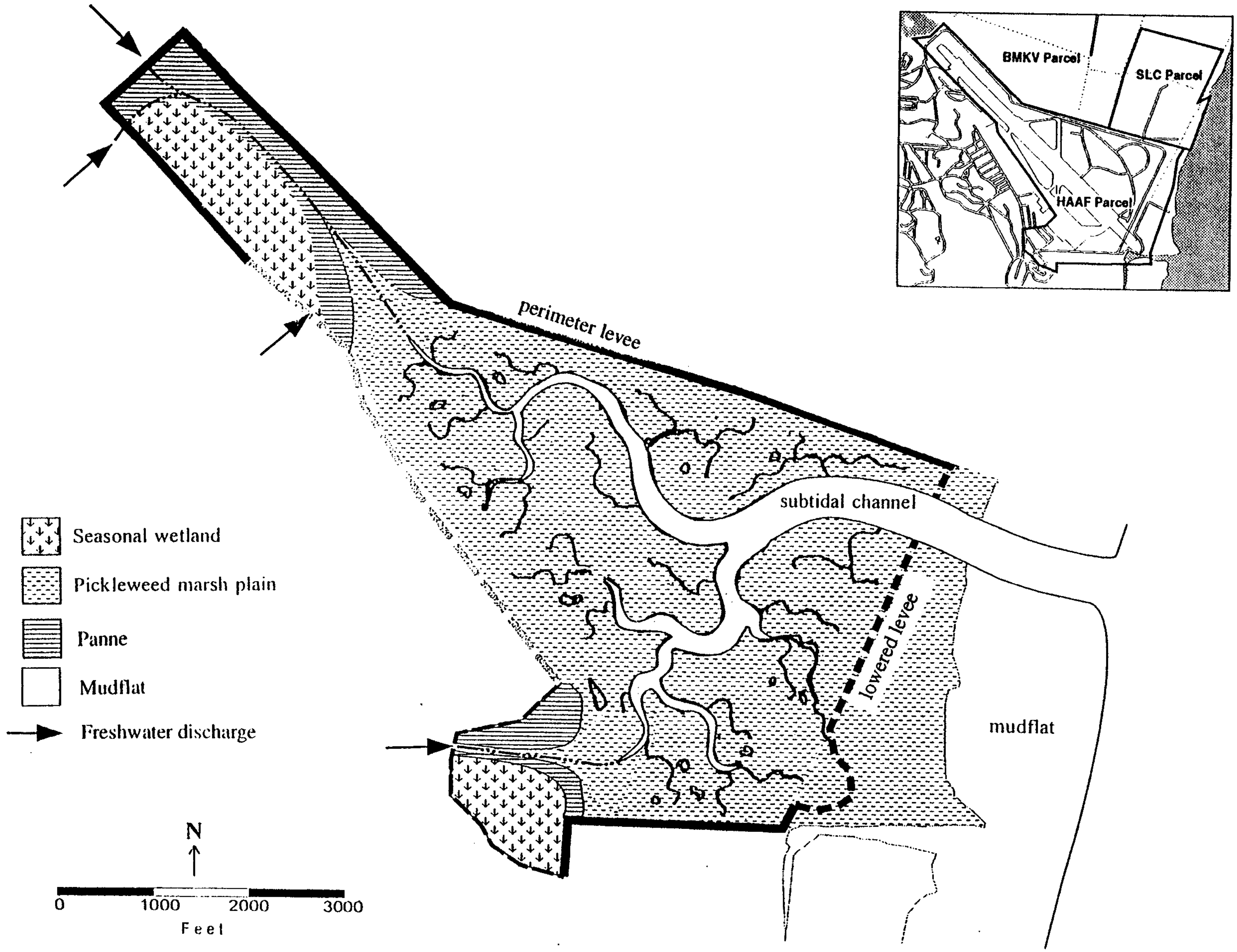

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Figure 8-8
Development and Distribution of Restored Habitat under Alternative 3 at Year 50

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Impact 8.32: Loss of Grassland

This impact is the same as Impact 8.9 described above for Alternative 2, except that approximately 16 acres of additional grassland habitat areas would be restored. This impact is considered less than significant and no mitigation is required.

Impact 8.33: Temporary Disturbance to the California Clapper Rail and California Black Rail during Construction

This impact is the same as Impact 8.10 described above for Alternative 2. This impact is considered significant. To reduce this impact to a less-than-significant level, the Coastal Conservancy, Corps, or successors in interest shall implement Mitigation Measure 8.10.

Impact 8.34: Temporary Disturbance to the Northern Harrier, Burrowing Owl, Saltmarsh Common Yellowthroat, and San Pablo Song Sparrow during Construction

This impact is the same as Impact 8.11 described above for Alternative 2. This impact is considered significant. To reduce this impact to a less-than-significant level, the Coastal Conservancy, Corps, or successors in interest shall implement Mitigation Measure 8.11.

Impact 8.35: Potential for Construction-Related Mortality of Chinook Salmon, Central Valley Steelhead, and Longfin Smelt

Operation of the hydraulic off-loader intake pumps from either of the proposed deep water or shallow water locations in San Pablo Bay could potentially result in mortality of longfin smelt or chinook salmon and Central Valley steelhead salmon smolts during outmigration (smolts of these species could be present in San Pablo Bay from about January 1 to June 30). Mortality to these species could result if fish are entrained in pump intakes; however, because pumping operations are temporary and water would be pumped from the open waters of San Pablo Bay rather than a narrow water body, which could result in channeling fish to the pump intakes, it is unlikely that these species would be entrained by pump operation. Therefore, this impact is considered less than significant.

Impact 8.36: Potential for Construction-Related Mortality of Salt Marsh Harvest Mice

This impact is the same as Impact 8.12 described above for Alternative 2, except that placement of the dredged material pipeline in the tidal marsh could affect the salt marsh harvest mouse in addition to the construction activities identified under Alternative 2. This impact is considered significant. To reduce this impact to a less-than-significant level, the Coastal Conservancy, Corps, or successors in interest shall implement Mitigation Measure 8.12.

Impact 8.37: Potential for Construction-Related Mortality of California Clapper Rails and California Black Rails

This impact is the same as Impact 8.13 described above for Alternative 2, except that placement of the dredged material pipeline in the tidal marsh could also result in direct mortality of California clapper rails and California black rails. Therefore, this impact is considered significant. To reduce this impact to a less-than-significant level, the Coastal Conservancy, Corps, or successors in interest shall implement Mitigation Measure 8.37.

Mitigation Measure 8.37: Avoid Operation of Equipment in the Outboard Tidal Marsh during the Breeding Period for California Clapper Rail and California Black Rail. This measure is the same as Mitigation Measure 8.13 described above for Alternative 2, except that the measure is expanded to include placement of the dredged material pipeline in the outboard tidal marsh as an additional activity to be avoided from April 15 through July 15.

Impact 8.38: Potential for Mortality of San Pablo Song Sparrows

This impact is the same as Impact 8.14 described above for Alternative 2. This impact is considered significant. To reduce this impact to a less-than-significant level, the Coastal Conservancy, Corps, or successors in interest shall implement Mitigation Measure 8.14.

Impact 8.39: Potential for Mortality of Burrowing Owls

This impact is the same as Impact 8.15 described above for Alternative 2. This impact is considered significant. To reduce this impact to a less-than-significant level, the Coastal Conservancy, Corps, or successors in interest shall implement Mitigation Measure 8.15.

Impact 8.40: Potential Disturbance to or Mortality of Special-Status Species resulting from Management and Maintenance Activities

This impact is the same as Impact 8.16 described above for Alternative 2. This impact is considered significant. To reduce this impact to a less-than-significant level, the Coastal Conservancy, Corps, or successors in interest shall implement Mitigation Measure 8.16.

Impact 8.41: Loss of Habitat for California Clapper Rail, California Black Rail, Salt Marsh Harvest Mouse, and Saltmarsh Common Yellowthroat

This impact is the same as Impact 8.17 described above for Alternative 2, except that slightly more habitat area would be affected and slightly less habitat area would be restored under Alternative 3. This impact is considered significant. To reduce this impact to a less-than-significant level, the Coastal Conservancy, Corps, or successors in interest shall implement Mitigation Measure 8.4.

Impact 8.42: Loss of Refugia for the California Clapper Rail, California Black Rail, and Salt Marsh Harvest Mouse

This impact is the same as Impact 8.18 described above for Alternative 2. This impact is considered less than significant and no mitigation is required.

Impact 8.43: Loss of Nesting Habitat for the San Pablo Song Sparrow

This impact is the same as Impact 8.19 described above for Alternative 2. This impact is considered significant. To reduce this impact to a less-than-significant level, the Coastal Conservancy, Corps, or successors in interest shall implement Mitigation Measures 8.4 and 8.5.

Impact 8.44: Loss of Nesting Habitat for the Burrowing Owl

This impact is the same as Impact 8.20 described above for Alternative 2. This impact is considered less than significant and no mitigation is required.

Impact 8.45: Increase in Suitable Nesting Habitat for the Northern Harrier

This impact is the same as Impact 8.21 described above for Alternative 2. This impact is considered beneficial.

Impact 8.46: Increase in Suitable Habitat for the Brown Pelican and Double-Crested Cormorant

This impact is the same as Impact 8.22 described above for Alternative 2. Dredged material would be placed in areas restored to tidal flow, however, and tidal salt marsh vegetation would establish more rapidly because the site is expected to aggrade to elevations that would sustain vegetation earlier in the process of site evolution. Consequently, open water areas would develop to mudflats and tidal coastal salt marsh sooner following introduction of tidal exchange to the site than under Alternative 2. This impact is considered beneficial.

Impact 8.47: Increase in Suitable Nesting Habitat for Resident Waterfowl

This impact is the same as Impact 8.23 described above for Alternative 2. This impact is considered beneficial.

Impact 8.48: Increase in Suitable Habitat for Wintering Waterfowl

This impact is the same as Impact 8.24 described above for Alternative 2. This impact is considered beneficial.

Impact 8.49: Increase in Suitable Habitat for Migratory Shorebirds

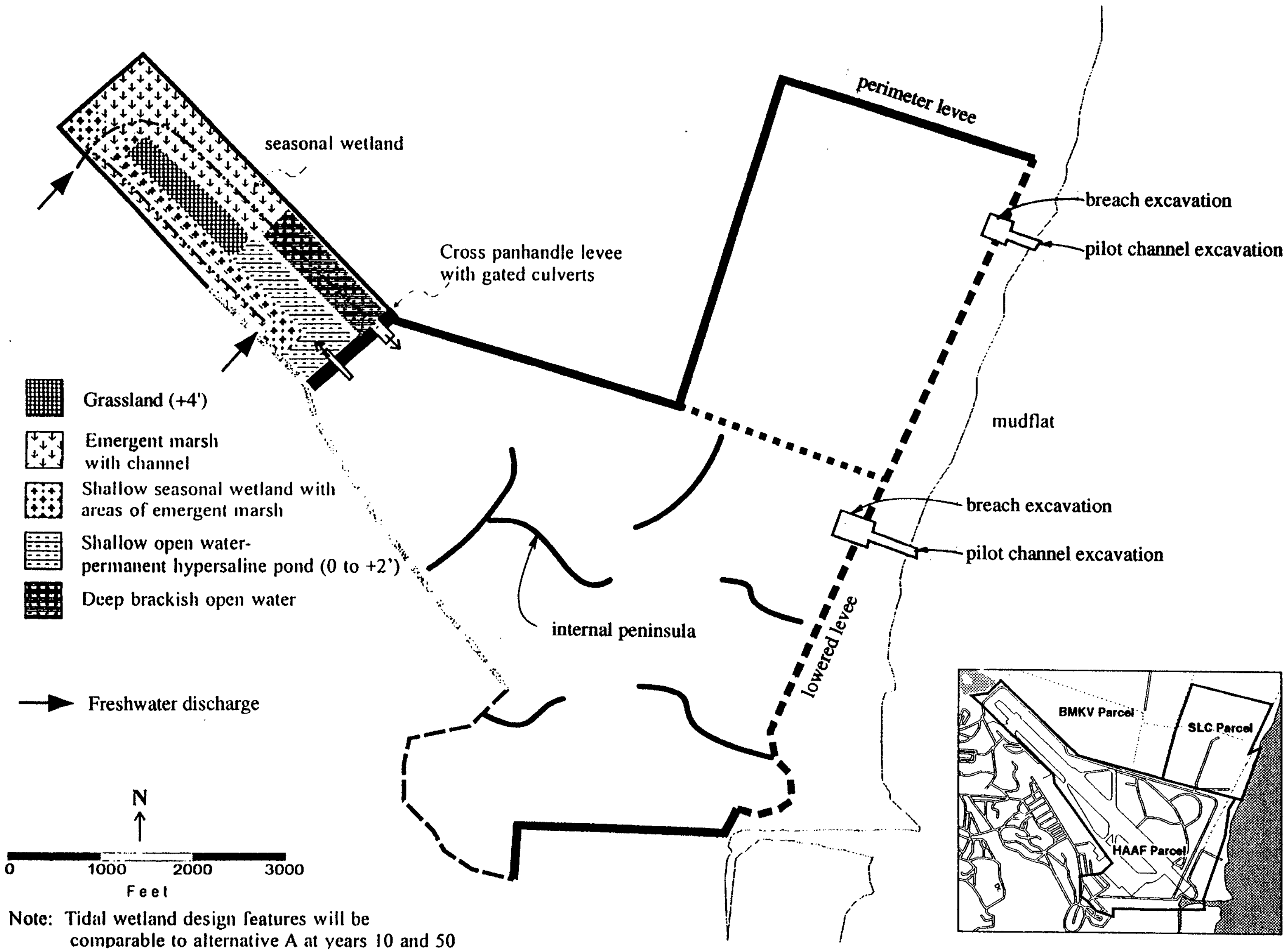
This impact is the same as Impact 8.25 described above for Alternative 2. Dredged material would be placed in areas restored to tidal flow, and tidal salt marsh vegetation would establish more rapidly because the site is expected to aggrade to elevations that would sustain vegetation earlier in the process of site evolution. Consequently, tidal mudflats would develop to tidal coastal salt marsh earlier following introduction of tidal exchange to the site than under Alternative 2. Under Alternative 3, approximately 33 acres of tidal pannes would be created that, in addition, would provide foraging habitat and flood refugia for shorebirds when tidal marshes are inundated by high tides (Table 8-3). This impact is considered beneficial.

Impact 8.50: Temporary Disturbance of Fish in San Pablo Bay during Construction

Transporting dredged material to the site would require pumping the material through the dredged material pipelines across part of San Pablo Bay from ~~a~~ hydraulic off-loaders, also located in the bay. This process could increase the turbidity surrounding the hydraulic off-loaders and create the potential for fuel spills, causing a disturbance to the fish species in the area; however, fish are likely to move out of the area until the water quality increases. All construction activities must meet the objectives established by the San Francisco RWQCB. Therefore, this impact is considered less than significant and no mitigation is required.

Impacts and Mitigation Measures Unique to Alternative 4

Figures 8-9 to 8-11 (depicting the HAAF and SLC parcels) illustrate the predicted development and distribution of restored habitats at years 0, 10, and 50, respectively, following implementation of Alternative 4. Table 8-2 presents a comparison between the acreages of habitats restored under Alternative 4 and acreages under Alternative 1 (and Alternatives 2, 3, and 5) at year 50. Table 8-3 presents the expected net change in habitat acreages from Alternative 1 with implementation of Alternative 4.



Note: Tidal wetland design features will be comparable to alternative A at years 10 and 50

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Figure 8-9
Development and Distribution of Restored Habitat under Alternative 4 at Year 0

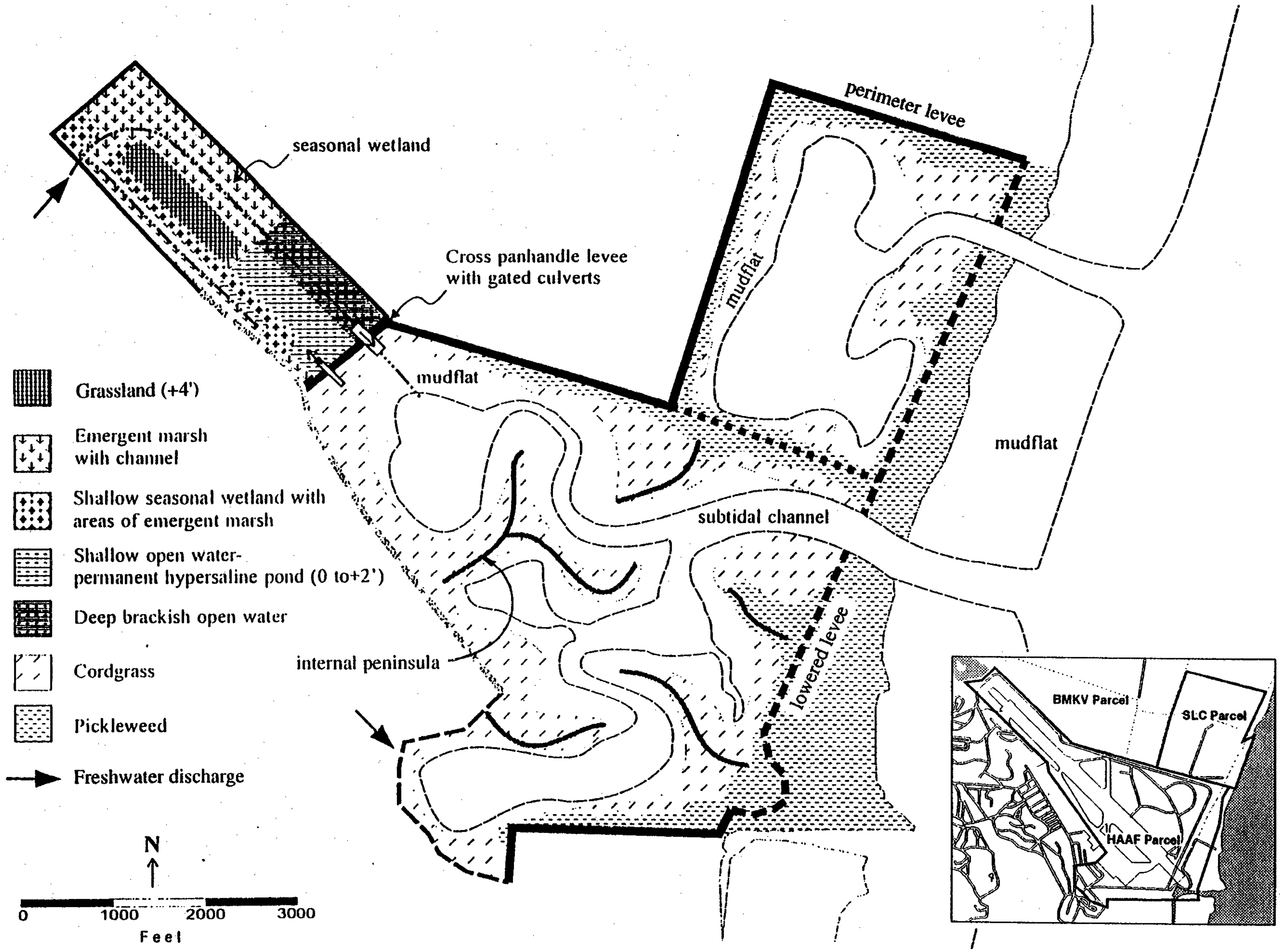

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Figure 8-10
Development and Distribution of Restored Habitat under Alternative 4 at Year 10

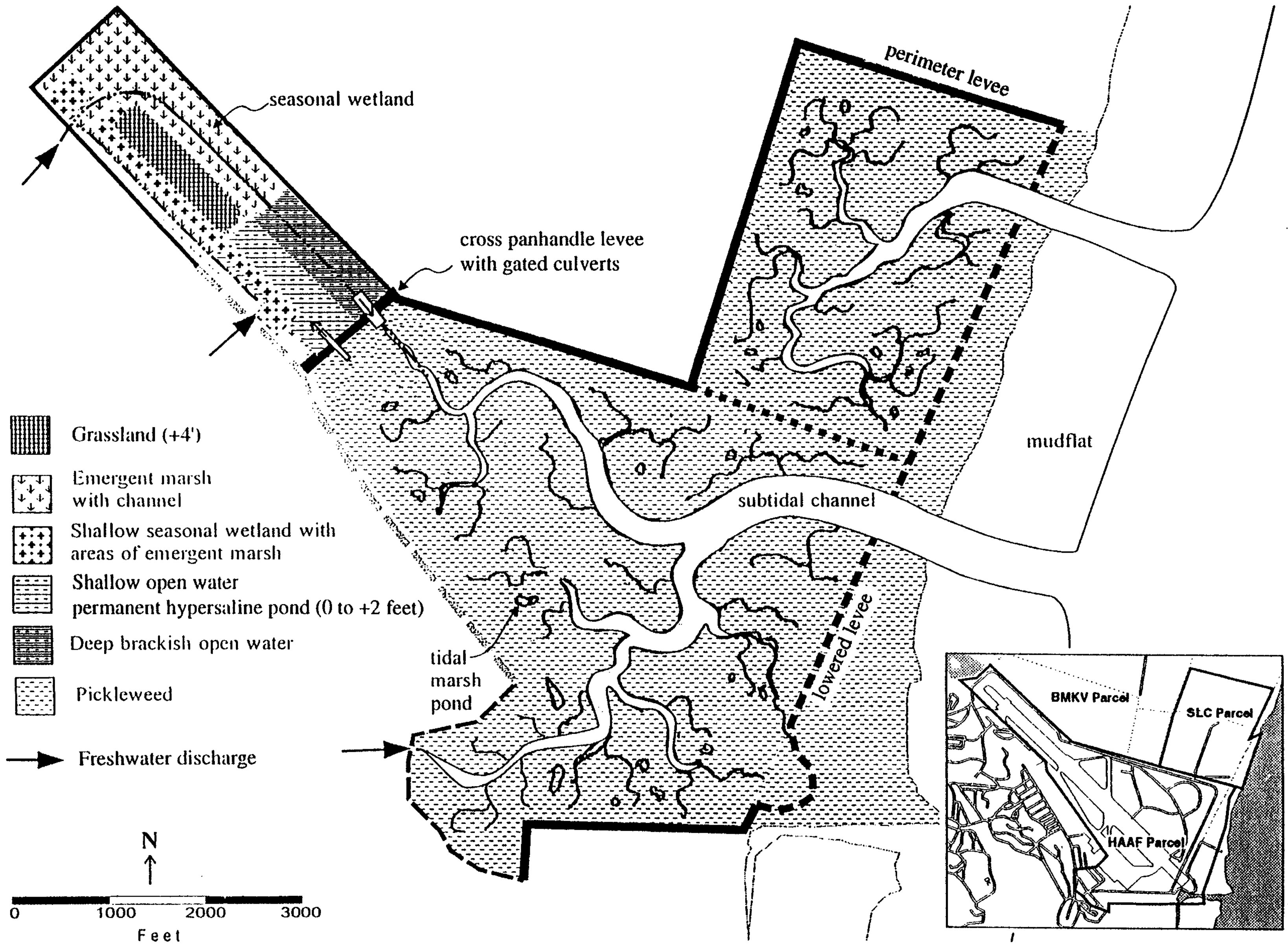

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Figure 8-11
Development and Distribution of Restored Habitat under Alternative 4 at Year 50

Alternative 4 is similar to Alternative 2, except that approximately 250 acres of additional coastal salt marsh and grassland habitat in the SLC parcel would be restored. The impacts and mitigation measures of Alternative 4 are the same as those described for Alternative 2, except that the magnitude of impacts and benefits differ. Differences between the magnitude of impacts and benefits of Alternative 4 and Alternative 2 compared to Alternative 1 are presented in Table 8-3.

Impacts and Mitigation Measures Unique to Alternative 5

Figures 8-12 to 8-14 (depicting the HAAF and SLC parcels) illustrate the predicted development and distribution of restored habitats at years 0, 10, and 50, respectively, following implementation of Alternative 5. Table 8-2 presents a comparison between the acreages of habitats estimated to be restored under Alternative 5 and acreages under Alternative 1 (and Alternatives 2, 3, and 4) at year 50. Table 8-3 presents the expected net change in habitat acreages from Alternative 1 with implementation of Alternative 5. Alternative 5 is similar to Alternative 3, except that approximately 250 acres of additional coastal salt marsh and grassland habitat on the SLC site would be restored. The impacts and mitigation measures of Alternative 5 are the same as those described for Alternative 3, except that the magnitude of impacts and benefits differ. Differences between the magnitude of impacts and benefits of Alternative 5 and Alternative 3 compared to Alternative 1 are presented in Table 8-3.

Potential Issues and Resolutions under the Bel Marin Keys V Scenario

The Coastal Conservancy and the Corps are considering this scenario at a programmatic level in the event that the BMKV parcel can be acquired for restoration before one of the other project alternatives can be implemented. Conceptually, the habitat types to be restored and the methods used to restore the habitats would be same as those proposed under Alternative 5.

The BMKV Scenario is similar to Alternative 5, except that approximately 1,358 acres of additional coastal salt marsh, tidal panne, seasonal wetland, and grassland habitat in the BMKV parcel would be restored (Table 8-4). With the exception of biological resources associated with agricultural habitats, the potential issues and resolutions under the BMKV Scenario are similar to those described for Alternative 5, except that the magnitude of effects and benefits would differ. Differences between the magnitude of effects and benefits of the BMKV Scenario and Alternative 5 compared to Alternative 1 are presented in Tables 8-3 and 8-4.

Potential Issue: Potential Loss of Wintering Waterfowl and Shorebird Foraging Habitat

Loss of approximately 1,314 acres of agricultural land with restoration of the BMKV parcel would result in the loss of foraging areas for wintering waterfowl and shorebird. Restoring the extensive mosaic of approximately 1,358 acres of intertidal mudflats, coastal salt marsh, brackish marsh, seasonal wetland, and grassland habitats under this alternative would likely provide foraging and resting habitat values at least as high as those areas that would be affected by the project. Therefore, this potential issue is considered less than significant.

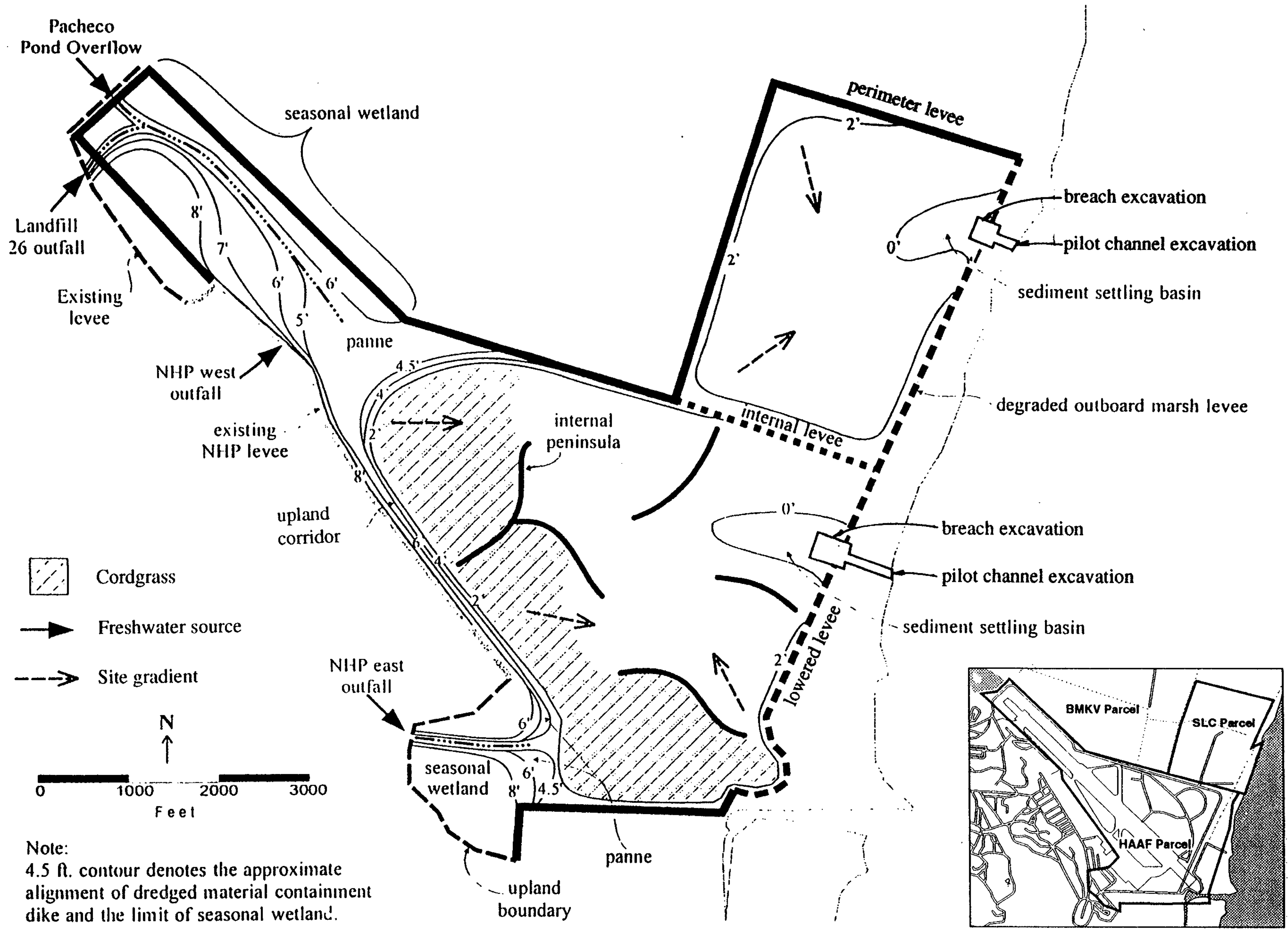

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Figure 8-12
Development and Distribution of Restored Habitat under Alternative 5 at Year 0

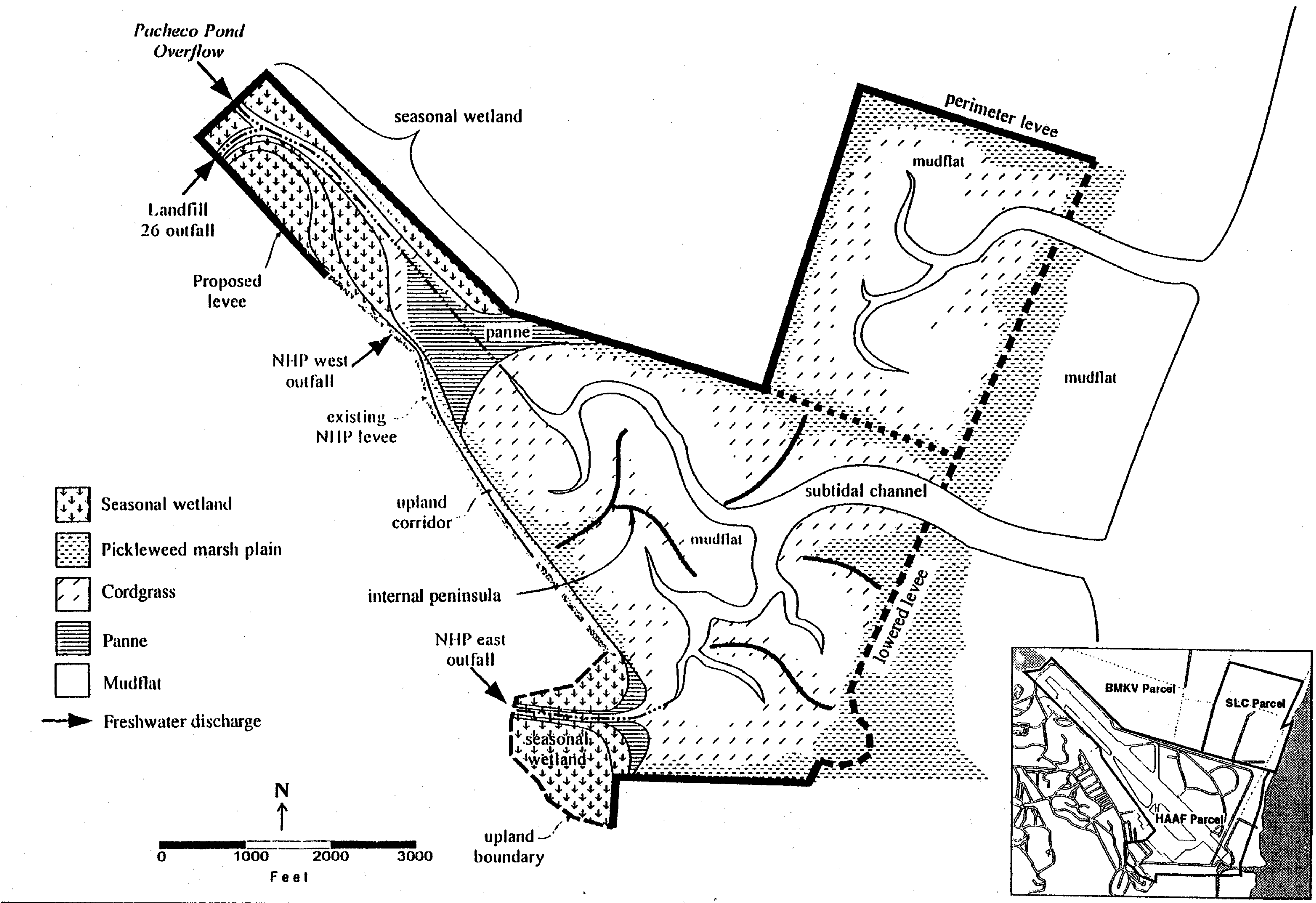

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Figure 8-13
Development and Distribution of Restored Habitat under Alternative 5 at Year 10

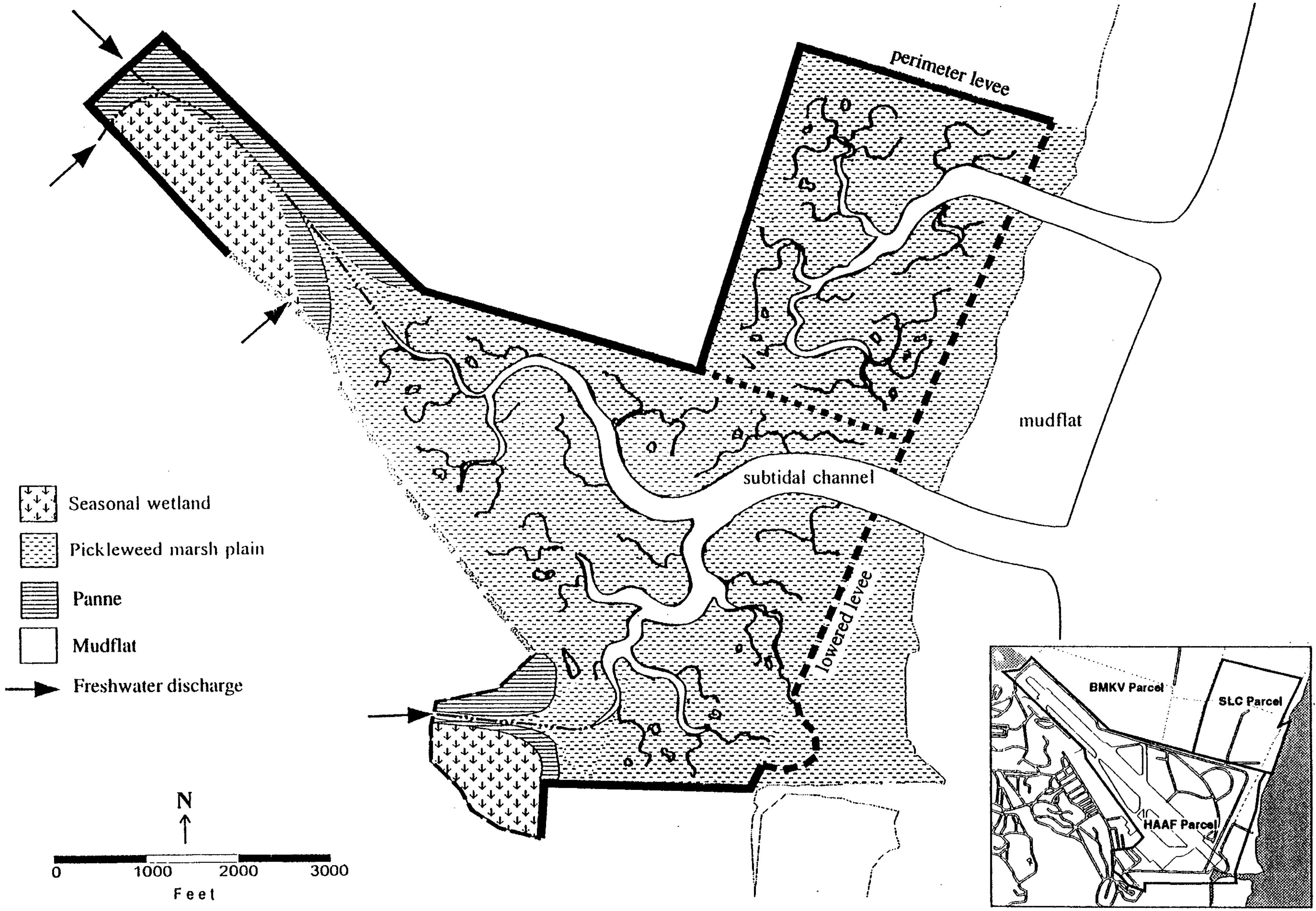

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Figure 8-14
Development and Distribution of Restored Habitat under Alternative 5 at Year 50

Table 8-4.
Estimated Acreage of Each Habitat Type and Net Change in Habitat Acreage under the Bel Marin Keys V Scenario Compared to Alternative I at Year 50 after Project Implementation

Habitat Type	Alternative I: No Action[a]	Bel Marin Keys V Scenario	
		Estimated Restored Habitat Area	Net Change from Alternative I
Subtidal channels	0.0	93.5	+93.5
Intertidal channels	0.0	52.3	+52.3
Coastal salt marsh (tidal)	120.0	1,561.2	+1,441.2
Coastal salt marsh (nontidal)	11.0	0.0	-11.0
Tidal pannes	0.0	98.5	+98.5
Brackish marsh	31.1	0.0[b]	-31.1[b]
Brackish open water	13.0	0.0[b]	-13.0[b]
Seasonal wetland	37.5	295.4[c]	+257.9[c]
Grassland	496.7	205.9	-290.8
Agriculture	1,314.0	0.0	-1,314.0
Developed areas	283.6	0.0	-283.6
Total	2,306.9	2,306.9	0.0

[a] Acreages for Alternative 1 include the HAAF, SLC, and BMKV parcels.

[b] An unknown quantity of brackish marsh and brackish open water will develop as inclusions within restored seasonal wetland habitat areas.

[c] This amount will include an unknown quantity of brackish marsh and brackish open water habitat area.

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Chapter 9. Land Use and Public Utilities

Affected Environment

Data Sources

The following documents were used to prepare this section:

- the Hamilton Army Airfield Disposal and Reuse Environmental Impact Statement (U.S. Army Corps of Engineers 1996a),
- the Novato General Plan (City of Novato 1996),
- Marin Countywide Plan (Marin County Community Development Agency 1994),
- San Francisco Bay Plan (San Francisco Bay Conservation and Development Commission 1969), and
- the Bel Marin Keys V revised draft EIR (Environmental Science Associates 1993).

Regulatory Setting

Novato General Plan

The Novato General Plan is a comprehensive, long-range planning document that identifies the city's land use, transportation, environmental, economic, fiscal, and social goals and policies as they relate to the conservation and development of land in Novato. The general plan was adopted in March 1996 and supersedes the city's 1981 general plan.

The general plan designates the HAAF and SLC parcels as open space. It describes open space uses as "Publicly-owned land that is largely unimproved and devoted to the preservation of natural resources, outdoor recreation, floodways and flood control, and the maintenance of public health and safety".

The allowable uses within this land use category include uses devoted to, among other purposes, the preservation of natural resources and outdoor education. In addition, the general plan contains EN Program 10.3 as follows:

> Encourage wetlands restoration where appropriate. Restoration of historic wetlands such as those at the Hamilton Field runway is contributing towards restoring those lands that experienced significant loss (over 80 percent) in the bay area.

Lastly, the general plan designates the project site as a "bayfront area"; bayfront areas are areas within Novato that require careful regulation because of their environmental values and the City's desire to preserve and enhance natural resources and historical resources, including wildlife and aquatic habitats, tidal marshes, seasonal marshes, lagoons, wetlands, agricultural lands and low-lying grasslands overlying historical marshes.

San Francisco Bay Plan

BCDC's San Francisco Bay Plan was prepared to guide the future protection and use of San Francisco Bay and its shoreline. The San Francisco Bay Plan identifies the HAAF and SLC parcels as high-priority areas for wildlife use. The plan was amended (Bay Plan Amendment No. 1-95) to change the airport priority use designation and policy note for the former HAAF. The plan contains the following policy:

> Develop comprehensive wetlands habitat plan and long-term management program for restoring and enhancing wetlands habitat in diked former tidal wetlands. Dredged materials should be used whenever feasible and environmentally acceptable to facilitate wetlands restoration.

Marin Countywide Plan

The Marin Countywide Plan is a long-range comprehensive plan that governs growth and development in the unincorporated areas of the county. The Marin Countywide Plan designates the land use at BMKV as agriculture and conservation with a permitted residential use of 1 unit per 2-10 acres (Crawford pers. comm.). The BMKV site is located in the Bayfront Conservation Zone as designated in the Marin Countywide Plan. This designation is intended to preserve, protect, and enhance existing species and habitat diversity in the county.

Bay Trail

The Bay Trail ~~is operated by the Bay Trail~~ Project, a nonprofit organization ~~operated by~~ affiliated with the Association of Bay Area Governments, guides and oversees planning of the Bay Trail. The regional hiking and bicycling trail around San Francisco and San Pablo Bays is at various stages of completion. Portions of the trail that are proposed for the project area are currently in the conceptual stage. Trail alignments proposed in the project area include the Spine Bay Trail, located ~~east~~ west of the New Hamilton Partnership development and following the existing Northwestern Pacific Railroad right-of-way, and the Spur Trail, located on the HAAF parcel perimeter levees (~~Figure 9-1~~ Figures 9-1 and 9-2). ~~The HRG has proposed a modified Spur Tail alignment that would be more compatible with the Hamilton wetland restoration plan than the unmodified, proposed Spur Trail alignment. The Spur Trail also would extend south through the St. Vincent's property and northwest along Pacheco Pond. In addition, several alternate alignments have been proposed west of the HAAF parcel (Scandone pers. comm.).~~ The Spur Trail also would extend south through St. Vincent's and Las Gallinas Sanitary District property and northwest along Pacheco Pond. The HRG has proposed a modified Spur Trail alignment that would be more compatible with the wetland restoration plan than the unmodified adopted Spur Trail alignment.

~~The HRG's proposed alternative alignment would connect to the currently proposed Spine Bay Trail and run along the New Hamilton Partnership levee, Hangar Road, and around Long Point. This alignment would provide enhanced public access to the western side of the proposed project area.~~

The HRG's proposed alternative Spur Trail alignment would run along the New Hamilton Partnership levee and Hangar Road and around Long Point. It would connect to the adopted Spine Trail (NWPRR right-of-way) via Main Gate Road or other HAAF access roads. This alternative alignment would provide enhanced public access to the western side of the project. Furthermore, it would be consistent with the City's intention to prohibit public access on the perimeter levee to protect wetland habitat (Wood pers. comm.).

The Bay Trail Project recently indicated that the current adopted Spine Trail alignment may not be available if the NWPRR right-of-way is developed as a rail corridor. Because of this uncertainty, it is important to allow for alternatives to ensure a continuous Bay Trail.

In the project area, there are several alternatives to the NWPRR right-of-way. One alternative is Nave Drive, which runs between Bel Marin Keys Boulevard and the St. Vincent's property to the south. From Nave Drive, visitors can enter and exit on several HAAF access roads and use the HRG's proposed Spur Trail.

Other trail alternatives are located on properties not yet open to public access. To the north, a connection could be developed from the New Hamilton Partnership levee through the Phase II properties to Nave Drive or the NWPRR right-of-way. A lead agency for planning of the Phase II properties, the City of Novato could coordinate with interested stakeholders to plan for a continuous Bay Trail-Spine Trail alignment with connections to the HRG's proposed Spur Trail at Hamilton.

Properties south of HAAF are in private ownership or are not open to the public. Any future public planning opportunities for these properties should seek a connection to the HRG's proposed Spur Trail to create a continuous Bay Trail, provided that the connections are sensitive to any adjacent wildlife areas. Stakeholders for this planning effort are the Cities of Novato and San Raphael, the Marin County Planning Department, BCDC, the Bay Trail Project, resource agencies, nonprofit organizations, and the Coastal Conservancy.

Final decisions on Bay Trail alignments with regard to design and implementation are the responsibility of the Bay Trail Project in conjunction with the City of Novato and the County of Marin.

Land Uses, Utilities, and Easements at the Project Site

Existing land uses, utilities, and easements at the project site are described below and identified in Figure ~~9-2~~ 9-3.

HAAF Parcel

Background. Hamilton Air Force Base was decommissioned as an active Air Force facility in 1974. Ownership of most of the property was transferred to the Army, Navy, and Coast Guard between 1974 and 1984. The portion of Hamilton Air Force Base transferred to the Army in 1984 was renamed Hamilton Army Air Field and served as a subinstallation to the Presidio. In addition to serving as an airfield for the Presidio, HAAF was used as a training center for Army Reserve aviation and medical units. State and local agencies and private organizations have also used the airfield occasionally for temporary, short-term events, subject to Army approval. No major repairs to HAAF facilities have been performed since the Air Force transferred the airfield to the Army, and facilities have since deteriorated.

HAAF, including a 20-acre site owned by the U.S. Navy and referred to as "the Navy ball field", located in the southwest corner of the parcel, is currently in the BRAC process. The runway is no longer used for aviation and, since approximately June 1995, has been used to stockpile suspected contaminated soils. Contaminated sites, such as underground storage tanks and dredge spoils, will be cleaned up in a two-phased process beginning in 1998 and finishing by December 1999. (Cawood pers. comm.)

Land Uses. The HAAF parcel includes a runway (approximately 8,000 feet long) that is no longer used, aprons, taxiways, the revetment area, an airplane hangar, and other miscellaneous structures. The revetment area is located in the northeastern corner of the HAAF parcel and is transected by concrete-paved taxiways that connect 28 circular revetment turnouts. The Navy ball field is located in the southwest corner of the HAAF parcel and is currently used as a baseball/softball field.

Three features associated with Landfill 26 are located in the HAAF parcel. The 12.4-acre Landfill 26 wetland mitigation site, located on the runway at the northwest end of the parcel, was constructed to replace seasonal wetlands lost during closure of Landfill 26. A borrow area southeast of the wetland mitigation site was excavated to provide fill for the

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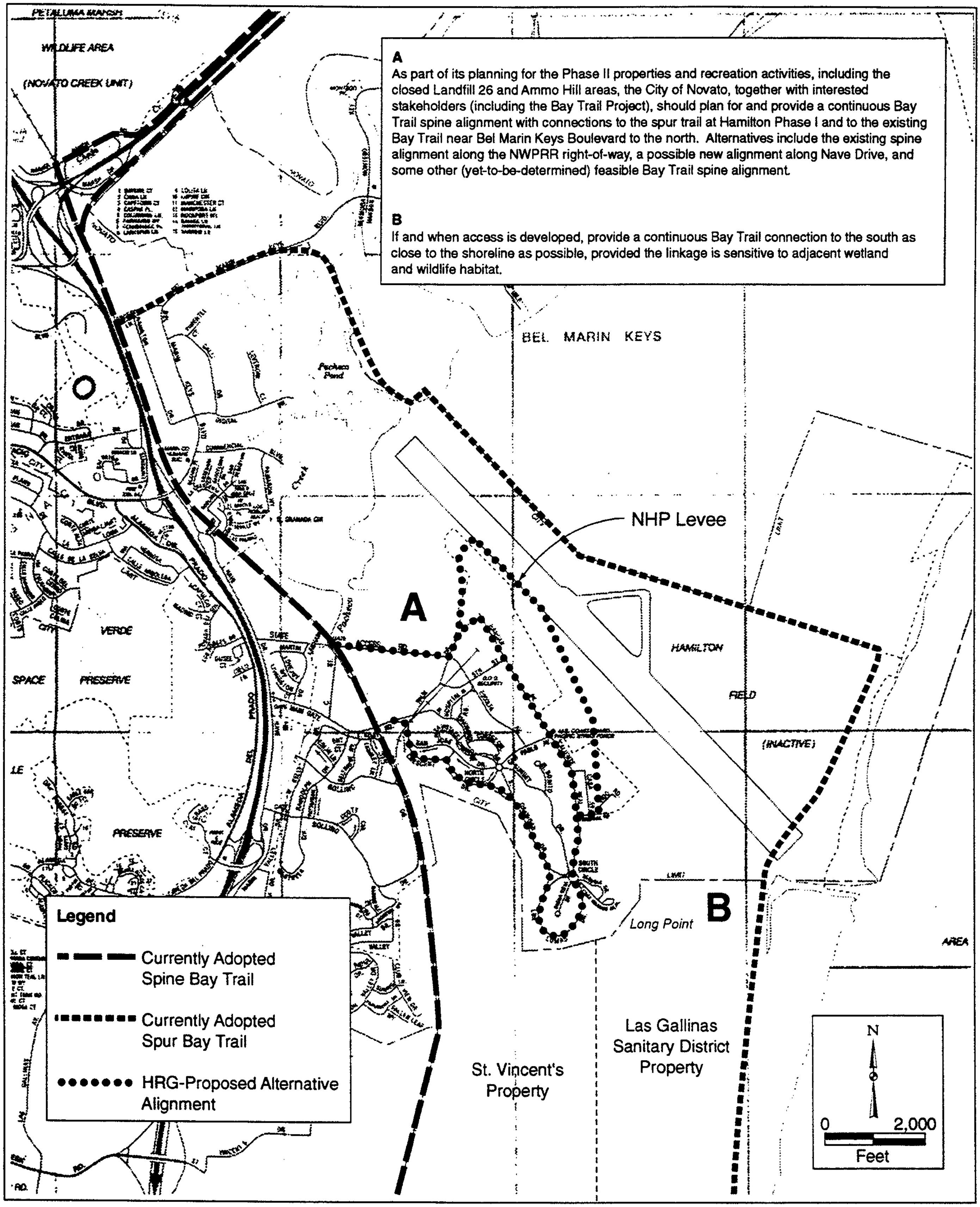

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Figure 9-1
Portions of the Bay Trail Proposed for the Project Area

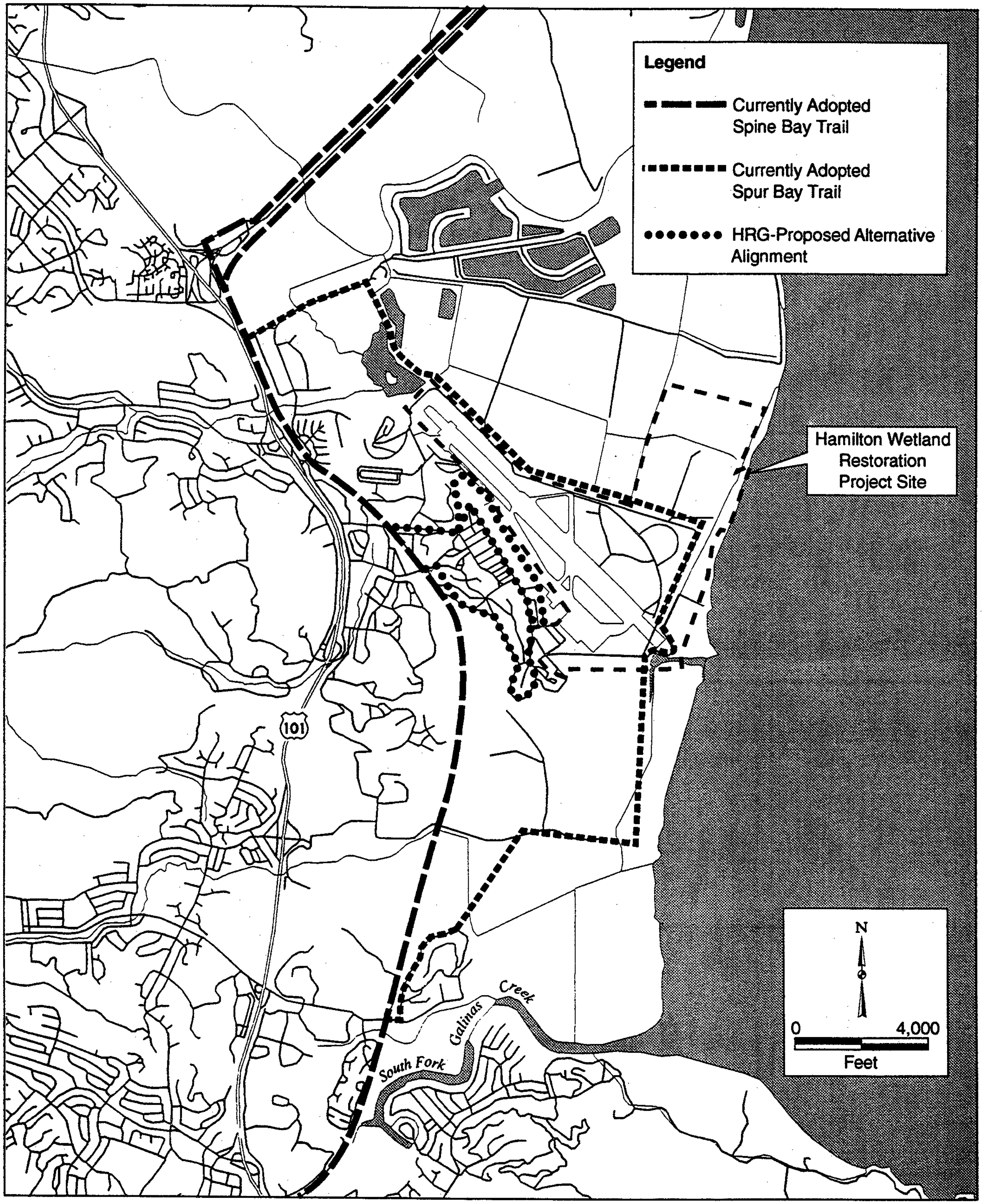

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Figure 9-2
Regional Location of the Proposed Bay Trail Project

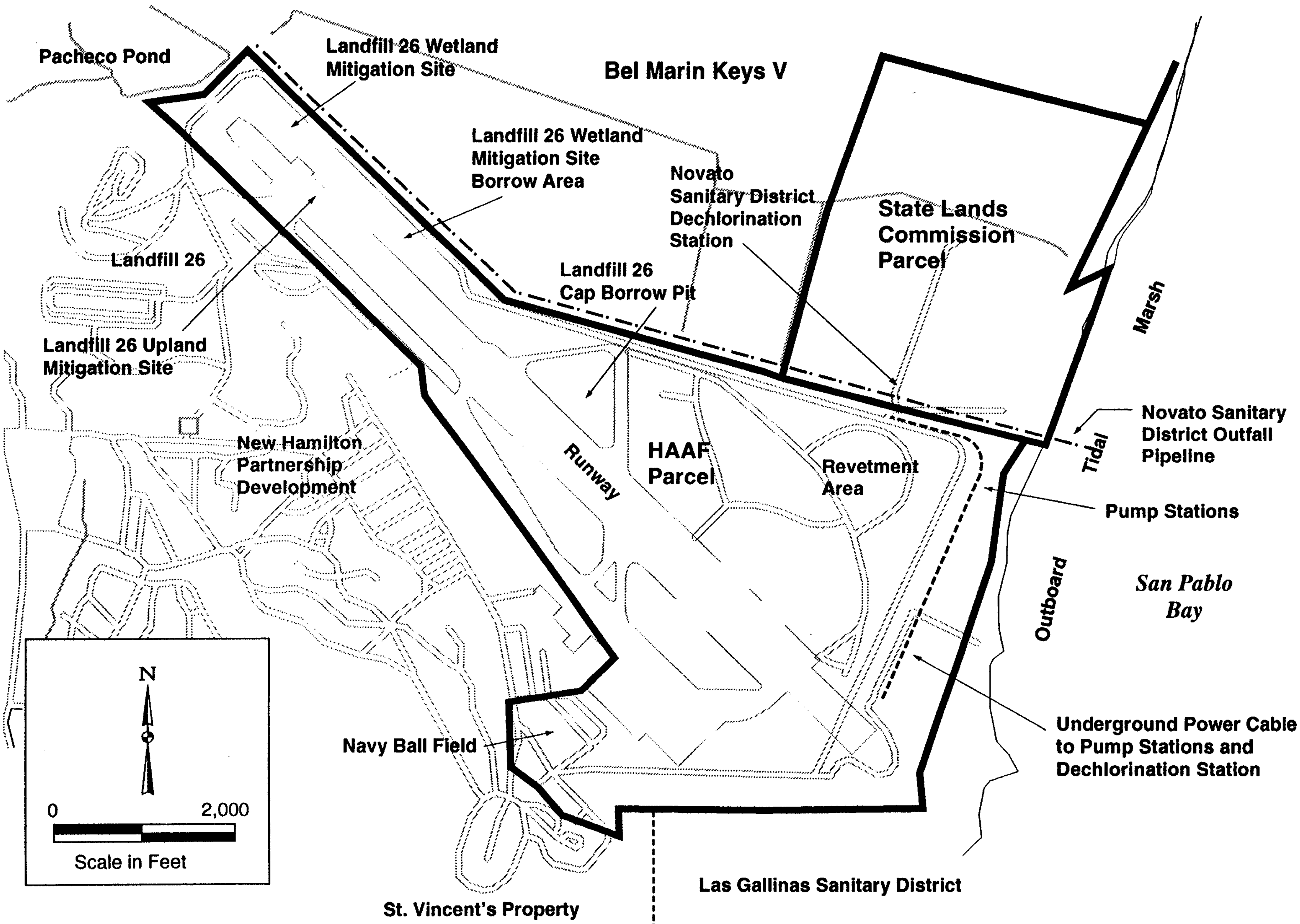

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Figure 9-3
Land Uses and Utilities in the Project Area

site. The borrow pit from which material was taken to cap Landfill 26 is a deep, triangular excavation with a surface area of approximately 13 acres.

Utilities. A drainage ditch runs along most of the perimeter levees except for the levee that separates the New Hamilton Partnership property from the HAAF parcel. Subdrainage pipes were installed throughout the HAAF parcel to assist in lowering the water table, and those pipes discharge to the perimeter drainage ditch.

Three pump stations operated by the Army are located near the northeastern corner of the HAAF parcel and discharge drainage from the perimeter ditch to the outboard tidal marsh. The pump stations include pumps, piping, and associated equipment. Pipes from adjacent properties also lead into the perimeter drainage system. Additional information regarding drainage facilities at the project site is provided in Chapter 5, "Surface Water Hydrology and Water Quality".

Pacific Gas and Electric Company (PG&E) provides electrical power to the HAAF parcel by means of a 60-kilovolt line from PG&E's substation and a small substation on the base. Power for the NSD dechlorination plant is provided by this system. An underground power line runs from a transformer at the HAAF pump stations through the outboard tidal marsh and then to NSD's dechlorination plant in the SLC parcel (Selfridge pers. comm.).

Easements and Requirements. As part of the BRAC process, the Army identified three easements on the HAAF parcel:

- Under Public Law 102-396, the New Hamilton Partnership holds an easement across the western edge of the HAAF parcel to maintain the flood control levee that separates the HAAF parcel from the New Hamilton Partnership development.
- The SLC has an easement across the HAAF parcel to maintain access to the SLC parcel. Although no official map of the easement exists, it is described as a 40-foot easement that extends from the entrance to the former Hamilton Air Force Base on Nave Drive to the SLC parcel. The easement follows existing roads.
- The NSD has an existing right of entry across HAAF to the dechlorination plant and associated facilities in the SLC parcel.

As described earlier, the Army has created a wetland mitigation site at the northern end of the airfield as compensation for the loss of wetlands that resulted during the closure of Landfill 26. The Army has indicated that the continued operation and maintenance of the wetland mitigation site would be a requirement of property transfer.

SLC Parcel

Land Uses. The SLC parcel (also known as the Antenna Field) was once an antenna installation for Hamilton Air Force Base. As part of the closure process at the air base, the antenna field was transferred to the SLC.

Antennas and associated cables are located in the area. Other facilities at the site include aboveground fuel tanks, transformers, target practice ranges previously used by the Novato Police Department, and burn pits. The need for environmental restoration of sites in the SLC parcel is currently being investigated by the Army under the Formerly Utilized Defense Sites program (described in more detail in Chapter 10).

Utilities. NSD operates a dechlorination plant located on the southern edge of the SLC parcel. Treated effluent is conveyed from the Ignacio Treatment Plant and the Novato Treatment Plant to the dechlorination plant through a 54-inch outfall force main located on the BMKV and SLC parcels, parallel to the HAAF perimeter levee. The treated effluent is dechlorinated and then discharged to San Pablo Bay. Power is supplied to the dechlorination plant through an underground power line that runs from a transformer at the perimeter ditch pump stations along the outboard tidal marsh. Water is brought to the dechlorination plant in trucks and is stored onsite.

Easements. ~~No known easements cross the SLC parcel.~~ The NSD has two 50-year easements on the SLC parcel. These include a 20-foot-wide easement for the outfall pipeline and an easement for the dechlorination plant.

Outboard Tidal Marsh

The HAAF and SLC parcels are separated from San Pablo Bay by a levee and a continuous area of pickleweed marsh. The project site contains approximately 66 acres of pickleweed marsh, including three perched ponds.

Land Uses adjacent to the Project Site

New Hamilton Partnership

Property located southwest of the HAAF parcel is owned by the New Hamilton Partnership (Figure ~~9-2~~ 9-3). A master plan for development of this property was approved by the City of Novato on June 22, 1993, and amended on June 28, 1994. The master plan approved the development of 750,000 square feet of offices, 75,000 square feet of retail space, and 845 residential units. Recently, the New Hamilton Partnership constructed a 100-year flood control levee in the HAAF parcel (between the New Hamilton Partnership development and the HAAF parcel) and has begun construction of the development.

St. Vincent's Landholdings/Las Gallinas Sanitary District

The Roman Catholic Archdiocese owns approximately 1,500 acres south and southwest of the HAAF parcel (Figure ~~9-2~~ 9-3). The area, known as the St. Vincent's property, is mostly undeveloped land used primarily for grazing and hay production. The Las Gallinas

Sanitary District owns a parcel southeast of the HAAF parcel and adjacent to the St. Vincent's property (Figure ~~9-2~~ 9-3).

Bel Marin Keys V

The BMKV parcel consists of approximately 1,610 acres north of the HAAF parcel and west of the SLC parcel (Figure ~~9-2~~ 9-3). In 1993, this property was proposed for development as a water-oriented, planned residential community. This development would be the last phase of the existing Bel Marin Keys community (Environmental Science Associates 1993). This proposed use of the site was not approved by the County of Marin. A new proposal for development has been submitted to the County of Marin. The current proposed project is similar in many ways to the prior project in that it consists of a water-oriented, planned residential community and golf course on approximately 1,610 acres. However, the previous project proposed a greater intensity of development on a larger portion of the site. The current proposed project is being processed by the County of Marin, and the site is currently used for agriculture.

Two major utility easements are known to cross the property. A 115-kilovolt power line crosses the property within a 40-foot-wide PG&E easement in the northwestern corner and the north-central portion of the area, adjacent to Novato Creek, and a 20-foot-wide NSD easement crosses the area along the outfall pipeline (Environmental Science Associates 1993).

Pacheco Pond

Pacheco Pond is located west of the northwest portion of the HAAF parcel. This 132-acre site is a flood control reservoir that receives flow from Pacheco Creek and San Jose Creek. Water from Pacheco Pond is discharged to Novato Creek. Additional information on Pacheco Pond is provided in Chapter 5, "Surface Water Hydrology and Water Quality".

Environmental Consequences and Mitigation Measures

Approach and Methods

Information related to land uses, utilities, and easements at the project site was reviewed and compared to the project alternatives to evaluate the potential for land use conflicts, disruption or loss of services provided by utilities, or conflicts with easements. Potential impacts were compared to the thresholds of significance described below to determine the level of significance of each impact.

Thresholds of Significance

According to Appendix G of the State CEQA Guidelines and professional criteria and judgment, a project is considered to have a significant impact on land use and public utilities if it would:

- conflict or be incompatible with the land use goals, objectives, or guidelines of applicable general plans;
- be inconsistent or conflict with statutes of the California Coastal Act or the land use goals, objectives, or policies of the BCDC or other applicable state agencies;
- substantially conflict with an existing onsite land use;
- substantially conflict with existing or future adjacent land uses; or
- result in the loss of an existing easement or service to existing facilities.

Impacts and Mitigation Measures of Alternative 1: No Action

Under Alternative 1, no wetland restoration would occur and HAAF would not be transferred from the Army. Site cleanup would continue, and maintenance and operation of the levee and drainage system would remain with the Army. Existing easements held by the SLC, New Hamilton Partnership, and NSD would remain in place. No impacts would occur in surrounding areas because the land uses in the HAAF and SLC parcels would not change. No impacts would occur as a result of loss of access to the SLC parcel and NSD facilities because access would continue to be provided across the HAAF parcel.

Impacts and Mitigation Measures Common to Alternatives 2, 3, 4, and 5

Impact 9.1: Consistency with Novato General Plan, San Francisco Bay Plan, and Hamilton Reuse Plan

The Novato General Plan and Hamilton Reuse Plan designate the project area for open space. The proposed action would be consistent with this land use designation because wetland restoration is an allowable use under this designation. The proposed action would also be consistent with the San Francisco Bay Plan because the plan identifies the land use of the project site as wetlands.

Impact 9.2: Compatibility with Bay Trail Alignment Plans

The plan for the Bay Trail indicates two possible alignments in the vicinity of the project site. The alignment for the Spine Bay Trail is located west of the New Hamilton Partnership development, not adjacent to the project site. The Spur Trail alignment is proposed for the outboard tidal marsh levee and the levee between the HAAF and SLC parcels. Construction of the portion of this alignment along the outboard levee would be infeasible under the proposed action because a portion of the levee would be breached and continuous access would not be provided. Because the plan acknowledges that ~~other trail alignments are available in the vicinity of the project~~ there are alternative locations for the Bay Trail that ensure continuous north/south connections, the proposed action would not affect the overall viability of the Bay Trail. In addition, the HRG's proposed alternative trail alignment would provide enhanced access to the western side of the wetland restoration project. The inability to implement the existing Spur Trail alignment in its entirety is considered less than significant and no mitigation is required.

Impact 9.3: Potential Loss of Maintenance Access to NSD Outfall Pipeline

The levee between the HAAF parcel and the BMKV and SLC parcels would be reconstructed. Reconstructing the levee could result in loss of access to the NSD outfall pipeline. However, as indicated in Chapter 3, "Project Alternatives under Consideration", access to the NSD outfall pipeline would continue to be provided. Because the Corps, Coastal Conservancy, or successors in interest would provide access, this impact is considered less than significant.

Impacts and Mitigation Measures Unique to Alternative 2

Impact 9.4: Compatibility with Adjacent Land Uses

Under Alternative 2, restored wetlands would be established in the HAAF parcel. Wetlands in this area would be adjacent to agricultural uses in the BMKV parcel and St. Vincent's property, commercial and residential development in the New Hamilton Partnership area, and open space in the SLC parcel. Restoring wetlands adjacent to these areas would not affect current or future land uses. Potential impacts on adjacent properties associated with seepage, flooding, mosquitos, and noise (addressed in other chapters of this EIR/EIS) are considered less than significant.

Impacts and Mitigation Measures Unique to Alternative 3

Impact 9.5: Compatibility with Adjacent Land Uses

The impact on adjacent land uses would be the same as described under Impact 9.4. This impact is considered less than significant and no mitigation is required.

Impact 9.6: Increased Light and Glare

The hydraulic off-loaders would be marked and lighted, consistent with U.S. Coast Guard regulations, to prevent navigational hazards to watercraft using the area at all times of the day and night. Lighted facilities would have a minor visual impact on views from the shoreline and from the bay. ~~The off-loading facility would be located as much as 34,000 feet offshore and would not~~ The shallow water off-loader would be located approximately 15,000 feet (2.8 miles) offshore, and the deep water off-loader would be located approximately 24,000 feet (4.5 miles) offshore. Neither off-loader would figure prominently in views from the shore; however, ~~it~~ the off-loaders would be obvious to users of this part of the bay, including recreational boaters, anglers, and sightseers. The continual lighting of the off-loading ~~facility~~ facilities for safety would create a negative visual focus during the night. However, on the basis of the distance of the lighted ~~facility~~ facilities from sensitive receptors and its temporary nature (construction phase only), this impact is considered less than significant and no mitigation is required.

Impacts and Mitigation Measures Unique to Alternative 4

Impact 9.7: Compatibility with Adjacent Land Uses

Under Alternative 4, restored wetlands would be established in the HAAF parcel. Wetlands in this area would be adjacent to agricultural uses in the BMKV parcel and St. Vincent's property, and commercial and residential development in the New Hamilton Partnership area. Restoring wetlands adjacent to these areas would not affect current or future land uses. Potential impacts on adjacent properties associated with seepage, flooding, mosquitos, and noise (addressed in other chapters of this EIR/EIS) are considered less than significant.

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Impacts and Mitigation Measures Unique to Alternative 5

Impact 9.8: Compatibility with Adjacent Land Uses

Impacts on adjacent land uses under Alternative 5 would be the same as described under Impact 9.7 for Alternative 4. This impact is considered less than significant and no mitigation is required.

Impact 9.9: Increased Light and Glare

Impacts associated with increased light and glare under Alternative 5 would be the same as described under Impact 9.6 for Alternative 3 except that the off-loaders would be in operation for a longer period. This impact is considered less than significant and no mitigation is required.

Potential Issues and Resolutions under the Bel Marin Keys V Scenario

Potential Issue: Consistency with Novato General Plan, Marin Countywide Plan, and San Francisco Bay Plan

As described under Impact 9.1, the proposed land uses in the HAAF and SLC parcels would be consistent with the land uses identified in the Novato General Plan and the San Francisco Bay Plan for the parcels. Additionally, the land use designation for the BMKV parcel in the Marin County General Plan is agriculture and conservation with a permitted residence of one unit per 2-10 acres (AGC 3).

Wetland restoration in the BMKV parcel is an allowable use under the AGC 3 designation. However, this land use designation requires concurrent preservation of agricultural land. This scenario would combine restoration of wetlands with agricultural demonstration or upland/agricultural uses~~. Although~~ ; however, the mix of restored wetlands with agricultural lands has not been determined~~; the~~. The restoration project is expected to be consistent with the AGC3 land use designation. The Marin County Board of Supervisors recently passed Resolution 98-114, which supports wetlands and/or agriculture for the site and states that the use of the BMKV parcel for these uses would be consistent with the adopted Marin Countywide Plan. A copy of the resolution is included in Appendix B.

Potential Issue: Loss of Agricultural Production

Portions of the 1,610-acre BMKV parcel are used for production of oat hay. Assuming the entire site is under production, conversion of the site to wetland use would result in the loss of agricultural production on an estimated 1,610 acres, representing approximately 55% of the 2,929 acres of harvested hay acreage in Marin County in 1996.

According to the soil survey of Marin County (U.S. Soil Conservation Service 1985), the Reyes soil comprising the site is a Class IV soil, indicating that it has a very severe limitation that reduces the choice of plants or requires special conservation practices. According to the description of this soil, the non-prime Reyes soil is suited to hay and pasture production. (U.S. Soil Conservation Service 1985.)

Based on the 1996 countywide production average of approximately 2.2 tons of hay per acre and an average production value of $59 per ton (Marin County Agricultural Commissioner's Office 1997), wetland use of the site would result in the estimated annual loss of 3,540 tons of hay production, valued at approximately $208,900. This loss would represent an estimated 55% of Marin County's $382,900 in hay production and 0.4% of the county's $56.4 million in total agricultural production in 1996.

The conversion of the BMKV parcel's non-prime agricultural land would not directly result in a major reduction in the value of countywide agricultural output. The potential loss of 55% of the county's hay production is not expected to have adverse secondary impacts on the economic health of the county's dairy sector, which depends heavily on regional hay production. The loss of the hay produced from the BMKV parcel could be offset by production from Sonoma County.

Potential Issue: Compatibility with Adjacent Land Uses

Under this scenario, restored wetlands would be established in the HAAF, SLC, and BMKV parcels. Wetlands in this area would be adjacent to agricultural uses of the St. Vincent's property and commercial and residential development in the New Hamilton Partnership area. Restoring wetlands adjacent to these areas would not affect current or future land uses. Potential effects on adjacent properties associated with seepage, flooding, mosquitos, and noise are considered to be less than significant. These effects are addressed in other chapters of this EIR/EIS.

Potential Issue: Increased Light and Glare

This scenario would have the same effect on light and glare as described under Impact 9.6. This potential issue is considered less than significant.

Potential Issue: Compatibility with Bay Trail Alignment Plans

This scenario would have the same effect on the Bay Trail as described under Impact 9.2. This potential issue is considered less than significant.

Potential Issue: Potential Damage and Loss of Maintenance Access to Utility Line in Bel Marin Keys V Parcel

This scenario would result in the inundation of the BMKV parcel. Inundation could result in potential damage and loss of maintenance access to the utility line that crosses the BMKV parcel. This potential issue could be considered significant. A potential resolution to this issue is described below.

Resolution: Assess Potential for Maintenance or Relocation of Utility Crossing of Bel Marin Keys V Parcel. The Coastal Conservancy, Corps, or successors in interest shall assess the potential for maintaining the utility line easement in the BMKV parcel and incorporate access into the design plan for the parcel. In addition, the Coast Conservancy will coordinate with PG&E to determine methods to ensure that the power line is not damaged by inundation or placement of dredged materials. In the event that providing access for maintenance or modifications is not feasible, the Coastal Conservancy, Corps, or successors in interest will ensure that an alternative utility easement is provided.

Chapter 10. Hazardous Substances, Waste, and Site Remediation

Affected Environment

Data Sources

The information presented in this section is based on existing data and previous reports that apply to the proposed Hamilton wetland restoration site. Descriptions of hazardous materials investigations or cleanup are limited to areas of concern within the HAAF and SLC parcels. Possible sources of introduced hazardous substances from fill materials are also described.

DoD is preparing assessments for cleanup activities at HAAF through the Corps Sacramento District. The Corps has prepared and is preparing environmental assessments (EAs) for area-specific remediation plans.

DoD is also responsible for investigating and remediating toxic or hazardous substances in the SLC parcel through the Defense Environmental Restoration Program for Formerly Used Defense Sites (FUDS) (10 USC 2701 et seq.). Investigation and remediation activities are being performed through the Corps, and a draft work plan for investigation of known sites was ~~expected to be~~ submitted to regulatory agencies ~~in early June~~ on September 11, 1998. The field investigation is anticipated during mid-July 1998 (Call pers. comm.).

The primary sources of information about the HAAF parcel are the following:

- Comprehensive Remedial Investigation Report, BRAC Property, Hamilton Army Airfield, Novato, CA (U.S. Army Corps of Engineers 1998c) and
- Site Investigation Work Plan and Contractor Quality Control Sampling and Analysis Plan, North Antenna Field, General Services Administration, Hamilton Army Airfield, Novato, CA (IT Corporation 1998).

The primary source of information regarding potential introduction of hazardous substances from dredged materials, aside from the draft Hamilton Wetlands Conceptual Restoration Plan (Woodward-Clyde Consultants 1998), was the Oakland Harbor

Navigation Improvement (50-Foot) Project Draft Feasibility Study and EIR/EIS (U.S. Army Corps of Engineers and Port of Oakland 1998a, 1998b, 1998c, 1998d, and 1998e).

Regulatory Overview

Several federal and state agencies have regulations that govern the use, generation, transport, and disposal of hazardous substances. The principal federal regulatory agency is EPA. The primary state agency in California with similar authority and responsibility is the California Environmental Protection Agency (Cal-EPA), which may delegate enforcement authority to other local agencies that have agreements with Cal-EPA. Federal regulations applicable to hazardous substances are contained primarily in Titles 29, 40, and 49 of the Code of Federal Regulations (CFR). State regulations have been consolidated into CCR Title 26.

This subsection describes the governing agencies responsible for oversight and cleanup of hazardous substances at the HAAF and SLC sites and for determining the suitability of dredged material for use in wetland restoration at the project site.

HAAF Parcel

The identification, decontamination, and disposal of hazardous waste at HAAF is regulated by the Resource Conservation and Recovery Act (RCRA); Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA); CCR Titles 22 and 23; and all applicable or relevant appropriate requirements (ARARs). The Army is responsible for the cleanup process and is doing so with funding provided through BRAC (U.S. Public Law 100-526). Cal-EPA is the lead agency for regulatory enforcement and oversight of those cleanup activities; however, the Army also must submit findings to EPA and the San Francisco Bay RWQCB.

Any transfer of property must be accompanied by a Finding of Suitability for Transfer (FOST) issued by the Army. A FOST is issued when a property has been determined to be environmentally suitable for transfer. CERCLA Section 120(h)(3) identifies the requirements for environmental suitability.

Regardless of the assessment and cleanup methods used by the Army, the ultimate condition of contaminated areas of HAAF must comply with regulatory cleanup levels established on the basis of the reuse plan for the property. Under certain circumstances, a Finding of Suitability for Transfer can be issued for a property with ongoing remediation of previous contamination when CERCLA Section 120(h)(3) requirements have been met, the proposed land use (e.g., wetlands) is compatible with the environmental condition of the property, no additional public or environmental health risk exists, and issuing such a finding does not interfere with ongoing actions.

The BRAC parcel at HAAF is not on the National Priorities List of contaminated sites requiring cleanup. A decision was made to pursue a programmatic approach for ~~fast-track~~ cleanup based on EPA's Guidance on Conducting Time-Critical Removal Actions under CERCLA (U.S. Army Corps of Engineers 1998b). Non-contiguous sites (outparcels) that have been contaminated primarily by petroleum products will be cleaned up using a process recommended by the State Water Quality Control Board for the implementation of corrective action plans (CAPs) (23 CCR Chapter 16).

~~The BRAC parcel will be cleaned up under a fast-track sequence of regulatory phases.~~ The Army identified the nature and extent of contamination at the BRAC parcel during a series of assessments and investigations culminating in the Comprehensive Remedial Investigation Report (U.S. Army Corps of Engineers 1998c). Based on those investigations, site-specific removal actions during 1998 and 1999 will be used to clean up contamination to preliminary screening levels recommended by oversight regulatory agencies. A combination of confirmatory sampling, toxicity testing, and ecological and human health risk assessments will provide information used to determine final cleanup goals (remedial action objectives) in a focused feasibility study during 1999. It is intended that all remedial action required to meet those goals will be completed during the removal and confirmatory stages of fieldwork, leading to an environmental Record of Decision that does not require further work.

SLC Parcel

The SLC parcel was owned by the Air Force and was operated as part of Hamilton Air Force Base until 1974. While the base was in active use by the Air Force, the parcel was used for a variety of purposes, including a rifle range, a pistol range, skeet shooting, fire-fighting training, and as a communication facility with a number of large antennae. Following the decommissioning of Hamilton Air Force Base, the State of California acquired the parcel and leased a portion of the rifle range to the City of Novato Police Department for small arms training.

Because ownership of the SLC parcel was transferred from DoD in 1974, environmental cleanup falls under the Formerly Used Defense Site (FUDS) program. The FUDS program, an element of the Defense Environmental Restoration program (DERP) (10 USC 2701 et seq.), requires remediation of contaminated sites consistent with CERCLA. The objective of the FUDS program is to reduce, in a timely, cost-effective manner, the risk to human health, safety, and the environment resulting from past DoD activities. Apportionment of liability for contamination associated with the subsequent property owner, or third parties, is addressed through the Potentially Responsible Party (PRP) component of the DERP FUDS process. The goal of the PRP process is to negotiate a fair and equitable settlement that represents DoD's responsibility for contamination at a property.

The SLC parcel is currently in the preliminary assessment/site investigation portion of the CERCLA process. This investigation includes the rifle range, which is a PRP site. Subsequent investigation of the SLC parcel will be conducted, if necessary, during a remedial investigation. It is currently planned to adopt remedial cleanup values developed for the HAAF parcel because of the similarity in contaminants, geology, and anticipated future land use. An interim removal action is planned at the conclusion of the site investigation. This interim removal action will include the rifle range if PRP negotiations have resulted in a settlement. After a Record of Decision is agreed to by DoD and federal and state regulators, any remaining cleanup will be conducted.

Chemical Suitability of Dredged Material

In the San Francisco Bay region, a consortium of regulatory agencies has been established to address the long-term management of disposal of dredged materials from the bay. The LTMS Agencies, comprising the Corps, EPA, Cal-EPA, the San Francisco Bay RWQCB, BCDC, and SLC, have established a Dredged Material Management Office (DMMO) that evaluates dredged materials and makes recommendations on their chemical and biological suitability for reuse in wetlands based on testing specific to the proposed site environment, using criteria from federal and state laws and guidance documents.

Regional testing guidelines for dredged material are provided by the LTMS Agencies in Public Notice 93-2, Testing Guidelines for Dredged Material Disposal at San Francisco Bay Sites, issued by the Corps' San Francisco District. RWQCB criteria for determining the chemical suitability of dredged material for use in tidal and seasonal wetland restoration projects, upland habitat creation, and other upland uses are contained in Interim Sediment Screening Criteria and Testing Requirements for Wetland Creation and Upland Beneficial Reuse (Wolfenden and Carlin 1992).

Source Areas of Hazardous Substances and Waste

This subsection describes the areas where previous operations or activities generated hazardous wastes at portions of the HAAF and the SLC parcels that are within the proposed Hamilton wetland restoration area. The contaminants identified and the current remedial status of the sites are described. This subsection also describes the quality of dredged sediments from various locations that have been proposed as source areas for fill material to create the wetlands under Alternative 3 or 5.

Hamilton Army Air Field

The type and source of contamination at each site and the status of investigation and remediation activities are summarized in Table 10-1. (U.S. Army Corps of Engineers 1998c.)

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Table 10-1.
Summary of Contaminated Areas at HAAF within the Proposed Wetland Restoration Area

Site Name/ Former Use	Identified Contaminants	Status
Airfield UST/AST sites	TPH-ext, BTEX, PNAs, lead, PCBs	Tanks removed, soil removal in 1998
Aircraft maintenance and storage facility (AMSF)	TPH-ext, BTEX, PNAs, lead, PCBs, VOCs	Transformer and soil removal in 1998
Former transformer sites	PCBs, TPH-ext	Transformers removed, pad and soil removal in 1998
Former sewage treatment plant (FSTP)	TPH-ext, BTEX, PNAs, VOCs, PCBs, pesticides, metals	Treatment units removed, remove soils, decommission pipelines in 1999
Pump station area UST/AST-6,7	TPH-ext, BTEX, lead, PNAs	UST removed, ASTs in use, soil removal in 1999
Former boat dock levee transformer	PCBs	Pad and soil removal in 1998
East levee generator/AST pad	TPH-ext, PCBs, metals	Generator and tanks removed, pad and soil removal in 1998
East levee construction debris disposal area burn pit	TPH-ext, BTEX, lead, PNAs, PCBs, pesticides	Soil removal, habitat mitagation in 1999
Coastal salt marsh sediment	Lead, PCBs, PNAs, TPH-ext, pesticides	Toxicity testig in 1998, sediment removal and habitat mitigation in 1999
Perimeter drainage ditch sediments (PDD) and ditch maintenance spoils piles	PNAs, PCBs, metals, pesticides, herbicides	Sediment and spoils removal in 1998
Revetment area turnouts	Metals, PNAs, TPH-ext	Toxicity testing, risk management decision in 1998
Revetment burn area	PCBs, TPH-ext, TPH-purg, PNAs	Pavement and soil removal in 1998
Onshore fuel line	TPH-ext, BTEX, PNAs	Fuel line removed, risk management decisions in 1998

Notes:
AST = aboveground storage tank.
SVOC = semivolatile organic compound.
BTEX = benzene, toluene, ethylbenzene, and xylenes.
TPH = total petroleum hydrocarbons.
MEK = methyl ethyl ketone.
VOC = volatile organic compound.
PCB = polychlorinated biphenyl.
PNA = polynuclear aromatic hydrocarbons.

Source: U.S. Army Corps of Engineers 1996a.

SLC Parcel

Assessment and investigation of the potential contamination in the SLC parcel has yet to be performed. Based on information provided by the Corps, potentially contaminated sites include a rifle range, a former firefighting facility, a pistol range, a night firing range, transformers, miscellaneous aboveground fuel storage tanks and underground storage tanks (USTs), and several unexploded grenades (unexploded ordnance) are present on this parcel (Call pers. comm.).

Sediment Quality

An estimated 5,000–40,000 tons of contaminants, comprising at least 65 types of materials, are deposited in San Francisco Bay annually. These contaminants include trace elements such as copper, nickel, silver, zinc, and synthetic organic compounds (e.g., organochlorine pesticides, polychlorinated biphenyls [PCBs], and polynuclear aromatic hydrocarbons). The contaminants originate with numerous industrial, agricultural, natural, and domestic activities and reach the estuary through various means, such as river flow, storm drains, discharges from maritime vessels, and disposal of dredged materials. Many persistent contaminants become bound to particulate matter and accumulate in areas of sediment deposition. Once these contaminants enter the bay and estuary, their fate is determined by a combination of physical, chemical, and biological processes (U.S. Army Corps of Engineers 1994b).

The processes of dredging and disposing of dredged materials in San Francisco Bay or in nonaquatic environments such as the proposed project site may disturb and redistribute contaminants that have been buried or otherwise sequestered in the sediments. These contaminants, once disturbed, may become biologically available in sediments and water at the site and exert toxic effects upon organisms that come in contact with them. The behavior of contaminants associated with sediments is difficult to predict but is influenced by temperature, amount of oxygen available, degree of acidity, sediment organic carbon content, salinity, and biological activity. The specific characteristics of each environment in which sediments are deposited will determine the mobility and toxicity of the contaminants and, in turn, the way in which those contaminants can affect organisms.

It is not possible to identify the specific dredged materials that would be deposited at the proposed project site. However, the following potential sources of dredged material have been identified:

- routine maintenance dredging projects,
- Port of Oakland 50-foot project,
- Concord Naval Weapons Station deepening,
- Southhampton Shoal deepening, and
- Redwood City Harbor deepening.

~~Each dredging project requires a dredging permit, and the quality of sediments is reviewed as part of each permit application by the RWQCB, EPA, and, for nonfederal projects, the Corps. Sufficient data are available to identify, in general terms, the chemical constituents that may be present in dredged sediments from the various potential source locations around the bay. (U.S. Army Corps of Engineers 1994b.)~~

As stated previously, the suitability of dredged material for the project site will be determined through the existing testing and suitability framework used by the state and federal agencies charged with approving disposal of material dredged from San Francisco Bay through the DMMO. The agencies require dredging project applicants to sample and test sediments proposed to be dredged for chemical constituents of concern and for toxicity, using protocols acceptable to the agencies. The adequacy of the sampling and testing is evaluated by the DMMO, which then reviews the test results to evaluate the acceptability of the dredged material for disposal at proposed sites in the bay, ocean, wetland, or upland environments.

To aid in determining the suitability of dredged material for use in wetland environments, the RWQCB has developed guidelines, known as the Wolfenden and Carlin guidelines (Wolfenden and Carlin 1992), that identify acceptable contaminant levels for use in wetland projects. The DMMO will use these guidelines to assess any dredged material proposed for use at the project site. Although the Wolfenden and Carlin document specifies slightly differing guidelines for "cover" material (which can be used anywhere in a wetland) and "noncover" material (which needs to be properly buried), only material appropriate for "cover" as determined by the DMMO will be accepted for use at the project site. Separate tests for contaminant leaching are used to evaluate the acceptability of material for upland disposal. Only material found suitable by the DMMO will be used as part of the upland components of the project.

Environmental Consequences and Mitigation Measures

Approach and Methods

The approach and methods used to evaluate hazardous substances, waste, and site remediation consisted of reviewing available reports regarding contaminants present at the site. In addition, data were reviewed regarding contaminant concentrations in potential dredged material proposed for reuse at the site. Potential impacts on public health from the release of onsite or imported contaminants were reviewed, including an assessment of toxicity and potential exposure pathways.

PA-01 0647

Thresholds of Significance

According to Appendix G of the State CEQA Guidelines, professional criteria and judgment, and applicable regulations and plans, the wetland restoration project could result in a significant impact if it would:

- create a potential public health hazard or
- involve the release of onsite contaminants or imported contaminants that pose a hazard to human, animal, or plant populations in the area affected.

Impacts and Mitigation Measures of Alternative 1: No Action

No new impacts related to hazardous waste would occur under Alternative 1. Regardless of final disposition of the proposed project site, identification, decontamination, and disposal of hazardous waste must be performed by DoD in accordance with all appropriate local, state, and federal regulations. The required level of remediation, however, may vary based on the selected final use of the project area.

No impacts associated with sediment quality would occur because no dredged material would be imported onto the HAAF or SLC parcels.

Impacts and Mitigation Measures Common to Alternatives 2, 3, 4, and 5

Impact 10.1: Potential Exposure of Humans, Plants, or Wildlife to Contaminants as a Result of Remediation Activities for the Proposed Action

The Army is required to perform appropriate cleanup of all hazardous waste sites located in the HAAF and SLC parcels in accordance with RCRA, CERCLA, CCR Titles 22 and 23, and all ARARs. Cal-EPA is the lead agency for regulatory enforcement and oversight of cleanup activities; however, the Army also must submit findings to EPA and the RWQCB.

Regardless of the assessment and cleanup methods used by the Army, the ultimate condition of contaminated areas at HAAF must meet regulatory cleanup requirements established in the reuse plan for the property. The Army is currently performing remedial activities at HAAF, with wetlands the presumptive future use (Eberline and Zianno pers. comms.). Under certain conditions, the property may be suitable for transfer as wetlands with ongoing remediation of previous contamination. However, these conditions include the stipulation that no additional public or environmental health risk exists.

The SLC parcel is regulated under the FUDS program. The Army is required to investigate and remediate identified toxic or hazardous substances to reduce the risk of exposure to humans and prevent ecological degradation.

Because of the cleanup requirements discussed above, the potential to expose humans, plants, and wildlife to contaminants is considered less than significant.

Impacts and Mitigation Measures Unique to Alternative 2

No impacts and mitigation measures are unique to Alternative 2.

Impacts and Mitigation Measures Unique to Alternative 3

Impact 10.2: Potential Exposure of Humans, Plants, or Wildlife to Hazardous Chemicals Contained in Dredged Material Used as Fill Material

The process of dredging material from various sources and placing these materials to expedite creation of wetlands may disturb and redistribute contaminants that have been buried or otherwise sequestered in the sediments. These contaminants, once disturbed, may become biologically available in sediments and water while being deposited at the site and may exert toxic effects on organisms that come in contact with them. Extensive sediment screening will be conducted in accordance with the interim screening criteria for sediment established by the RWQCB in 1992. These sediment screening and testing requirements were developed specifically for projects using sediments for "wetlands and upland beneficial reuse".

Two types of material may be placed at upland/bayland sites and used for wetland creation or restoration, based generally on the concentration of particular contaminants and the results of bioassays:

- ✦ **Cover sediments** are those that would pass leaching and bioassay tests and contain certain contaminants at concentrations less than those specified in the RWQCB's interim screening criteria. The interim screening criteria are shown in Table 10-2 and compared to average levels of the same contaminants in the bay. Cover material must comply with the RWQCB's criteria for aquatic, wetland, and upland disposal. Cover material can be used in wetland creation and restoration areas, for levee construction, and for covering noncover material.

- ✦ **Noncover sediments** are those that pass leaching tests and have contaminant concentrations that exceed criteria for cover material, but do not exceed the less-stringent criteria for noncover material. Noncover material must be covered on the top and sides by a minimum of 3 feet of cover material or material native to the site.

Table 10-2.
Interim Screening Criteria

Constituent	Nonaquatic Criteria[a]		San Francisco Bay Reference Sediments[b]
	Noncover (mg µg/kg)	Cover (mg µg/kg)	Average (Range) (mg µg/kg)
Arsenic (As)	85 - 33	<33	--
Cadmium (Cd)	9 - 5	<5	0.25 (0.12 - 0.74)
Chromium (Cr)	300 - 220	<220	76 (61 - 87)
Copper (Cu)	390 - 90	<90	45 (22 - 124)
Lead (Pb)	110 - 50	<90	39 (8 - 110)
Mercury (Hg)	1.3 - 0.35	<0.35	--
Nickel (Ni)	200 - 140	<140	76 (62 - 90)
Selenium (Se)	1.4 - 0.7	<0.7	--
Silver (Ag)	2.2 - 1.0	<1.0	0.60 (0.10 - 1.16)
Zinc (Zn)	270 - 160	<160	112 (77 - 137)
PCBs	0.4 - 0.05	<0.05	--
Pesticides (Total DDT)	0.1 - 0.003	<0.003	--
PAHs (Total)	35 - 4	<4	--
PAHs (lmw)	NA		--
PAHs (hmw)			--

Notes: µg = microgram.
kg = kilogram.
PAHs = polynuclear aromatic hydrocarbons.
lmw = low molecular weight.
hmw = high molecular weight.

The reference sediment levels are baywide combined averages and ranges based on data from fall 1991 in dry weather.

[a] Source: Wolfenden and Carlin 1992.

[b] Source: Taberski and Carlin 1992.

Because the proposed Hamilton wetland restoration project would make use of only cover-quality dredged material that satisfies the interim cover criteria, this impact is considered less than significant and no mitigation is required. Noncover sediments are not proposed to be used.

Impacts and Mitigation Measures Unique to Alternative 4

No impacts and mitigation measures are unique to Alternative 4.

Impacts and Mitigation Measures Unique to Alternative 5

Impacts and mitigation measures under Alternative 5 are the same as those described for Alternative 3.

Potential Issues and Resolutions under the Bel Marin Keys V Scenario

Potential issues and resolutions under the BMKV Scenario are similar to the impacts and mitigation measures common to Alternatives 2, 3, 4, and 5 and those unique to Alternative 3.

Chapter 11. Transportation

Affected Environment

Data Sources

Information from the Hamilton Army Airfield Disposal and Reuse EIS (U.S. Army Corps of Engineers 1996a) and the Oakland Harbor Navigation Improvement Project (U.S. Army Corps of Engineers and Port of Oakland 1998e) was used to prepare this analysis.

Roadway Network

Regional Access

Regional access to the HAAF, SLC, and BMKV parcels is provided by U.S. Highway 101 and State Route 37. U.S. Highway 101 is a principal north-south freeway connecting HAAF to Sonoma County to the north and San Francisco Bay Area to the south. State Route 37 extends east from U.S. Highway 101 in Novato to Interstate 80 in Vallejo. Figure 11-1 identifies major roadways in the project area.

Access to Project Area

Access to the HAAF parcel is currently provided by Ignacio Boulevard, Alameda del Prado, Nave Drive, Main Gate Road, and State Access Road. All vehicles traveling to and from HAAF currently use Nave Drive. This road is a two-lane facility extending north from Alameda del Prado to the U.S. Highway 101 interchange at Ignacio Boulevard. Nave Drive connects to Main Gate Road and State Access Road, which provide access to HAAF.

A permanent access route would be established over a proposed easement connecting Nave Drive with the HAAF parcel (Figure 3-3). This easement would be the primary access route to the restoration site for construction and maintenance purposes.

No public roads are present in the HAAF parcel. Access around the area is provided by Perimeter Road. The number of trips made to the HAAF parcel is unknown; however, the area is not open to the public. Access to the SLC parcel is provided by a legally deeded access easement across HAAF. Although no official map of the easement exists, it is described as a 40-foot easement that extends from the entrance of HAAF to the SLC property adjacent to the bay over existing roads, including Main Gate Road, Palm Drive, Hangar Avenue, and Perimeter Road.

Access to the BMKV parcel is provided by Ignacio Boulevard and Bel Marin Keys Boulevard. No public roadways exist within the BMKV parcel. The existing private roads are used primarily for agricultural operations.

Existing Levels of Service

The existing level of service (LOS) for each critical intersection in the project area has been estimated, ranging from A to E during a.m. and p.m. peak hours (Table 11-1). The LOS for existing peak-hour freeway operations is estimated to range from D to E/F on U.S. Highway 101 and is estimated at B on State Route 37 between U.S. Highway 101 and Atherton Avenue (Table 11-2).

Vessel Transportation

Regional commercial vessel traffic in San Pablo Bay is restricted to the San Pablo Strait Channel Regulated Navigation Area established by the U.S. Coast Guard. This channel delineates the only area where the water depths are sufficient to allow the safe transit of large vessels through San Pablo Bay.

Regional noncommercial vessel traffic, including recreational use, occurs in the western portion of San Pablo Bay. The Petaluma River navigation channel is located east of the hydraulic off-loader sites. Nearby recreational boat access points include a boat launch ramp at Black Point approximately 4 miles north, the Port Sonoma Marina approximately 4 miles north, Novato Creek approximately 3 miles north, Las Gallinas Creek approximately 3 miles south, and China Camp State Park approximately 4 miles south.

Environmental Consequences and Mitigation Measures

This section discloses impacts on transportation associated with construction and operation of each project alternative. Impacts associated with transporting materials from the dredge site to the hydraulic off-loaders have been evaluated as part of other environmental documentation for the Oakland Harbor navigation improvement project (U.S. Army Corps of Engineers and Port of Oakland 1998a, 1998b, 1998c, and 1998d). The document concluded that transporting dredged material by barge would not result in a significant impact on transportation.

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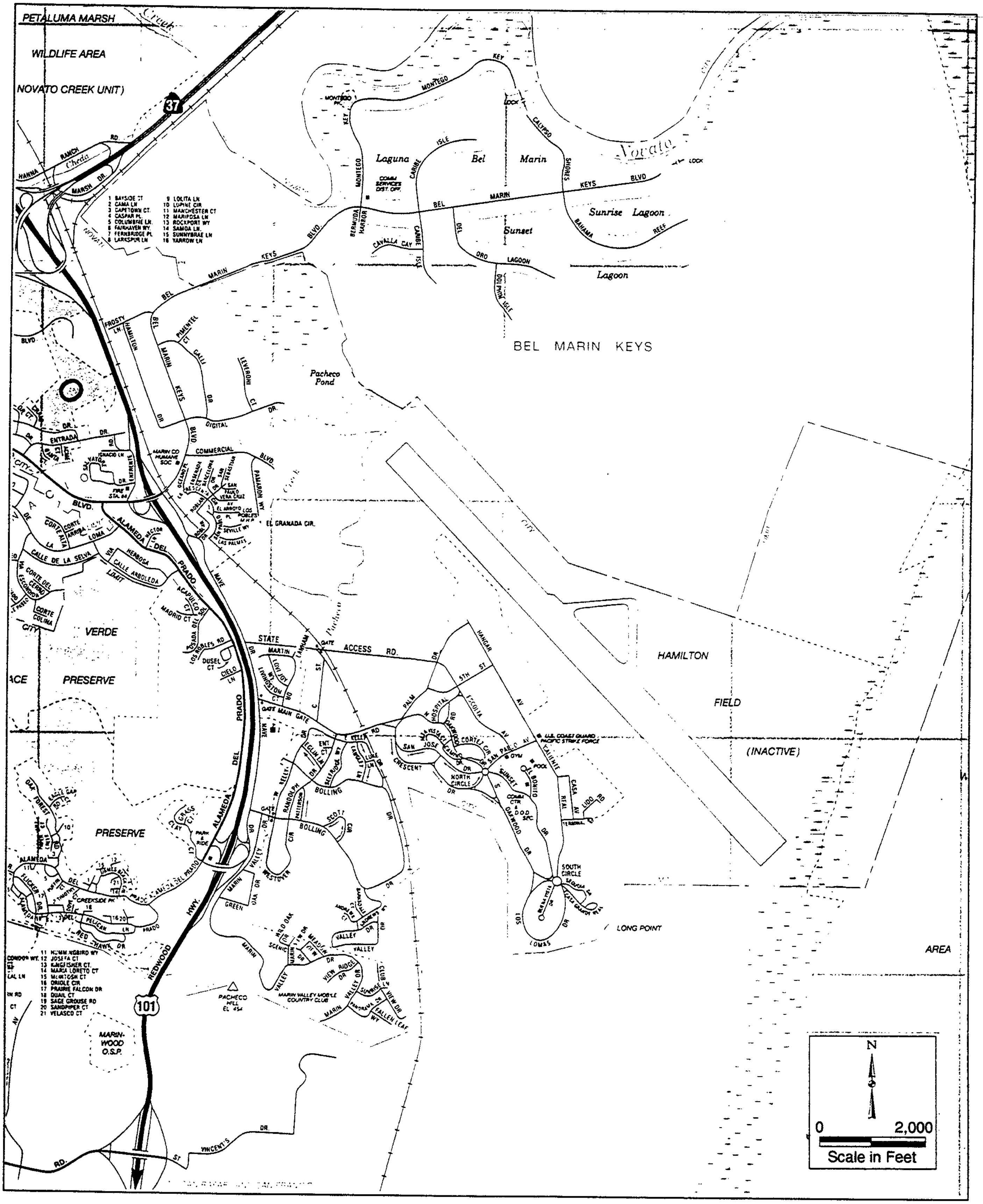

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Figure 11-1
Transportation Network in the Project Area

Table II-I.
Summary of Intersection Levels of Service and Peak-Hour Freeway Operations under Alternatives 2-5

Intersection	LOS A.M.	LOS P.M.
1. Ignacio Boulevard/U.S. Highway 101 southbound ramps	D	C
2. Ignacio Boulevard/U.S. Highway 101 northbound on-ramp	B	D
3. Nave Drive/U.S. Highway 101 northbound off-ramp	B	D
4. Nave Drive/State Access Road	A	D
5. Nave Drive/Main Gate Road	C	D
6. Nave Drive/U.S. Highway 101 northbound ramps	A	A
7. Alameda del Prado/Clay Court	C	C
8. Alameda del Prado/U.S. Highway 101 southbound ramps	A	A

Note: The capacity analysis for cumulative conditions was based on the roadway network improvements developed for the Hamilton Field Project. These improvements include modifications to the U.S. Highway 101/Ignacio Boulevard interchange, addition of lanes to some of the critical intersections, and signalization of the unsignalized intersections.

Source: U.S. Army Corps of Engineers 1996a.

Table II-2.
Year 2010 Freeway Capacity

Freeway Segment	Capacity Each Direction	Year 2010 Peak Direction			
		A.M. Southbound		P.M. Northbound	
		Volume	LOS	Volume	LOS
U.S. Highway 101 - Lucas Valley Rd. to Miller Creek Rd.	7,200	8,540	F	7,750	F
U.S. Highway 101 - Miller Creek Rd. to Alameda del Prado	8,100	8,660	F	7,870	E
U.S. Highway 101 - Alameda del Prado to Ignacio Blvd.	7,200	8,020	F	7,600	F
U.S. Highway 101 - Ignacio Blvd. to State Route 37	8,100	8,880	F	9,080	F
U.S. Highway 101 - State Route 37 to Rowland Blvd.	5,400	6,360	F	6,470	F
U.S. Highway 101 - Rowland Blvd. to De Long Ave.	5,400	5,280	E	5,550	F
U.S. Highway 101 - De Long Ave. to Atherton Ave.	5,400	6,370	F	6,130	F
U.S. Highway 101 - Atherton Ave. to Marin/Sonoma County line	4,400	5,100	F	5,230	F
State Route 37 - U.S. Highway 101 to Atherton Ave.	3,600	3,010	D	2,750	C

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Approach and Methods

The wetland restoration project could result in impacts associated with construction, operation, and maintenance of the project site. Construction-related impacts could result from trips to and from the project site made by construction workers and from installation and operation of the hydraulic off-loaders and piping. Operation and maintenance impacts could occur as a result of trips made to the site by caretakers, researchers, or visitors.

Assigning LOS is a quantitative method for describing traffic conditions on intersections and road segments. LOS ranges from A (uncongested) to F (totally congested). This evaluation is based on the traffic model used by the Army in the Hamilton Army Airfield Disposal and Reuse EIS (U.S. Army Corps of Engineers 1996a) to evaluate the impacts of different reuse scenarios on roadway LOS in the project area. (The model was first developed to evaluate buildout of the New Hamilton Partnership development.) This model predicted the LOS for eight intersections in the project area and nine major highway segments (eight segments of U.S. Highway 101 and one segment of State Route 37). The results of the analysis of no-action conditions from the HAAF disposal and reuse EIS were used to characterize conditions under Alternative 1: No Action for this project because that scenario represents buildout of the New Hamilton Partnership project combined with no reuse of the HAAF or SLC parcel.

The total number of daily trips generated during the construction phase of the restoration project was based on the equipment estimated to be needed during the construction phase of the project, especially while levees would be constructed. Based on the number of pieces of construction equipment needed, construction of the project was estimated to result in an increase of approximately 38 daily vehicle trips to the project site, including 15 trips each during the morning and evening commute period and eight during the lunch hour. The methods and assumptions used to arrive at this estimate are described in Appendix E.

Although the restoration project does not include a formal public recreation component, visitation by the public would be allowed after construction is completed. Public use would be restricted to the New Hamilton Partnership flood control levee. Trips associated with public use and operation and maintenance of the project are expected to be minimal and are not expected to affect circulation patterns or capacity at nearby intersections or roadway segments.

Thresholds of Significance

According to Appendix G of the State CEQA Guidelines, a project will normally have a significant impact on the environment if it would result in an increase in traffic that is substantial in relation to the existing traffic load and capacity of the street system. Impacts on shipping and recreational boating were considered significant if the project would restrict navigation or create a navigational hazard.

Impacts and Mitigation Measures of Alternative 1: No Action

Under Alternative 1: No Action, no wetland restoration would occur. The project site would not be transferred to the Coastal Conservancy, and the Army would maintain ownership of the HAAF parcel and continue to clean up the site. No impacts on LOS at important intersections and roadway segments would be expected because no activities associated with wetland restoration or other reuse activities would occur.

Impacts and Mitigation Measures Common to Alternatives 2, 3, 4, and 5

Impact 11.1: Change in LOS at Important Intersections and Roadway Segments during Construction Phase

As indicated under "Approach and Methods" above, restoration of wetlands at the project site is estimated to increase the number of vehicle trips to the project site by 38 per day under Alternatives 2-5. Based on the LOS for intersections and roadway segments shown in Table 11-1, the daily increase in traffic would not change LOS on freeway segments or important intersections. Because the minimal increase in daily traffic is not expected to result in a change in LOS, the impact on transportation under Alternatives 2-5 is considered less than significant and no mitigation is required.

Impact 11.2: Change in LOS at Important Intersections and Roadway Segments during Operation Phase

During the operation phase of the proposed project under Alternatives 2-5, trips to the HAAF and SLC parcels would increase slightly compared to conditions under Alternative 1. Most of the additional trips would relate to maintenance and monitoring activities. The number of daily trips cannot be estimated accurately; however, traffic is expected to be greatly reduced from levels expected during the construction phase. The number of additional trips attributable to maintenance and monitoring would be extremely small compared to the volume of traffic at important intersections and roadway segments under Alternative 1 (Table 11-1). The impact on circulation attributable to project operation is considered less than significant because the LOS at roadway segments and intersections is not expected to change. No mitigation is required.

Impacts and Mitigation Measures Unique to Alternative 3

Impact 11.3: Disruption of Vessel Transportation in San Pablo Bay by Hydraulic Off-Loaders and Pipes during Construction Phase

Installing and operating the hydraulic off-loaders and piping could result in impacts on vessel transportation. Installation and use of the hydraulic off-loaders would not result in a conflict with vessel transportation in the area because the hydraulic off-loaders would not be located within established navigation routes and the project sponsor would be required by the U.S. Coast Guard to properly mark and light the off-loaders to prevent navigational hazards to watercraft using the area at all times of the day and night. The piping would be submerged and would not present a navigational hazard during or after installation.

The U.S. Coast Guard publishes specific "rules of the nautical road" that govern dredging operations in inland waterways. Specific markings on and lighting of dredging equipment allow mariners to readily recognize the operations and maneuver appropriately. These specific rules for marking equipment apply to the dredge site and the equipment used to transport dredged material associated with the proposed project (i.e., hydraulic off-loaders and pipes). The dredging contractor would be required to adhere to these requirements. Because established navigation routes would not be disrupted and facilities would be marked and lighted consistent with existing regulations, the impact on vessel transportation under Alternative 3 is considered less than significant and no mitigation is required.

Impacts and Mitigation Measures Unique to Alternative 4

No impacts and mitigation measures would be unique to Alternative 4.

Impacts and Mitigation Measures Unique to Alternative 5

The impact on vessel transportation during the construction phase of Alternative 5 would be the same as that described for Alternative 3 under Impact 11.3. This impact is considered less than significant and no mitigation is required.

Potential Issues and Resolutions under the Bel Marin Keys V Scenario

Potential Issue: Change in LOS at Important Intersections and Roadway Segments during Construction Phase

The effect on transportation during the construction phase of the BMKV Scenario would be similar to that described for Alternatives 2-5 under Impact 11.1. This effect would not be considered significant.

Potential Issue: Change in LOS at Important Intersections and Roadway Segments during Operation Phase

The effect on transportation during the operation phase of the BMKV Scenario would be similar to that described for Alternatives 2-5 under Impact 11.2. This effect is not considered significant.

Potential Issue: Disruption of Vessel Transportation in San Pablo Bay by Hydraulic Off-Loader and Pipes during Construction Phase

The effect on transportation during the operation phase of the BMKV Scenario would be similar to that described for Alternatives 3 and 5 under Impact 11.3. This effect is not considered significant.

PA-01 0663

Chapter 12. Air Quality

Affected Environment

Data Sources

The following information on affected environment for air quality is based on previously published information. The Hamilton Army Airfield disposal and reuse EIS (U.S. Army Corps of Engineers 1996a) provided the basis for this section. The Bay Area Air Quality Management District's (BAAQMD's) guidelines for assessing air quality impacts were used to evaluate the environmental effects of the project and the alternatives (Bay Area Air Quality Management District 1996).

Regional Climate

The concentration of a given pollutant in the atmosphere is determined by the amount of pollutant released and the atmosphere's ability to transport and dilute the pollutant. The major determinants of air pollution transport and dilution are wind, atmospheric stability, terrain, and insolation.

In Novato, the topography is generally flat and elevation is less than 100 feet above sea level. The project area is characterized by warm, dry summers and cool, moist winters.

Figure 12-1 shows the wind rose for a meteorological station located at HAAF. The wind rose shows the percentage of time wind blows in each direction and the mean wind speed by direction. Annually, the predominant wind direction is from the northwest. During spring and fall, the predominant direction is from the west-northwest. The predominant wind direction is from the east-southeast during summer and from the north-northwest during winter. Mean wind speeds range from 5 to 10 miles per hour, and calm winds occur 31.3% of the time. (California Air Resources Board 1984.)

Federal and State Ambient Air Quality Standards

California and the federal government have each established ambient air quality standards for several pollutants (Table 12-1). For some pollutants, separate standards have been set for different time periods. Most standards have been set to protect public health; however, for some pollutants, standards have been based on other values, such as protection of crops, protection of materials, or avoidance of nuisance conditions.

The air pollutants of greatest concern in the project area are carbon monoxide (CO), ozone, and inhalable particulate matter less than 10 microns in diameter (PM10). A mildly toxic pollutant, CO interferes with oxygen transport to body tissues. The major effects of ozone (a component of photochemical smog) include reductions in plant growth and crop yield, chemical deterioration of various materials, irritation of the respiratory system, and eye irritation. Particulate matter can be responsible for a wide range of pollution effects, including visibility reduction, respiratory irritation, corrosion of structures and materials, and economic effects related to soiling of materials.

Existing Air Quality Conditions

The existing air quality conditions in the project area can be characterized by monitoring data collected in the region. PM10, CO, and ozone concentrations are measured at several north bay monitoring stations. Recent monitoring data are presented in Table 12-2.

The closest PM10 air quality monitoring station is in San Rafael. This station has recorded exceedances of the California PM10 24-hour standard (50 micrograms per cubic meter [$\mu g/m^3$]) during each year of the monitoring data.

The closest CO air quality monitoring stations are in San Rafael and Santa Rosa. These stations have recorded no violations of the CO standards during the recent years of monitoring.

The closest ozone air quality monitoring stations are in San Rafael and Santa Rosa. These air quality monitoring stations have recorded no exceedances of the ozone standard during the four most recent years of available data.

Emission Sources

Ozone precursor and CO emissions stem primarily from vehicle traffic associated with urban development. A variety of emission sources contribute to PM10 problems in the area. Major contributors to particulate matter problems include dust generated by agricultural activities, resuspended by vehicle traffic, and generated by construction and demolition and aerosols formed by photochemical smog reactions.

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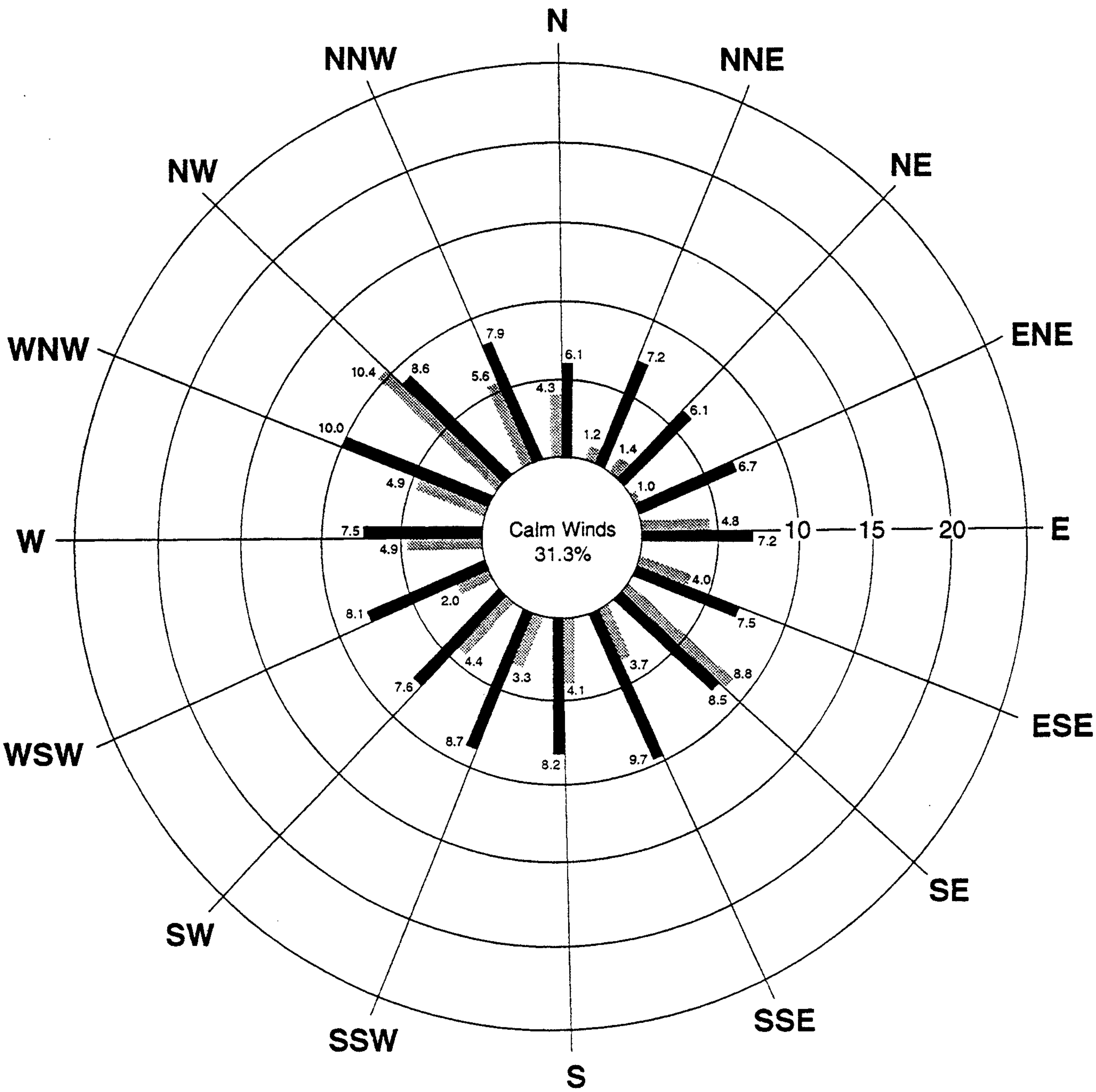

LEGEND

Based on 278,159 hourly observations from 1939 to 1970 at Hamilton Army Force Base

Percent by direction
Mean wind speed (mph)

Source: California Air Resources Board 1984.

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Figure 12-1
Wind Rose Depicting Average Wind Speed and Directional Frequency at Hamilton Army Airfield

Table 12-1.
Ambient Air Quality Standards Applicable in California

Pollutant	Symbol	Average Time	Standard, as parts per million		Standard, as micrograms per cubic meter		Violation Criteria	
			California	National	California	National	California	National
Ozone	O_3	8 hours[a]	N/A	0.08	N/A	160	N/A	If 3-year average of annual third-highest daily 8-hour maximum exceeds standard
		1 hour	0.09	0.12	180	235	If exceeded	If exceeded on more than 3 days in 3 years
Carbon monoxide	CO	8 hours	9.0	9	10,000	10,000	If exceeded	If exceeded on more than 1 day per year
		1 hour	20	35	23,000	40,000	If exceeded	If exceeded on more than 1 day per year
Nitrogen dioxide	NO_2	Annual average	N/A	0.053	N/A	100	N/A	If exceeded
		1 hour	0.25	N/A	470	N/A	If exceeded	N/A
Sulfur dioxide	SO_2	Annual average	N/A	0.03	N/A	80	N/A	If exceeded
		24 hours	0.04	0.14	105	365	If exceeded	If exceeded on more than 1 day per year
		1 hour	0.25	N/A	655	N/A	N/A	N/A
Inhalable particulate matter	PM10	Annual geometric mean	N/A	N/A	30	N/A	If exceeded	N/A
		Annual arithmetic mean	N/A	N/A	N/A	50	N/A	If exceeded
		24 hours	N/A	N/A	50	150	N/A	If exceeded on more than 1 day per year
	PM2.5	Annual arithmetic mean[a]	N/A	N/A	N/A	15	N/A	If spatial average exceeded on more than 3 days in 3 years
		24 hours[a]	N/A	N/A	N/A	65	N/A	If exceeds 98th percentile of concentrations in a year

Notes: All standards are based on measurements at 25°C and 1 atmosphere pressure.
National standards shown are the primary (health effects) standards.
N/A = not applicable.

[a] New standards effective July 1997. Eight-hour ozone standard replaces 1-hour standard after compliance with the 1-hour standard has been attained.

Table 12-2.
Summary of Air Quality Monitoring Data Collected near Hamilton Army Airfield

Monitoring Station	Parameter	Federal Standard	California Standard	Year 1992	1993	1994	1995
PM10 ($\mu g/m^3$)							
San Rafael	Annual geometric mean	50 $\mu g/m^3$	30 $\mu g/m^3$	22.0	21.3	21.6	19.2
	24 hours - 2nd highest	150 $\mu g/m^3$	50 $\mu g/m^3$	58	45	72	48
Carbon monoxide (ppm)							
Santa Rosa	Peak-hour value	30 ppm	20 ppm	6	6	5	5
	Peak 8-hour value	9 ppm	9 ppm	4.0	3.8	3.5	2.8
	Days above standard[a]			0	0	0	0
San Rafael	Peak-hour value	30 ppm	20 ppm	8	9	6	6
	Peak 8-hour value	9 ppm	9 ppm	5.0	4.0	3.0	3.3
	Days above standard			0	0	0	0
Ozone (ppm)							
Santa Rosa	1-hour maximum	0.12 ppm	0.09 ppm	0.08	0.08	0.08	0.10
	Hours above standard[b]			0	0	0	1
San Rafael	1-hour maximum	0.12 ppm	0.09 ppm	0.07	0.08	0.09	0.09
	Hours above standard			0	0	0	0

[a] Days above standard means days with 1 or more exceedances of the 8-hour CO standard.
[b] Hours above standard means number of hours with exceedances above the California ozone standard.

Source: California Air Resources Board 1993.

PA-01 0669

Attainment/Nonattainment Status

The San Francisco Bay Area Air Basin (SFBAAB) includes San Francisco; portions of Sonoma and Solano Counties; and all of San Mateo, Santa Clara, Alameda, Contra Costa, Marin, and Napa Counties.

The SFBAAB is currently classified as a nonattainment area for the state PM10 standards and for the state and federal ozone standards. The SFBAAB is an attainment area for the federal PM10 standards and for the state and federal CO, nitrogen dioxide (NO_2) and sulfur dioxide (SO_2) standards. Attainment designations are made for individual pollutants, such as NO_2 and SO_2. These should not be confused with generic terms, such as oxides of nitrogen (NO_x) and oxides of sulfur (SO_x), which describe groups of pollutants.

The BAAQMD, which has primary air quality responsibilities within the SFBAAB, had asked EPA to redesignate the entire SFBAAB as an attainment area for ozone based on monitoring data from the mid-1990s. However, based on recent monitoring data, EPA has designated the SFBAAB as a nonattainment area for ozone.

Air Quality Management Programs

Air pollution control programs were established in California prior to the enactment of federal requirements. Federal Clean Air Act legislation in the 1970s resulted in a gradual merger of local and federal air quality programs, particularly industrial source air quality permit programs. Development of air quality management planning programs during the past decade has generally been in response to requirements established by the federal Clean Air Act. Enactment of the California Clean Air Act in 1988 and the federal Clean Air Act Amendments of 1990 has produced additional changes in the structure and administration of air quality management programs.

The California Clean Air Act requires preparation of an air quality attainment plan for areas that violate state air quality standards for CO, SO_2, NO_2, or ozone. No locally prepared attainment plans are required for areas that violate the state PM10 standards. The California Air Resources Board addresses PM10 attainment issues in California Air Quality Data (California Air Resources Board 1993).

Air pollution problems in the San Francisco Bay Area are primarily the result of locally generated emissions. The San Francisco Bay Area, however, has been identified as a source of ozone-precursor emissions that occasionally contribute to air quality problems in the Monterey Bay area, the northern San Joaquin Valley, and the southern Sacramento Valley. Consequently, air quality planning for the San Francisco Bay Area must not only correct local air pollution problems, but must also reduce the Bay Area's impact on downwind air basins.

In 1997, the BAAQMD released its current Clean Air Plan and Triennial Assessment, which it prepared in cooperation with the Association of Bay Area Governments and the Metropolitan Transportation Commission (Bay Area Air Quality Management District 1997). The plan, which was approved by the BAAQMD Board of Directors in December 1997, addresses ozone problems in the Bay Area.

Monitoring data show that the SFBAAB from the mid-1990s was meeting the federal CO and ozone standards. Consequently, the BAAQMD had asked EPA to redesignate the SFBAAB as an attainment area for ozone. However, the BAAQMD now violates the federal and state zone standard; thus, EPA has classified the Bay Area as a ozone nonattainment area.

General Conformity

As required by the 1990 Federal Clean Air Act Amendments, EPA enacted two separate federal conformity rules. Those rules (incorporated as Section 40 CFR Parts 51 and 93) are designed to ensure that federal actions do not cause or contribute to air quality violations in areas that do not meet the national ambient air quality standards. The two rules include transportation conformity, which applies to transportation plans, programs, and projects, and general conformity, which applies to all other nontransportation-related projects.

The proposed wetland restoration project would be subject to the general conformity rule because the Corps is participating in the project.

A general conformity determination is required by Section 40 CFR Part 51, Subpart W, and Part 93, Subpart B. The general conformity regulation requires that federal agencies sponsoring nontransportation-related activities show that the emissions associated with those activities conform to state implementation plans (SIPs) if emissions meet specific criteria. First, the emissions must occur in areas designated as nonattainment areas for one or more of the federal ambient air quality standards. Second, those emissions must exceed certain de minimis threshold levels.

Currently, the SFBAAB, which includes Marin County, is classified as a moderate federal nonattainment area for ozone. Ozone is an indirectly generated pollutant that results when the ozone precursors NO_x and reactive organic gases (ROG) form in the atmosphere in the presence of sunlight. Because ozone is not a directly emitted pollutant, EPA has, in its general conformity regulations, set *de minimis* levels for ozone precursors rather than for ozone. From a conformity standpoint, areas classified as moderate ozone nonattainment areas are exempt from conformity if emissions of ROG are less than 50 tons per year and emissions of NO_x are less than 100 tons per year.

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Environmental Consequences and Mitigation Measures

Approach and Methods

Analytical Methods

The BAAQMD's approach to analysis of construction impacts is to emphasize implementation of effective and comprehensive control measures rather than detailed quantification of emissions (Bay Area Air Quality Management District 1996). However, because of the requirement to prepare a general conformity analysis as required by EPA and BAAQMD, a quantitative evaluation of ozone precursors was conducted.

Impact Mechanisms

Operation. At full function, the proposed wetlands would generate air emissions related to visitor use and maintenance activities. Because visitor use and maintenance activities would be limited, impacts on air emissions would be considered less than significant.

Construction Period. Construction of the proposed action may generate significant air emissions. Construction-related emissions are generally short term but may still cause adverse air quality impacts. Fine particulate matter (PM10) is the pollutant of greatest concern with respect to construction activities. PM10 emissions can result from a variety of construction activities, including excavation, grading, demolition, vehicle travel on paved and unpaved roads, and emission of vehicle and equipment exhaust. Construction-related emissions of PM10 can vary greatly depending on the level of activity, the specific operations taking place, the equipment being operated, local soils, weather conditions and other factors. Construction-related emissions can cause substantial increases in localized concentrations of PM10. Particulate emissions from construction activities can lead to adverse health effects, as well as nuisance concerns such as reduced visibility and soiling of exposed surfaces. (Bay Area Air Quality Management District 1996.)

In addition, PM10 emissions could increase between the time dredged materials are placed on the site and the time the bayward levee is breached. PM10 could be generated as the dredged material dries.

Construction equipment emits CO and ozone precursors. However, these emissions are included in the emission inventory that is the basis for the regional air quality plans. Construction activities are not expected to impede attainment or maintenance of ozone and CO standards in the Bay Area (Bay Area Air Quality Management District 1996). Project impacts on CO are assumed to be less than significant and are not evaluated further. Ozone precursors are evaluated in the general conformity analysis.

Operation of the hydraulic off-loaders and supplemental pipeline booster pumps would not contribute to construction-related emissions of CO or ozone precursors because the off-loaders and pumps would be electric-powered. Therefore, operation of the hydraulic off-loaders and booster pumps was not evaluated in the following impact analysis.

Thresholds of Significance

According to the BAAQMD guidelines and professional judgment, a project is considered to have a significant impact air quality if it would allow uncontrolled emissions of PM10. In addition, EPA and BAAQMD conformity thresholds state that emissions exceeding 50 tons ROG per year or 100 tons NO_x per year would result in a significant impact.

Impacts and Mitigation Measures of Alternative 1: No Action

Under Alternative 1, the HAAF parcel would remain under Army ownership and the existing uses of the SLC parcel are expected to continue. Because no changes in activities are expected under Alternative 1, no change in PM10, CO, or ozone precursors would occur.

Impacts and Mitigation Measures Common to Alternatives 2, 3, 4, and 5

All air quality impacts of Alternatives 2, 3, 4, and 5 are common to all four alternatives.

Impact 12.1: Construction-Related Emissions of PM10

As described under "Impact Mechanisms", implementation of the proposed action would result in PM10 emissions from mass grading and levee and training berm construction. This impact would be considered significant. To reduce this impact to a less-than-significant level, the construction contractor shall implement Mitigation Measure 12.1.

Mitigation Measure 12.1: Control PM10 Emissions in Accordance with BAAQMD Standards. The BAAQMD guidelines identify feasible control measures for construction emissions of PM10. The following list of measures was developed from the BAAQMD master list based on an understanding of the project:

a. Water all active construction areas at least twice daily.

b. Apply water three times daily or apply nontoxic soil stabilizers on all unpaved access roads, parking areas, and staging areas.

c. Sweep daily (with water sweepers) all paved access roads, parking areas, and staging areas.

d. Sweep streets daily (with water sweeper) if visible soil material is carried onto adjacent public streets.

e. Hydroseed or apply (nontoxic) soil stabilizers to inactive construction areas (previously graded areas inactive for 10 days or more).

f. Water twice daily or apply (nontoxic) soil stabilizers to exposed stockpiles.

g. Limit traffic speeds on unpaved roads to 15 miles per hour (mph).

h. Revegetate disturbed areas as soon as possible.

i. Suspend excavation and grading activity when winds (instantaneous gusts) exceed 25 mph.

Impact 12.2: Construction-Related Emissions of Ozone Precursors

The wetland creation project would generate air emissions of 3 tons per year of ROG and 41 tons per year of NO_x, which are less than the *de minimis* threshold levels for ozone precursors. These emission estimates are based on the vehicle activity described in Appendix E. Consequently, the proposed wetland restoration project is exempt from the requirement to conduct additional in-depth conformity analyses.

Potential Issues and Resolutions under the Bel Marin Keys V Scenario

Potential Issue: Construction-Related Emissions of PM10

As described under "Impact Mechanisms", implementation of the proposed action would result in PM10 emissions from grading and other earthworking activities. This potential issue would be considered significant. A potential resolution to this issue would be similar to Mitigation Measure 12.1.

Chapter 13. Noise

Affected Environment

Data Sources

The Hamilton Army Airfield disposal and reuse EIS (U.S. Army Corps of Engineers 1996a) provided the basis for this discussion.

Noise-Sensitive Receptors in the Project Vicinity

Land uses with residences, hospitals, libraries, recreation areas, and other similar uses are generally considered to be sensitive to noise. The existing noise-sensitive uses in the project area are:

- the New Hamilton Partnership commercial and residential development located adjacent to the HAAF parcel and proposed access route and
- existing Bel Marin Keys development located north of the HAAF and SLC parcels.

Existing Noise Conditions

Existing noise conditions near the project areas are governed primarily by the distance from and the amount of traffic on the local roadways. Roadways in the project area include U.S. Highway 101, Nave Drive, Bel Marin Keys Boulevard, Ignacio Boulevard, Main Gate Road, and State Access Road. Existing noise levels were estimated for the Hamilton Army Airfield disposal and reuse EIS, with traffic noise levels determined using the Federal Highway Administration Traffic Noise Prediction Model (FHWA-77-RD-108). Table 13-1 presents the traffic noise level (day-night average sound level [L_{dn}], the average sound exposure over a 24-hour period), expressed in decibels (dB) at a distance of 100 feet from the centerline of the roadway. Distances to the 70-, 65-, and 60-dB-L_{dn} traffic noise contours are also summarized in Table 13-1. The results indicate that U.S. Highway 101 is the dominant source of traffic noise in the project area.

Existing traffic noise at the sensitive receptors described previously has been estimated based on the traffic noise results presented in Table 13-1. The traffic noise at each receptor area varies depending on the proximity of the area to U.S. Highway 101 (Table 13-2). The existing noise levels at the New Hamilton Partnership development and BMKV is 45–50 dB-L_{dn}.

Noise Standards and Regulation

Various federal, state, and local agencies have developed guidelines for evaluating land use compatibility under different sound-level ranges. The following sections summarize those guidelines.

Federal Guidelines

The federal Noise Control Act of 1972 established a requirement that all federal agencies administer their programs to promote an environment free of noise that jeopardizes public health or welfare. EPA was given the responsibility for:

- providing information to the public regarding identifiable effects of noise on public health or welfare,
- publishing information on the levels of environmental noise that will protect public health and welfare within an adequate margin of safety,
- coordinate federal research and activities related to noise control, and
- establish federal noise emission standards for selected products distributed in interstate commerce.

EPA identified indoor and outdoor noise limits to protect against effects on public health and welfare. Outdoor limits of 55 dB-L_{dn} and indoor limits of 45 dB-L_{dn} are identified as desirable to protect against speech interference and sleep disturbance for residential areas and areas with educational and healthcare facilities.

The U.S. Department of Housing and Urban Development has established guidelines for evaluating noise impacts on residential projects. Sites are generally considered acceptable if they are exposed to outdoor noise levels of 65 dB-L_{dn} or less, normally unacceptable if they are exposed to levels of 65–75 dB-L_{dn}, and unacceptable if exposed to levels of 75 dB-L_{dn} or greater.

Table 13-1.
Summary of Traffic Noise Modeling for Existing Conditions

Roadway	Segment	L_{dn} at 100 feet from Roadway Centerline	Distance (in feet) from Centerline of Roadway to L_{dn} Contour Line for Existing Conditions		
			70 L_{dn}	65 L_{dn}	60 L_{dn}
U.S. Highway 101 (without soundwall)		77	305	658	1,418
U.S. Highway 101 (with soundwall)[a]		72	142	305	658
Nave Drive	U.S. Highway 101 on-ramps to Bolling Drive	58	–[b]	–[b]	76
	Bolling Drive to Main Gate Road	59	–[b]	–[b]	80
	Main Gate Road to State Access Road	59	–[b]	–[b]	89
	State Access Road to northbound U.S. Highway 101 off-ramp	60	–[b]	–[b]	106
	U.S. Highway 101 off-ramp to Ignacio Boulevard	63	–[b]	72	155
Bel Marin Keys Boulevard	U.S. Highway 101 to Digital Drive	66	54	116	249
Ignacio Boulevard	Freeway ramps to Alameda Del Prado	64	–[b]	90	194
	West of Alameda Del Prado	64	–[b]	83	178
Alameda Del Prado	Ignacio Boulevard to Clay Court	60	–[b]	–[b]	96
	South of Clay Court	58	–[b]	–[b]	69
Bolling Drive	East of Nave Drive	53	–[b]	–[b]	32
Main Gate Road	East of Nave Drive	53	–[b]	–[b]	33
State Access Road	East of Nave Drive	52	–[b]	–[b]	28

[a] A soundwall is located on the east side of the freeway between State Access Road and Main Gate Road and reduces noise by about 5 dB.

[b] Contour line does not extend beyond the edge of the roadway.

Table 13-2. Estimated Noise near a Construction Site

Distance Attenuation		Distance to dBA Contours	
Distance to Receptor (feet)	Sound Level at Receptor (dBA)	Sound Level at Contour (dBA)	Distance to Contour (feet)
50	94	95	45
100	88	90	79
200	82	85	138
400	75	80	240
600	72	75	417
800	69	70	736
1,000	67	65	1,115
1,500	62	60	1,918
2,000	59	55	2,902
2,500	56	50	4,006
3,000	54	45	5,365
4,000	50	40	7,407
5,280	46	35	8,074
7,500	39	30	8,801

The following assumptions were used:

Basic sound level dropoff rate:	6.0
Atmospheric absorption coefficient:	0.5
Reference noise level:	94
Distance for reference noise level:	50

Notes:

Calculations include the effects of atmospheric absorption at at a dropoff rate of 0.5 dB/100 meters. The effects of local shielding from buildings and topography are not included and will substantially reduce sound levels.

Except for sounds with highly distinctive tonal characteristics, noise from a particular source will not be identifiable when its level is substantially less than background noise levels.

State Guidelines

In 1987, the California Department of Health Services published guidelines for the noise elements of local general plans. These guidelines include a sound level/land use compatibility chart that categorizes various outdoor L_{dn} ranges by land use. These guidelines identify the normally acceptable range for low-density residential uses as less than 65 dB and conditionally acceptable levels as 55–70 dB.

Local Guidelines

The Marin County Noise Element was adopted in 1994. The noise element also provides guidelines for noise exposure levels at certain types of land uses. The guidelines state that residential, public, and institutional uses should not be subjected to noise levels above 60 dB-L_{dn}.

The City of Novato General Plan states that the compatibility standard of 60 dB-L_{dn} is to be applied to residential areas.

Environmental Consequences and Mitigation Measures

Approach and Methods

Analytical Methods

Noise impacts were evaluated by comparison of anticipated noise levels with reference noise levels developed by EPA, the distances to sensitive noise receptors, and local noise guidelines. Noise levels were measured in A-weighted decibels (dBA), a composite frequency-weighting scheme that approximates the way the human ear responds to sound levels.

Impact Mechanisms

Implementation of the Hamilton wetland restoration project would require the use of heavy construction equipment. Figure 13-1 illustrates the noise levels produced by various types of construction equipment. Properly maintained equipment will produce noise levels near the middle of the indicated ranges. Activities such as levee and berm construction and offloading and placing dredged materials may occur throughout the project area, depending on the alternative. The types of construction equipment used for earthmoving typically generate noise levels of 70–90 dBA at a distance of 50 feet when the equipment is operating. Electric-powered pumps used to off-load dredged material generate considerably less noise than the 70-82 dBA typically generated by pumps powered by internal combustion engines (Figure 13-1).

Construction equipment operations can vary from intermittent to fairly continuous use, with multiple pieces of equipment operating concurrently. A worst-case construction scenario may consist of concurrent operation of a bulldozer (87 dBA), a backhoe (90 dBA), a grader (90 dBA) and a front loader (82 dBA) in the same general area. Peak construction-period noise from this combination of equipment would be about 94 dBA from the construction site.

Table 13-2 summarizes noise levels as a function of distance from an active construction site with the previously described equipment in operation. Episodes of noise levels greater than 60 dBA will occasionally occur at locations within about 1,900 feet of a construction site. Episodes of noise levels greater than 70 dBA will occur at areas within about 750 feet of a construction site.

Visitor traffic along roadways to site access points may also increase noise levels. However, it is expected that visitor traffic will be substantially less than that of active recreation parks (e.g., ball fields, equestrian facilities). It is likely that there will be no measurable increase in noise levels at sensitive receptors along roadways leading to the site.

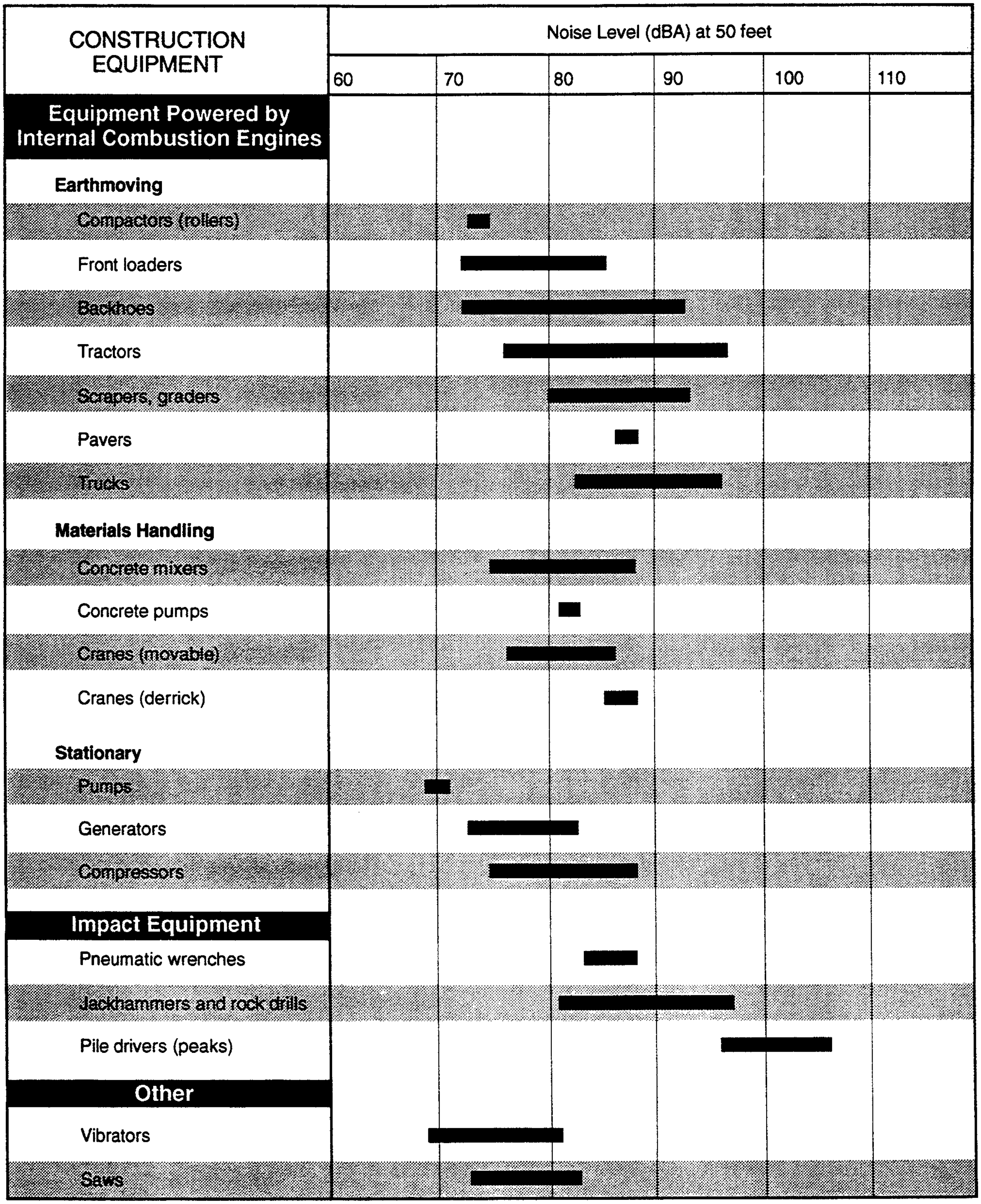
Thresholds of Significance

According to the State CEQA Guidelines and professional judgment, a project is considered to have a significant impact on noise if it would:

- increase noise levels to 60 dBA or
- increase noise levels by 3 dBA in areas where noise levels already exceed 60 dBA.

Impacts and Mitigation Measures of Alternative I: No Action

Under Alternative 1, the HAAF parcel would be placed in caretaker status and uses of the SLC parcel would not change. Because cleanup activities on the HAAF parcel would be completed, noise generated by these activities would decrease.



Source: U.S. Environmental Protection Agency 1971.

Jones & Stokes Associates, Inc.

Figure 13-1
Construction Equipment Noise Ranges

Impacts and Mitigation Measures Common to Alternatives 2, 3, 4, and 5

Impact 13.1: Potential Increases in Traffic Noise Levels

Implementation of the project would result in increases in traffic associated with construction and operation of the restoration site. As indicated in Chapter 11, "Transportation", most traffic to the site would be routed over the proposed access route through the GSA sale parcel (Figure 3-4). Because materials for levee construction are available onsite, traffic generated during the construction phase would consist primarily of workers commuting to the site. The low number of daily trips (38) is not expected to affect noise conditions in the area crossed by the proposed access easement. The impact on sensitive noise receptors as a result of increased traffic during the construction phase is considered less than significant.

After the construction phase of the restoration project is completed, traffic to the site would consist of trips made for maintenance and monitoring purposes and trips made by visitors. Trips made for maintenance and monitoring purposes would be infrequent and would not affect postconstruction noise levels. Visitors to the site would be restricted to the New Hamilton Partnership flood control levee and probably would travel to the site over existing roadways. Although no formal recreation use plan has been developed for the site, the number of trips made for recreational purposes is not expected to substantially increase traffic through the New Hamilton Partnership development. The slight increase in traffic is not expected to affect noise levels in the New Hamilton Partnership development. The impact on sensitive noise receptors as a result of increased traffic over the postconstruction phase is considered less than significant.

Impact 13.2: Temporary Increases in Noise Levels to More Than 60 dBA during Construction

As described in "Impact Mechanisms", implementation of the proposed action would result in noise levels exceeding 60 dBA at distances up to 1,900 feet from grading and other earthworking activities. Sensitive noise receptors include the New Hamilton Partnership property and wildlife areas at Pacheco Pond/Ignacio Reservoir. Although temporary, this impact would be considered significant. To reduce this impact to a less-than-significant level, the construction contractor shall implement Mitigation Measure 13.2.

Mitigation Measure 13.2: Employ Noise-Reducing Construction Practices. To reduce noise levels to the maximum extent practicable, the wetland construction contractor shall employ the following noise-reducing construction practices:

- Restrict construction within 1,000 feet of residences to daytime hours. No construction shall be performed within 1,000 feet of an occupied dwelling unit on Sundays, on legal holidays, or between the hours of 10 p.m. and 7 a.m. on other days.

- All equipment shall have sound control devices no less effective than those provided as original equipment. All motorized equipment shall have muffled exhaust.

- As directed by the appropriate jurisdictional agency, the contractor shall implement appropriate additional noise mitigation measures including, but not limited to, changing the location of stationary construction equipment, shutting off idling equipment, rescheduling construction activities, or notifying adjacent residents in advance of construction.

Impacts and Mitigation Measures Unique to Alternative 3

Impact 13.3: Increased Noise from Use of Hydraulic Off-Loaders and Supplemental Booster Pumps

The electric-powered shallow water and deep water hydraulic off-loaders would be located approximately ~~34,000 feet~~ 15,000 feet (2.8 miles) and 24,000 feet (4.5 miles), respectively, offshore and would not contribute significantly to ambient noise levels onshore because of the relatively low noise level and distance from sensitive receptors. Similarly, electric-powered supplemental booster pumps would be located offshore and would not contribute significantly to ambient noise levels onshore. Because of the relatively low noise levels produced by electric-powered equipment and the distance between the off-loaders and sensitive noise receptors, noise levels at sensitive receptors will be well below desirable limits. The impact on sensitive noise receptors as a result of off-loading dredged materials during the construction phase is considered less than significant and no mitigation is required.

Impacts and Mitigation Measures Unique to Alternative 4

No impacts and mitigation measures would be unique to Alternative 4.

Impacts and Mitigation Measures Unique to Alternative 5

The noise impacts associated with use of the hydraulic off-loaders and supplemental booster pumps during the construction phase of Alternative 5 would be similar to those described for Alternative 3 in Impact 13.3. This impact is considered less than significant and no mitigation is required.

Potential Issues and Resolutions under the Bel Marin Keys V Scenario

Potential Issue: Potential Increases in Traffic Noise Levels

Noise effects associated with increased traffic during the construction and operation phases of the restoration project would be similar to those described in Impact 13.1. This potential issue is considered less than significant.

Potential Issue: Temporary Increases in Noise Levels to More than 60 dBA during Construction

As described in "Impact Mechanisms", implementation of the proposed action would result in noise levels exceeding 60 dBA at distances up to 1,900 feet from grading and other earthworking activities. Sensitive noise receptors include the New Hamilton Partnership property, wildlife areas at Pacheco Pond/Ignacio Reservoir, and the existing Bel Marin Keys development. Although temporary, this potential issue would be considered significant~~ and unavoidable~~. A potential resolution to this issue could be similar to Mitigation Measure 13.2.

Potential Issue: Increased Noise Levels from Use of Hydraulic Off-Loaders and Supplemental Booster Pumps

Noise effects associated with use of the hydraulic off-loaders and supplemental booster pumps during the construction phase of the restoration project would be similar to those described in Impact 13.3. This potential issue is considered less than significant.

Chapter 14. Cultural Resources

Affected Environment

Data Sources

The cultural resource analysis is based on the Hamilton Army Airfield disposal and reuse EIS (U.S. Army Corps of Engineers 1996a), which summarizes information obtained from the following sources:

- National Register of Historic Places Evaluation of Eight Buildings on Hamilton Army Airfield, Marin County, California, Final Report (PAR Environmental Services 1993a);
- Hamilton Army Airfield Historic District Historic Resources Inventory Forms (PAR Environmental Services 1993b);
- National Register of Historic Places Evaluation, Hamilton Army Airfield Historic District, Marin County, California (Draft) (PAR Environmental Services 1993c);
- National Register of Historic Places Registration Form, Hamilton Army Air Field Historic District, Novato, California (PAR Environmental Services 1994); and
- National Register of Historic Places Registration Form, Hamilton Army Air Field Discontiguous Historic District, Novato, California (PAR Environmental Services 1998).

In addition, information about the BMKV parcel is based on the Bel Marin Keys V final EIR/EIS (Environmental Science Associates 1993) and miscellaneous studies of the SLC parcel. The area of potential effects (APE) includes the HAAF and SLC parcels.

Prehistory of the Area

The project area is located in the former territory of the Coast Miwok, who have inhabited Marin and Sonoma Counties from approximately 5,000 years ago and who live there today. Early inhabitants relied heavily on the resources associated with San Pablo Bay and associated marshes and estuarine environments. Several archaeological sites associated with past use are found near the project area and generally inland of the project site; most are situated above the historic marshlands. The Coast Miwok village of Puyuku is situated within 1 mile of the project site.

Historic Background

It is presumed that the earliest Coast Miwok contact with Europeans came in the late 1500s with the voyages of Drake and Cermeno. Missionization, beginning in the late 1700s, forced Native Americans to convert to Christianity, resulting in population displacement and cultural disintegration. Epidemics further reduced native populations. After Mexico gained its independence from Spain, a series of land claims were granted to the *Californios* (California citizens of Mexican descent). Rancho San Jose, in which the BMKV parcel is contained, was granted to Ignacio Pacheco. Livestock grazing associated with the rancho was the predominant agricultural pursuit at that time. With railroad development in the 1870s, Novato and Ignacio became viable agricultural communities. Levee construction and land reclamation of the 1890s increased agricultural options. When the California Packing Company (Cal Packing, now Del Monte) took over the property in the late 1920s, agricultural use was pursued in earnest. Cal Packing raised sugar beets, peas, and other crops and bred stallions, which were also used in farm work. Irrigation necessary for this large-scale operation was provided by onsite wells, which have since been abandoned because of saltwater intrusion. Agricultural use of the property still occurs but is limited to dry farming of oat hay.

HAAF was constructed between 1931 and 1935, specifically as a bombardment base. As one of three such bases in the United States at the time, the airfield played a vital role in the development of air defense mechanisms on the west coast in the 1930s and in the training and processing of units during the early 1940s. The use of a Spanish Eclectic architectural style represented a departure from the traditional military approach to base construction, increasing the base's importance. The craftsmanship evident in the original buildings found on base, and the overall layout and landscaping, are also significant. More generic-style temporary buildings that are characteristic of construction methods used during World War II are also found at HAAF.

In 1993, the significance of HAAF was evaluated against the criteria established for the National Register of Historic Places (NRHP) and found to be eligible as a historic district (PAR Environmental Services 1993c). This research has determined that the most significant phase of historical activity at HAAF occurred during 1931–1946; the boundaries of a historic district were established accordingly to include all areas of the military reservation active during that period. Within the period of significance for the Hamilton Historic District are two distinct architectural and historical phases: 1931–1935 and 1938–1946. During 1931–1935, the permanent facilities were constructed and the post was established as a vital component of west coast air defense, and during 1938–1946, the air base underwent a period of dramatic expansion to serve in its role as a staging area for World War II air transport and a postwar reentry facility.

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Regulatory Setting

When the Army was directed to dispose of the HAAF, it was obligated to comply with Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended, and its implementing regulations, 36 CFR Part 800. Compliance with Section 106 requires historic properties (including archaeological, historical, and architectural resources) to be inventoried and evaluated for their eligibility for listing on the NRHP.

The Army's compliance with Section 106 for the Hamilton Army Airfield Historic District has been directed by two memoranda of agreement (MOA). The first agreement was executed in April 1994 between the Army, General Services Administration (GSA), Advisory Council on Historic Preservation (ACHP), and State Historic Preservation Officer (SHPO). The MOA covered the effects of conveyance of the outparcels on historic properties. Subsequently, another MOA was executed between the Army, ACHP, and SHPO regarding the effect on historic properties of the disposal and reuse of the BRAC parcels.

Summary of Cultural Resource Investigations

The results of previous studies in the area of potential effects (APE) for the proposed project are described below.

Archaeological Studies

Numerous archaeological investigations have been conducted within the boundaries of the Hamilton installation (Archaeological Consulting and Research Services 1979a, 1979b; Archaeological Resource Service 1991; Baker and Salzman 1980; Chavez 1986; Desgrandchamp and Clark 1978; Flynn 1978; PAR Environmental Services 1989). Portions of the APE for the project have been surveyed. Unsurveyed portions of the APE are fill, with little or no potential to contain cultural resources. No known archaeological sites were found to be present on any of the parcels subjected to disposal and reuse (Archaeological Consulting and Research Services 1979a, 1979b; Chavez 1986).

Architectural Studies

HAAF has been the subject of numerous architectural investigations. In 1993, the research culminated in a complete inventory of HAAF (PAR Environmental Services 1993b) and the preparation of a determination of eligibility (DOE) report (PAR Environmental Services 1993c) and draft NRHP nomination for the Hamilton Army Airfield Historic District (PAR Environmental Services 1993d). The DOE report presents the historical context for the air base, a thorough documentation of the cultural landscape at HAAF, and the evaluation of the district's eligibility for listing on the NRHP as specified in 36 CFR 60.4.

In April 1998, PAR Environmental Services conducted a reevaluation of the DOE and prepared the National Register of Historic Places registration form for the Hamilton Historic District (PAR Environmental Services 1998). The result of this reevaluation was a reduction in the area encompassed by the district. Current district boundaries are presented in Figure 14-1. Currently, the district boundaries are outside the footprint of the wetland restoration project. This reevaluation is currently in draft form and is being reviewed by the Office of Historic Preservation.

Status of Mitigation Implementation at HAAF

Disposal and reuse of HAAF was determined to have an adverse effect on the integrity and research potential of the historic district as a whole. To mitigate this impact, the Army is implementing mitigation measures stipulated in the MOA for other Army actions, namely the conveyance of the outparcels and BRAC parcels. These mitigation measures include preparing historical documentation, developing two video productions on the history of the former HAAF, completing a nomination to the NRHP, preparing a museum interpretive plan and brochure for the Novato Historical Guild, and preparing written and photographic documentation of the historic district for submittal to the Library of Congress, in accordance with the requirements of the Historic American Building Survey (HABS).

To further mitigate the transfer of historic properties, the Army has developed an interpretive display to illustrate to the public the history and significance of the district. This exhibit includes a transportable modular display, interpretive materials illustrating the historical and architectural significance of Hamilton Historic District, and a portable television and videocassette recorder for viewing the videos. The exhibit was designed to be presented at professional meetings, Army functions, and other public venues, including the Novato Historical Guild.

To supplement historical research conducted to date, the Army is conducting oral history research to document the experiences of personnel formerly stationed at the installation. This information will be used as part of both the Novato Historical Guild's museum and the Army's mobile interpretive display.

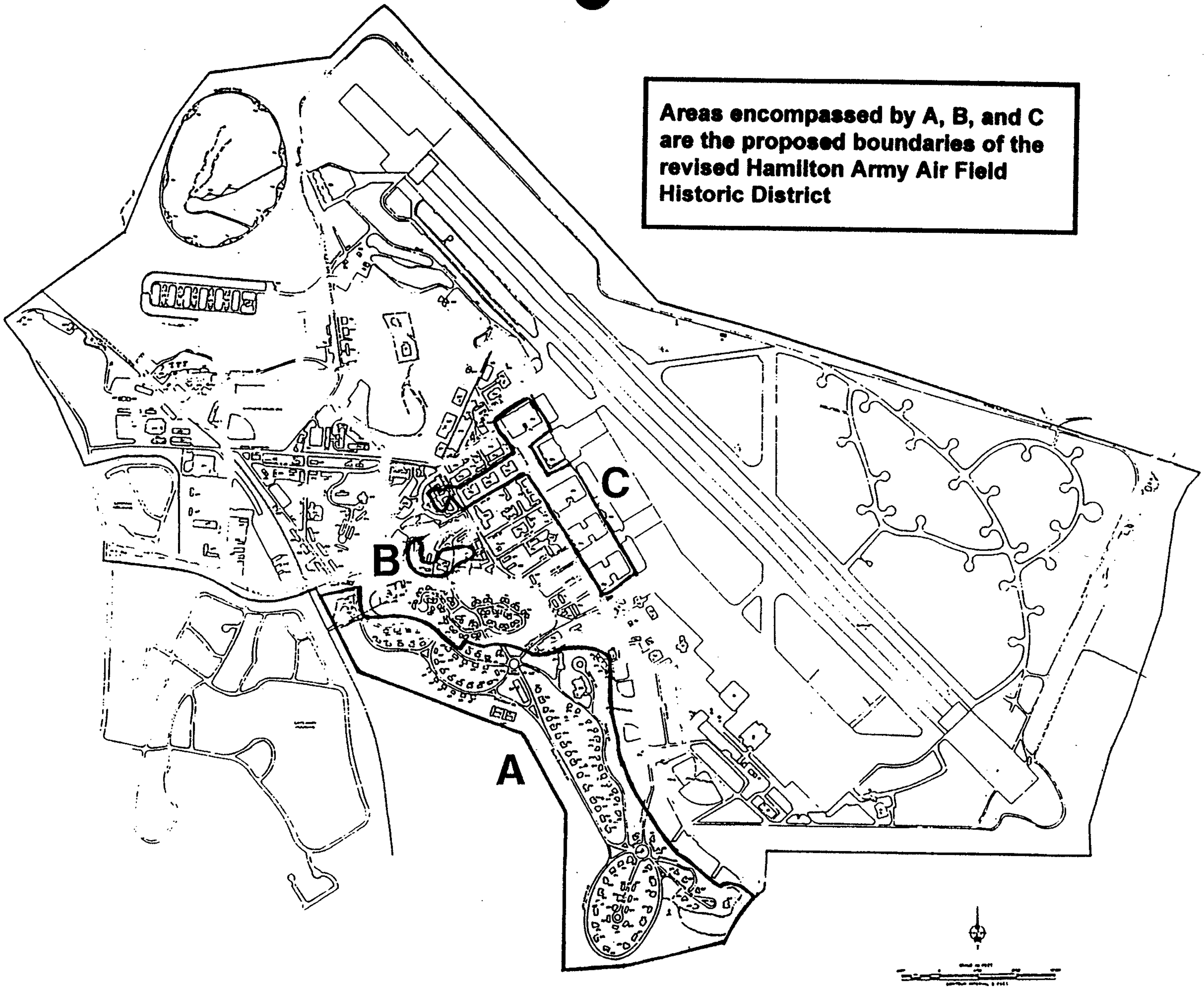

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Figure 14-1
Proposed Boundaries of the Revised Hamilton Army Air Field Historic District

Summary of Cultural Resources in the APE for the Proposed Project

The HAAF parcel and the BMKV parcel have been surveyed for cultural resources, and no known prehistoric or historic archaeological resources are present on either of these two parcels (Archaeological Consulting and Research Services 1979a, 1979b; Chavez 1986; Environmental Science Associates 1993). The HAAF parcel includes elements of the former Hamilton Army Airfield Historic District, but as it is currently delineated (Figure 14-1), no portions of the proposed revised Hamilton Historic District are in the APE for the Hamilton Wetland Restoration Project (PAR Environmental Services 1998). Although the potential for these parcels to contain prehistoric or historic resources is considered low, resources may exist beneath the surface.

The SLC parcel has not been surveyed for cultural resources. Remnants of the site's previous use as an Air Force antenna field are scattered throughout the site, including an array of seven 50-foot-tall poles topped by antennas, a concrete operations building, a concrete generator building, a paved parking area, and numerous concrete footings. In addition, in the southeastern corner of the area is the former Air Force rifle range. Because the SLC parcel was formerly part of San Pablo Bay, it is highly unlikely that prehistoric resources are present on the site; however, offshore archaeological resources (e.g., fishing camps, wharves, sunken ships and boats) could be present.

Environmental Consequences and Mitigation Measures

Approach and Methods

Impact Mechanisms

Ground-disturbing activities could adversely affect previously unidentified historic and prehistoric cultural resources that could be present at the project site.

Thresholds of Significance

CEQA defines a significant historical resource as "a resource listed or eligible for listing on the California Register of Historical Resources" (Pub. Res. Code, Section 5024.1). For a historical resource to be eligible for listing on the California Register of Historical Resources (CRHR), it must be significant at the local, state, or national level under one or more of the following four criteria:

(1) it is associated with events that have made a significant contribution to the broad patterns of local or regional history, or the cultural heritage of California or the United States;

(2) it is associated with the lives of persons important to local, California, or national history;

(3) it embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of a master or possesses high artistic values; or

(4) it has yielded, or has the potential to yield, information important to the prehistory or history of the local area, California, or the nation.

Historical resources automatically listed on the CRHR include those historic properties listed on, or formally determined eligible for listing on, the NRHP.

Because the proposed project also must comply with Section 106 of the NHPA, federal significance criteria are also applied in the following analysis. For federal projects, cultural resource significance is evaluated in terms of eligibility for listing on the NRHP. NRHP criteria for eligibility are defined as follows:

> The quality of significance in American history, architecture, archeology, and culture is present in districts, sites, buildings, structures, and objects of state and local importance that possess integrity of location, design, setting, materials, workmanship, feeling and association, and that:
>
> (a) are associated with events that have made a contribution to the broad pattern of our history;
>
> (b) are associated with the lives of people significant in our past;
>
> (c) embody the distinct characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
>
> (d) have yielded, or are likely to yield, information important in prehistory or history (36 CFR 60.4).

Impacts and Mitigation Measures of Alternative 1: No Action

Under Alternative 1, no cultural resources would be disturbed.

Impacts and Mitigation Measures Common to Alternatives 2 and 3

No known cultural resources are present in the areas that would be affected under Alternative 2 or 3; therefore, restoration is not expected to result in any cultural resource impacts.

Impacts and Mitigation Measures Common to Alternatives 4 and 5

Impact 14.1: Potential Disturbance of Unknown Resources on the SLC Parcel

Potentially historic cultural resources associated with the former HAAF are present on the SLC parcel. These resources have not been inventoried or evaluated to determine whether they are significant. Because the revised proposed Hamilton Army Airfield Historic District has been substantially downsized and is now limited to the few major structures and structure groupings still present, it is likely that these ancillary resources would not be found significant. However, if the resources present on the SLC are found to be significant using NRHP or CRHR criteria, restoration activities could adversely affect them. This impact is considered significant. To mitigate this impact to a less-than-significant level, the Coastal Conservancy, Corps, or successors in interest shall implement Mitigation Measure 14.1.

Prehistoric or historic archaeological resources are not likely to be located in the SLC parcel; however, if these resources were present, restoration activities could adversely affect unknown cultural resources eligible for listing on the NRHP or the CRHR. This impact is considered significant. To mitigate this impact to a less-than-significant level, the Coastal Conservancy, Corps, or successors in interest shall implement Mitigation Measure 14.2.

Mitigation Measure 14.1: Avoid or Document Significant Historic-Period Cultural Resources. The Coastal Conservancy, Corps, or successors in interest shall retain a qualified cultural resource specialist to conduct a cultural resource investigation, including an inventory of the entire parcel and a significance evaluation to determine whether the historic-period resources present on the SLC parcel are eligible for listing on either the CRHR or the NRHP. If any of these resources or any newly discovered resources are determined to be significant, the Coastal Conservancy, Corps, or successors in interest shall conduct a program of data recovery or documentation in accordance with the guidelines of the Secretary of the Interior.

Mitigation Measure 14.2: Avoid or Document Significant Prehistoric Cultural Resources. The Coastal Conservancy, Corps, or successors in interest shall retain a qualified cultural resource specialist to conduct a cultural resource investigation to assess whether buried prehistoric or historic period resources are likely to be present on the SLC parcel. A program of focused historical research should be conducted to prepare this assessment. If research indicates that there is a potential for the discovery of buried resources during project implementation, a plan to address unanticipated discoveries should be developed before construction begins. This plan should include requirements for monitoring (as appropriate) and the actions that will follow any unanticipated discovery of cultural materials.

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Potential Issues and Resolutions under the Bel Marin Keys V Scenario

Potential Issue: Potential Disturbance of Unknown Resources on the SLC Parcel

Restoration of the BMKV and SLC parcels could adversely affect cultural resources eligible for listing on the NRHP or the CRHR. This potential issue is considered significant. A potential resolution to this issue would be similar to Mitigation Measure 14.2.

Chapter 15. Other Required Analyses

In addition to the foregoing analysis of project-related impacts in various environmental topic areas, NEPA and CEQA require additional analysis of cumulative impacts, irreversible and irretrievable commitments of resources, and the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity.

Cumulative Impacts

The methodology used to develop the cumulative impact analysis included reviewing the current general plans for the City of Novato and Marin County, the Bel Marin Keys Unit V final EIR/EIS (Environmental Science Associates 1993), the Hamilton Army Airfield Disposal and Reuse EIS (U.S. Army Corps of Engineers 1996a), and the Oakland Harbor navigation improvement (50-foot) project final EIR/EIS (U.S. Army Corps of Engineers and the Port of Oakland 1998d). The multiple source approach provided information about whether the proposed project would contribute to significant cumulative effects.

Because the BMKV Scenario addresses the longest potential phase of restoration of tidal marsh adjacent to San Pablo Bay, it has been used as the basis for addressing cumulative impacts for this EIR/EIS. That is, this scenario is reviewed in the context of the other plans and projects discussed above. (Except where indicated, Alternatives 2-5 would result in less severe impacts because the area being restored would be smaller under any of these alternatives and the period of restoration would be shorter.)

Because the BMKV Scenario would result in a substantial benefit to the environment in terms of biological resources and does not involve the development of the site for intensive land uses, there are very few significant cumulative impacts associated with the project. The following sections support this conclusion on a topic-by-topic basis.

Geology and Soils

The project area is one of the most seismically active regions of the nation. The development of the BMKV Scenario is not, however, expected to exacerbate or contribute to seismic hazards; the requirements to conduct geotechnical investigations and develop appropriate design for the levees would fully address this issue. Furthermore, this scenario would preclude development of a large site for urban development and, therefore, substantially limits the exposure of people to seismic hazards.

Hydrology and Water Quality

Implementation of the BMKV Scenario along with other projects envisioned in the area would result in potential water quality impacts on San Pablo Bay during construction and operation. Over the long term as the wetlands develop, however, water quality is expected to improve compared to existing conditions because functioning wetlands filter contaminants from runoff and enhance water quality, whereas under current conditions, the bay and other water bodies receive contaminated runoff from the HAAF, SLC, and BMKV parcels.

Furthermore, because the BMKV Scenario envisions the use of dredged material for wetlands, and, therefore, reduces the potential for disposing of the material in the bay or ocean, this project will result in a net benefit to water quality of the bay and ocean. This benefit is one of the objectives of the LTMS.

Public Health

Implementation of the BMKV Scenario would increase the potential for mosquito production but would not contribute to a significant cumulative impact because mosquito abatement practices are implemented as needed (see Chapter 7 for details), thereby eliminating large-scale, cumulative problems.

Biological Resources

The BMKV Scenario would substantially increase the available acreages of important tidal and nontidal habitat available for sensitive wildlife species. Therefore, it is expected to be cumulatively beneficial for biological resources.

Land Use and Public Services

As described in Chapter 9, the BMKV Scenario would contribute to the loss of agricultural land in oat hay production in Marin County, but the loss is expected to be offset by production in Sonoma County. Nevertheless, because of the difficulty of adequately mitigating for the loss of agricultural lands in the region, this scenario is considered to contribute to a cumulative regional loss of agricultural land. Implementation of Alternative 2, 3, 4, or 5 would avoid this impact.

The BMKV Scenario would not contribute to a significant cumulative impact on public services because it would not result in an increase in population, housing, or economic growth that would create additional demand for these services.

Traffic, Air Quality, and Noise

Construction traffic would represent a short-term minor increase in traffic that could contribute to traffic congestion on roadways in the City of Novato and adjacent areas and on state facilities; because this traffic, although temporary, would exacerbate congestion on some roadways that are already operating at an unacceptable LOS (see Chapter 11), it is recommended that a construction traffic plan be implemented as part of the final design to ensure that construction traffic is routed through appropriate intersections (i.e., those that are operating at an acceptable LOS) and is concentrated during nonpeak hours.

The BMKV Scenario is expected to be below *de minimis* thresholds levels for ozone precursors and, therefore, by definition would not cause or contribute to any new ambient air quality standard violation, increase the severity or frequency of any existing standard violation, or delay timely attainment of any standard (see Chapter 12). In addition, as discussed in the Oakland Harbor navigation improvement project EIR/EIS, cumulative air quality emissions from dredging, transport, reuse, disposal and other construction activities for that project were found to have a less-than-significant cumulative impact (which considered this project site for disposal). Therefore, this project is not expected to result in a cumulative impact on ozone precursors. However, PM10 impacts under the BMKV scenario would contribute to a cumulative PM10 impact, which can be mitigated to a less-than-significant level by controlling PM10 emissions in accordance with BAAQMD standards.

The BMKV Scenario is not expected to contribute to significant long-term cumulative noise impacts. It would, however, exacerbate existing noise levels at sensitive receptors during construction; these noise levels can be reduced, but not to a less-than-significant level, through appropriate construction practices.

Hazardous Substances, Waste, and Site Remediation

Proposed transfer of the HAAF and SLC parcels from Army ownership to the Coastal Conservancy is contingent on cleanup of hazardous substances; therefore, the BMKV Scenario would not exacerbate or cumulatively contribute to hazardous materials impacts.

Cultural Resources

Implementation of the BMKV Scenario could contribute to a cumulative loss of cultural resources in the region if appropriate mitigation measures are not implemented through the planning process. Because mitigation measures for cultural resources are expected to be implemented through CEQA, NEPA, and the Section 106 process for discretionary actions, however, this impact is considered less than significant.

Irreversible and Irretrievable Commitment of Resources

The proposed project would result in the irretrievable commitment of fossil fuels and other energy sources needed to build, operate, and maintain the wetlands. The restoration of the site to wetlands, however, is not considered an irreversible commitment because the landscape could once again be converted to other land uses in the future, even after restoration.

Relationship between Short-Term Uses of the Environment and the Maintenance and Enhancement of Long-Term Productivity

Short-term uses of the environment that would occur with restoration include the impacts on existing wetlands and habitat and those from other construction-related activities. However, in the long term, the site is expected to be substantially more productive for habitat and wildlife values.

Chapter 16. Consultation and Other Requirements

This chapter provides an overview of the consultation and other requirements for the Hamilton Wetland Restoration Project and describes the progress made in meeting those requirements.

Federal Endangered Species Act

The Corps has been informally consulting with USFWS regarding the project. The Corps initiated informal consultation by requesting a list of threatened, endangered, and candidate species in the project area. USFWS responded with a list of such species. Chapter 8, "Biological Resources", describes the potential for listed, proposed, or other sensitive species to occur in the area affected by the alternatives. Meetings are being conducted with USFWS to determine the scope of required consultation, identify species of concern, and develop an appropriate approach to addressing listed and proposed species as part of the Section 7 consultation.

National Historic Preservation Act

When the Army was directed to dispose of HAAF, it was required to comply with Section 106 of the NHPA. Compliance with Section 106 required the Army to inventory historic properties and evaluate the eligibility of those properties for listing in the NRHP. The effects of disposal and reuse of HAAF on properties that may be eligible for listing or are listed on the NRHP was addressed during that process. Chapter 14, "Cultural Resources", describes the potential effects of the project alternatives on cultural resources and identifies measures that may be necessary to avoid or reduce impacts on these resources.

Farmland Protection Policy Act

The Farmland Protection Policy Act of 1981 requires federal agencies to consider project alternatives that minimize or avoid adverse impacts on prime and unique farmland. As described in Chapter 9, "Land Use and Public Utilities", farmland would not be affected by the project alternatives. In the event that the project is expanded to include the BMKV parcel, the Corps will be required to contact the U.S. Natural Resources Conservation Service to comply with the provisions of the act.

Executive Order 11988—Floodplain Management

Executive Order 11988, "Floodplain Management", requires federal agencies to prepare floodplain assessments for proposed projects located in or affecting floodplains. An agency proposing to conduct an action in a floodplain must consider alternatives to avoid adverse effects and incompatible development in the floodplain. If the only practicable alternative involves siting in a floodplain, the agency must minimize potential harm to or development in the floodplain and explain why the action is proposed in the floodplain.

As described in Chapter 5, "Surface Water Hydrology and Water Quality", the entire project site is within the 100-year floodplain. Because the objective of the project is to restore tidal wetlands, the area within the project boundaries would be flooded. Secondary impacts involving the potential for flooding surrounding parcels as a result of the proposed project are addressed in Chapter 5. This EIR/EIS concluded that the project would not increase the potential for flooding on surrounding parcels through project design or implementation of mitigation measures.

Executive Order 11990—Protection of Wetlands

Executive Order 11990, "Protection of Wetlands", requires federal agencies to prepare wetland assessments for projects located in or affecting wetlands. Agencies must avoid undertaking new construction in wetlands unless no practicable alternative is available and the proposed action includes all practicable measures to minimize harm to wetlands.

One of the primary goals of the project is to restore wetlands in the HAAF and SLC parcels. As described in Chapter 8, "Biological Resources", the restoration project would result in the loss of brackish marsh. However, this loss would be substantially offset by the creation of both tidal wetland and coastal salt marsh under all alternatives.

Executive Order 12898—Environmental Justice

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority and Low-Income Populations", requires federal agencies to identify and address disproportionately high and adverse human health or environmental effects of their actions on minorities and low-income populations and communities. Because no permanent or temporary residences are located on the project site, the Hamilton Wetland Restoration Project would not result in disproportionately high or adverse human health or environmental effects on minority or low-income populations.

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Chapter 17. Citations

Printed References

Aquatic Habitat Institute. 1990. San Francisco estuary project: status and trends report on dredging and waterway modification in the San Francisco estuary. San Francisco Estuary Project. Oakland, CA.

Archaeological Consulting and Research Services, Inc. 1979a. Report of the preliminary archaeological reconnaissance of AFRES parcels 1 and 3, Hamilton Air Force Base. California. (RPT. #S-1549 on file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.) Mill Valley, CA. Prepared for General Services Administration Contract No. FO4602-76-M-0558.

__________. 1979b. Report of the preliminary archeological reconnaissance of AFRES parcels 1 and 3. Hamilton Air Force Base, California. Manuscript on file at the Northwest Information Center of the California Archeological Inventory, Sonoma State University, Rohnert Park, CA. Unpublished report.

Archaeological Resource Service. 1991. A cultural resources evaluation of approximately 10 miles of pipe-line replacement in the Terra Linda, Marinwood, and Hamilton Field Districts of Marin County, California. Petaluma, CA. Prepared for Marin Municipal Water District, Corte Madera, CA.

Baker, S. and S. Salzman. 1980. Archaeological investigations at site C, Hamilton Air Force Base, Marin County, California. (RPT. #S-2136 on file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.) Archaeological Consultants. San Francisco, CA. Prepared for Heritage Conservation and Recreation Service, San Francisco, CA.

Bay Area Air Quality Management District. 1996. BAAQMD CEQA guidelines - assessing the air quality impacts of projects and plans. San Francisco, CA.

__________. 1997. Bay Area 97 clean air plan and triennial assessment. San Francisco, CA.

Berg-Revoir Corporation. 1985. Geotechnical study—Hamilton Field. May 29, 1985. (HLA Job No. 17,469,002.01.) Novato, CA. Prepared by Harding Lawson Associates, Novato, CA.

Bissell & Karn/Greiner. 1993. Flood and drainage baseline study for Hamilton Army Airfield. June. San Ramon, CA.

Bohart, R. M., and R. K. Washino. 1978. Mosquitoes of California. 3rd ed. University of California, Division of Agricultural Sciences. Berkeley, CA.

California Air Resources Board. 1984. California surface wind climatology. Aerometric Data Division. Sacramento, CA.

__________. 1993. California air quality data. Summary of air quality data, Volumes XXI, XXII, XIII, and XXIV. Sacramento, CA.

California Department of Water Resources. 1978. Wind in California. (Bulletin 185.) Sacramento, CA.

__________. 1993. Sacramento - San Joaquin Delta atlas. Sacramento, CA.

California Regional Water Quality Control Board, San Francisco Bay Region. 1997. Water quality control plan - San Francisco Bay Region (2). Oakland, CA.

California State Water Resources Control Board. 1 1990. Enclosed bays and estuaries plan. Sacramento, CA.

Chavez, D. 1986. Cultural resources evaluation for the Hamilton Field EIR, City of Novato, Marin County, California. (RPT. #S-8180 on file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.) David Chavez & Associates. Mill Valley, CA. Prepared for EIP Associates, San Francisco, CA.

City of Novato. 1996. Novato general plan. March. Novato, CA.

Collins, J. N., and V. H. Resh. 1989. Guidelines of the ecological control of mosquitoes in non-tidal wetlands of the San Francisco Bay area. California Mosquito and Vector Control Associations, Inc., and the University of California Mosquito Research Program. Berkeley, CA.

Conomos, T. J., and D. H. Peterson. 1977. Suspended particle transport and circulation in San Francisco Bay: An overview. M. Wiley (ed.) in Estuarine Processes - Volume II. Academic Press. New York, NY.

Desgrandchamp, C., and M. Clark. 1978. Pipeline and water treatment plant facilities, Marin County. Manuscript on file at the Northwest Information Center of the California Archeological Inventory, Sonoma State University, Rohnert Park, CA. Unpublished report.

EIP Associates. 1986. Section 3.2.1, "Soils, geology, and seismicity" in Hamilton Field master plan—multiple use project draft environmental impact report. December. (EIP 85.179.) San Francisco, CA. Prepared for the City of Novato, Novato, CA.

__________. 1993. Hamilton field project - final subsequent EIR. Volume I: Revised SEIR Part 2 of 2. San Francisco, CA. Prepared for the City of Novato Community Development Department, Novato, CA.

Environmental Science Associates, Inc. 1993. Bel Marin Keys Unit V final environmental impact report/environmental impact statement. Volume I—revised draft. August. (Corps Public Notice No. 15813N33A; State Clearinghouse No. 89072519.) San Francisco, CA.

Flynn, K. 1978. Archaeological impact evaluation of two noncontingency parcels of land near Ignacio, Marin County: (A) Bell Marin Keys Unit IV and (B) Ignacio Industrial Park Unit III (ARS 78-27.) Letter report #S-891 on file at the Northwest Information Center, Sonoma State University, Rohnert Park, CA.

Geomatrix Consultants, Inc. 1998. Evaluation of effects of placing fill against the flood control levee, Hamilton Field Phase I, Novato, CA. April 2, 1998. (Geomatrix Project No. 2228.02.) San Francisco, CA. Prepared for New Hamilton Partnership, Emeryville, CA.

Hamilton Local Reuse Authority. 1996. Hamilton Army Airfield reuse plan. Final. Novato, CA.

IT Corporation. 1997. Conceptual design report—soil encapsulation berms, Hamilton Army Airfield, Novato, CA. (Contract No. DACW05-95-D-001.) Revision A. April. Martinez, CA. Prepared for U.S. Army Corps of Engineers, Sacramento, CA.

__________. 1998. Site investigation work plan and contractor quality control/sampling and analysis plan, North Antenna Field, General Services Administration, Hamilton Army Airfield, Novato, CA. Revision 0. July 10, 1998. Martinez, CA. Prepared for U.S. Army Corps of Engineers, Sacramento, CA.

Jennings, M. R., and M. P. Hayes. 1994. Amphibian and reptile species of special concern in California. Final report. California Department of Fish and Game, Inland Fisheries Division. Rancho Cordova, CA.

Jones & Stokes Associates, Inc. 1991. Wetland delineation office report for Hamilton Army Airfield, Novato, California. (JSA 89-173.) Sacramento, CA. Prepared for U.S. Army Corps of Engineers, Air Force Project Management Office, Sacramento, CA.

__________. 1995. Environmental impact report and environmental impact statement for the Delta Wetlands project. Draft. September 11, 1995. (JSA 87-119.) Prepared for California State Water Resources Control Board, Division of Water Rights, and U.S. Army Corps of Engineers, Sacramento District, Sacramento, CA.

__________. 1998. Scoping report for the Hamilton wetland restoration plan EIR/EIS. Administrative draft. April 15, 1998. (JSA 98-033.) Sacramento, CA. Prepared for California Coastal Conservancy, Oakland, CA, and U.S. Army Corps of Engineers, San Francisco District, San Francisco, CA.

Long. 1991. The potential for biological effects of sediment-sorbed contaminants tested in the national status and trends program. Technical memorandum. National Oceanic and Atmospheric Administration.

Long et al. 1995. Incidence of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments. National Oceanic and Atmospheric Administration.

LSA Associates, Inc. 1997. Delineation of Clean Water Act jurisdiction on proposed Bel Marin Keys project site, Novato, CA. (LSA Project No. TPP502.) September 22, 1997. Point Richmond, CA.

Marin County Agricultural Commissioner's Office. 1997. Marin County crop and livestock report for 1996. Novato, CA.

Marin County Community Development Agency. 1994. Marin countywide plan. Marin, CA.

Moyle, P. B., R. M. Yoshiyama, J. E. Williams, and E. D. Wikramanayake. 1995. Fish species of special concern in California. University of California, Davis. Davis, CA. Prepared for California Department of Fish and Game, Rancho Cordova, CA.

National Oceanic and Atmospheric Administration. 1997. National Climatic Data Center records, Hamilton AFB Station. On Earth Info CD-ROM. Period of Record 1948-1964. Boulder, CO.

Natural Diversity Data Base. 1997. Computer report of special natural communities, animals, and plants for the Brentwood 7.5-minute quadrangel. February 1998. California Department of Fish and Game. Sacramento, CA.

Natural Diversity Data Base. 1997. Computer database search for special natural communities, animals, and plants for the Petaluma Point and Novato 7.5-minute quadrangles. California Department of Fish and Game. Sacramento, CA.

PAR Environmental Services, Inc. 1989. Cultural resources assessment of Army properties on Hamilton Air Force Base, Marin County, California. Prepared for Jones & Stokes Associates, Inc., Sacramento, CA. Unpublished report.

__________. 1993a. National Register of Historic Places evaluation of eight buildings on Hamilton Army Airfield, Marin County, California. Sacramento, CA.

__________. 1993b. Hamilton Army Airfield historic district historic resource inventory forms. Sacramento, CA.

__________. 1993c. National Register of Historic Places evaluation, Hamilton Army Air Field historic district, Marin County, California. Draft report. Sacramento, CA.

__________. 1994. National Register of Historic Places registration form, Hamilton Army Air Field historic district, Novato, California. June. Sacramento, CA.

__________. 1998. National Register of Historic Places registration form, Hamilton Army Air Field discontiguous historic district, Novato, California. Sacramento, CA. Submitted to Engineering Field Activity, West, Naval Facilities Engineering Command, San Bruno, CA.

Philip Williams & Associates. 1998. Unpublished information related to conceptual design for tidal wetland restoration for the Hamilton Army Airfield Focused Feasibility Study.

Regional Water Quality Control Board. 1995. San Francisco Airport (SFO) site cleanup requirements, saltwater protection zone tier 1 standards. San Francisco Bay Region. San Francisco, CA.

Remsen, J. V. 1978. Bird species of special concern in California: an annotated list of declining or vulnerable bird species. (Wildlife Management Branch Administrative Report No. 78-1.) California Department of Fish and Game, Nongame Wildlife Investigations. Sacramento, CA.

Robert Bein, William Frost & Associates. 1995. Hamilton Army Airfield reuse plan—existing conditions analysis. May 25, 1995. Irvine, CA. Prepared for the Hamilton Reuse Planning Authority.

Sacramento-Yolo County Mosquito Abatement and Vector Control District. 1990. Technician's manual. Sacramento, CA.

San Francisco Bay Conservation and Development Commission. 1969. San Francisco Bay plan. January 1969, as amended. San Francisco, CA.

Skinner, M. W., and B. M. Pavlik. 1994. Inventory of rare and endangered vascular plants in California. 5th edition. (Special Publication No. 1.) California Native Plant Society. Sacramento, CA.

Taberski, K M., and J. L. Carlin. 1992. San Francisco pilot regional monitoring program 1991-1992, summary progress report. San Francisco Regional Water Quality Control Board, Oakland, CA.

U.S. Army Corps of Engineers. 1989. Hamilton Army Airfield flood control study. Final report. May. Sacramento, CA.

__________. 1992. Sediment budget study for San Francisco Bay. (DACWO&-89-D-0029.) Ogden Beeman and Associates and Ray B. Krone and Associates.

__________. 1994a. Draft environmental assessment and negative declaration—remedial work on BRAC property, Hamilton Army Air Field, Marin County, California. Sacramento District. Sacramento, CA.

__________. 1994b. Montezuma wetlands project draft environmental impact report/environmental impact statement, Volume I. October. (State Clearinghouse No. 91113031.) San Francisco District. San Francisco, CA.

__________. 1996a. Environmental impact statement - Hamilton Army Airfield disposal and reuse. Volume I. Final. February. Sacramento District. Sacramento, CA. Technical assistance from Jones & Stokes Associates, Inc. (JSA 92-204.), Sacramento, CA.

__________. 1996b. Environmental impact statement—Hamilton Army Airfield disposal and reuse. Volume II, Responses to comments. February. Sacramento District. Sacramento, CA. Technical assistance from Jones & Stokes Associates, Inc. (JSA 92-204.), Sacramento, CA.

__________. 1996c. Review of model plans for the John F. Baldwin ship channel project. Committee on Tidal Hydraulics, U.S. Army Engineer Waterways Experiement Station. Vicksburg, MS.

__________. 1996d. Flood and drainage baseline study for Hamilton Army Airfield disposal and reuse. April. Sacramento, CA. (JSA 92-204.) With technical assistance from Jones & Stokes Associates, Inc., Sacramento, CA.

__________. 1997. Perimeter drainage ditch engineering evaluation report, BRAC property, Hamilton Army Airfield. September. Sacramento, CA. Prepared by IT Corporation, Martinez, CA.

__________. 1998a. Ecological baseline conditions at the State Lands Commission's Antenna Field, Hamilton Army Air Field, Marin County, California. Draft. January. Sacramento District, Environmental Resources Branch. Sacramento, CA.

__________. 1998b. EPA's guidance on conducting time-critical removal actions under CERCLA. In Draft removal action work plan and contractor quality control/sampling and analysis plan, BRAC property, Hamilton Army Airfield, Novato, California. May. Sacramento, CA. Prepared by IT Corporation, Martinez, CA.

__________. 1998c. Comprehensive remedial investigation report, BRAC property, Hamilton Army Airfield, Novato, CA. July 1998. Sacramento, CA. Prepared by IT Corporation, Martinez, CA.

U.S. Army Corps of Engineers and Port of Oakland. 1998a. Oakland Harbor navigation improvement (-50 foot) project draft environmental impact statement/environmental impact report. Executive Summary. February. (State Clearinghouse No. 97072051.) San Francisco and Oakland, CA.

__________. 1998b. Oakland Harbor navigation improvement (-50 foot) project draft environmental impact statement/environmental impact report. Volume I, Draft feasibility study. February. (State Clearinghouse No. 97072051.) San Francisco and Oakland, CA.

__________. 1998c. Oakland Harbor navigation improvement (-50 foot) project draft environmental impact statement/environmental impact report. Volume III, Draft feasibility study appendices. February. (State Clearinghouse No. 97072051.) San Francisco and Oakland, CA.

__________. 1998d. Oakland Harbor navigation improvement (-50 foot) project draft environmental impact statement/environmental impact report. Volume IV, Draft environmental impact statement/environmental impact report appendices. February. (State Clearinghouse No. 97072051.) San Francisco and Oakland, CA.

__________. 1998e. Oakland Harbor navigation improvement (-50 foot) project draft environmental impact statement/environmental impact report. Volume II, Draft environmental impact statement/environmental impact report. February. (State Clearinghouse No. 97072051.) San Francisco and Oakland, CA.

U.S. Environmental Protection Agency. 1971. Noise from construction equipment and operations, building equipment, and home appliances. (NTID300.1.) Arlington, VA. Prepared by Bolt, Beranek and Newman, Inc., Boston, MA. U.S. Government Printing Office. Washington, DC.

U.S. Soil Conservation Service. 1985. Soil survey of Marin County, California. U.S. Government Printing Office, Washington, D.C.

U.S. Geologic Survey. 1951. 7.5 minute quad sheet - Petaluma Point, CA. Photorevised 1968, 1980.

Williams, D. F. 1986. Mammalian species of special concern in California. (Wildlife Management Division Administrative Report 86-1.) California Department of Fish and Game, Wildlife Management Division. Sacramento, CA.

Wolfenden, D., and P. Carlin. 1992. Interim sediment screening criteria and testing requirements for wetland creation and upland beneficial reuse. California Environmental Protection Agency, California Regional Water Quality Control Board, San Francisco Bay Region, Oakland, CA.

Woodward-Clyde. 1985. Hamilton Air Force Base GSA sale area confirmation study for surface and subsurface hazardous materials contamination, final report. Omaha, NE.

__________. 1995. Accelerated environmental cleanup work plan for BRAC parcel at Hamilton Army Airfield. U.S. Army Corps of Engineers, Sacramento District, Sacramento, CA.

__________. 1998. Draft Hamilton wetlands conceptual restoration plan. April. Prepared with H.T. Harvey and Associates and Philip Williams and Associates, Ltd. Prepared for the California State Coastal Conservancy and the City of Novato, Novato, CA.

Personal Communications

Baye, Peter. U.S. Fish and Wildlife Service. April 7, 1998—memorandum to Rachel Kamman, "Clarification of Wetland Design Issues for Hamilton Marsh Restoration Project".

Call, Brad. U.S. Army Corps of Engineers, Sacramento District, Sacramento, CA. June 3, 1998—telephone conversation.

Cawood, Gary. BRAC representative. Department of the Army Headquarters, Sausalito, CA. May 13, 1998—Hamilton Army Air Field site visit and tour; May 20, 1998—telephone conversation.

Crawford, Brian. Principal planner. Marin County Community Development Agency, Marin, CA. May 27, 1998—telephone conversation.

Eberline, John. IT Corporation, San Francisco, CA. May 28, 1998—telephone conversation.

Keith, Ron. Entomologist. Marin-Sonoma Mosquito Abatement District, Petaluma, CA. April 5, 1998 - telephone conversations; May 6, 1998 - information letter.

Scandone, Ceil. Project manager. Bay Trail Project, Oakland, CA. April 6, 1998—letter to Terri Nevins of the Coastal Conservancy and Steve Goldbeck of the BCDC.

Selfridge, Tom. Engineer. Novato Sanitary District, Novato, CA. May 26, 1998—telephone conversation.

Wood, Roderick J. City manager. City of Novato, Novato, CA. October 15, 1998 - letter to California Coastal Conservancy.

Wooley, J. Marin County Flood Control and Water Conservation District. June 26, 1998.

Zianno, Paul. U.S. Army Corps of Engineers, Sacramento District, Sacramento, CA. May 29, 1998—telephone conversation.

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List of Acronyms

List of Acronyms

APE	area of potential effects
ARAR	applicable or relevant appropriate requirements
AST	aboveground storage tank
BAAQMD	Bay Area Air Quality Management District
Basin Plan	San Francisco Regional Water Quality Control Board Water Quality Control Plan
BCDC	San Francisco Bay Conservation and Development Commission
BMKV	Bel Marin Keys Unit V
BMO	best management practice
BRAC	Defense Base Closure and Realignment Act
BTEX	benzine, toluene, ethylbenzene, and xylenes
Cal-EPA	California Environmental Protection Agency
CALFED	CALFED Bay-Delta Program
CAP	corrective action plans
CCMP	Comprehensive Conservation and Management Plan
CCR	Code of California Regulations
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
City	City of Novato
CNPS	California Native Plant Society
CO	carbon monoxide
Coastal Conservancy	California State Coastal Conservancy
Corps	U.S. Army Corps of Engineers
CRHR	California Register of Historical Resources
dB	decibel
dBA	A-weighted decibel
DFG	California Department of Fish and Game
DMMO	Dredged Material Management Office
DoD	Department of Defense
DOE	determination of eligibility
EA	environmental assessment
EBEP	Enclosed Bays and Estuaries Plan
EIR	environmental impact report

EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
FR	Federal Register
FUDS	Defense Environmental Restoration Program for Formerly Used Defense Sites
Goals Project	San Francisco Bay Area Wetland Ecosystems Goals Project
GSA	General Services Administration
HAAF	Hamilton Army Airfield
HABS	Historic American Building Survey
HRC	Hamilton Reuse Commission
HRG	Hamilton Restoration Group
L_{dn}	day-night average sound level
LOS	level of service
LTMS	Long-Term Management Strategy for Disposal of Dredge Sediments in San Francisco Bay
M	Richter scale magnitude
MAD	mosquito abatement district
MCFCWCD	Marin County Flood Control and Water Conservation District
MEK	methyl ethyl ketone
MHHW	mean higher high water
MLLW	mean lower low water
MOA	memorandum of agreement
mph	miles per hour
MSMAD	Marin-Sonoma Mosquito Abatement District
NEPA	National Environmental Policy Act
NGVD	national geodetic vertical datum
NHPA	National Historic Preservation Act of 1966
NMFS	National Marine Fisheries Service
NOI	notice of intent
NOP	notice of preparation
NO_2	nitrogen dioxide
NO_x	oxides of nitrogen
NRHP	National Register of Historic Places
NSD	Novato Sanitary District
PCBs	polychlorinated biphenyls
PG&E	Pacific Gas and Electric Company
PM10	inhalable particulate matter less than 10 microns in diameter
PNA	polynuclear aromatic hydrocarbons

RCRA	Resource Conservation and Recovery Act
RWQCB	Regional Water Quality Control Board
SFBAAB	San Francisco Bay Area Air Basin
SLC	California State Lands Commission
SO_2	sulfur dioxide
SO_x	oxides of sulfur
SVOC	semivolatile organic company
TPH	total petroleum hydrocarbons
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UST	underground storage tank
VOC	volatile organic compound
WDR	waste discharge requirement
$\mu g/m^3$	micrograms per cubic meter

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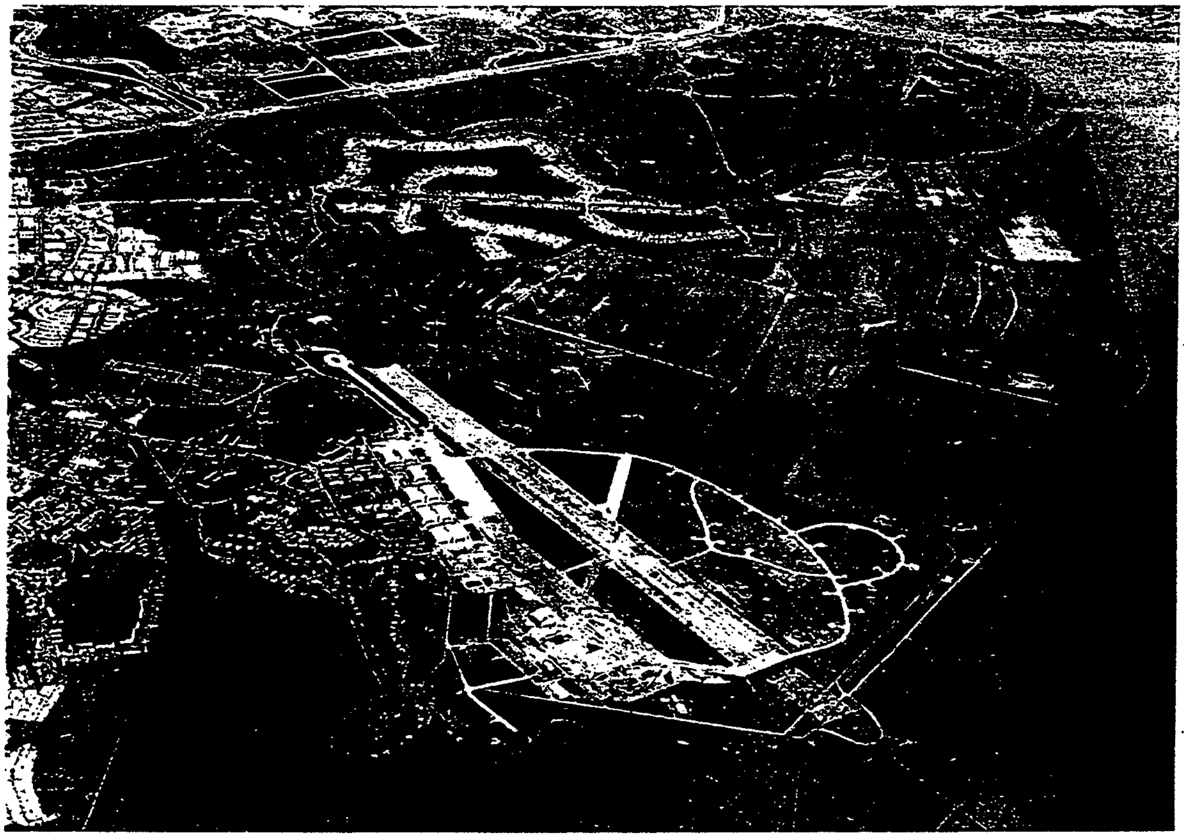
Appendix A.
Draft Executive Summary for the Hamilton Wetlands Conceptual Restoration Plan

DRAFT
EXECUTIVE SUMMARY

HAMILTON WETLANDS CONCEPTUAL RESTORATION PLAN



Prepared for
The State Coastal Conservancy
The City of Novato

April 24, 1998

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The California State Coastal Conservancy (Conservancy), with staff support from the San Francisco Bay Conservation and Development Commission (BCDC), is investigating the feasibility of restoration of the former Hamilton Army Airfield and the adjacent State Lands Commission (SLC) Antennae Field to tidal and non-tidal wetlands. This Feasibility Analysis and Conceptual Restoration Plan (Hamilton Conceptual Plan) presents a plan to carry out this proposed wetland restoration project.

The Hamilton Conceptual Plan discusses the project goals and objectives established by the Hamilton Restoration Group (HRG) (Section ES-1), describes the project area (Section ES-2), discusses the development of project alternatives (Section ES-3), presents an ecological and engineering overview of the Preferred Alternative, including a cost estimate (Section ES-4), highlights the differences between the Preferred Alternative and the Natural Sedimentation alternative (Section ES-5), describes the timeline for restoration (Section ES-6), and identifies issues for further consideration during final design (Section ES-7).

The project site is located on the northwestern edge of San Pablo Bay in the San Francisco Estuary (see Figure ES-1). The Hamilton site, totaling over 900 acres, consists of the 619-acre former Hamilton Army Airfield plus the contiguous 20-acre Navy ballfields to the south (together termed the "HAAF parcel"), and the contiguous 250-acre State Lands Commission Antennae Field (termed the "SLC parcel") to the north of HAAF. The HAAF site (excluding the Navy ballfields) is currently owned by the U.S. Army and is proposed to be transferred to the Conservancy following base closure. The Navy ballfields are currently owned by the U.S. Navy and are also proposed to be transferred to the Conservancy. The SLC parcel is currently owned by the State Lands Commission of California.

Wetlands restoration on the portion on the airfield parcel (Figure ES-2) and the adjoining abandoned antennae field that together constitute the project area is consistent with and helps implement applicable local, regional, and state plans, including the Hamilton Reuse Plan, the City of Novato General Plan, and the San Francisco Bay Conservation and Development Commission San Francisco Bay Plan. Restoration is also consistent with several regional initiatives and plans including:

- the San Francisco Estuary Project's Comprehensive Conservation and Management Plan,
- the Regional Habitat Goals Process,
- the Long Term Management Strategy (LTMS) for Dredged Material Disposal
- the CALFED program.

Use of the airfield for aviation would not be consistent with local and regional planning and would be incompatible with the extensive residential development under construction immediately adjacent to the old runway. Therefore, aviation use is not considered in this Conceptual Plan.

In addition, the project will:

- Place the restored wetlands under the long-term management of the U.S. Fish and Wildlife Service or the California Department of Fish and Game.
- Complete the closure, transfer and reuse of the Hamilton Army airfield

- Provide for beneficial use in site construction of over 10 million cubic yards of dredged material from Bay maintenance dredging and new deepening projects that otherwise would likely be disposed as a waste in the Bay or ocean
- Use freshwater runoff from surrounding properties to enhance habitat diversity
- Improve local flood protection
- Provide for public access

ES-1.1 PROJECT GOALS AND OBJECTIVES

The Hamilton Restoration Group (HRG), an advisory group including the City of Novato; local, state and federal resource and regulatory agencies; the U.S. Army; adjacent landowners; concerned individuals; non-profit groups, and the business and dredging community was central to the development of the conceptual plan. The design team, consisting of staff of the Coastal Conservancy, BCDC, and the consultants, worked with the HRG to develop the project goal and objectives as described in the following sections.

ES-1.1.1 Goal

The goal of the Hamilton Wetland Restoration Project is to create a diverse array of wetland and wildlife habitats at the Hamilton site that benefits a number of endangered species as well as other migratory and resident species.

ES-1.1.2 Ecological Objectives

- Creation of a mix of tidal habitats on 80 percent of the land area available for restoration. This mix will consist of subtidal open water, intertidal mudflats, low, middle and high intertidal marsh, channels, interior tidal ponds, and tidal pannes, with the relative amount of each type changing over time as the site evolves following restoration.
- Creation of a mix of nontidal habitats on 20 percent of the land area available for restoration. If this is not feasible, at least the minimum acreage necessary to replace existing seasonal wetlands on the site at a 1:1 ratio (about 8 percent) will be created. This mix will consist of shallow seasonal ponds and wetlands, and a limited amount of grassland and upland.

ES-1.1.3 General Objectives

- To design and engineer a restoration project that stresses simplicity and has little need for active management
- To demonstrate beneficial reuse of dredged material, if feasible
- To recognize existing site opportunities and constraints, including the runway and remediation of contaminated areas, as integral components of design
- To ensure no net loss of wetland habitat functions presently provided at the Hamilton site

- To create and maintain wetland habitats that sustain viable wildlife populations, particularly for Bay Area special status species
- To include buffer areas along the upland perimeter of the project area, particularly adjacent to residential areas, so that wildlife will not be impacted by adjacent land uses. Perimeter buffer areas should also function for upland refuge, foraging, and corridors for some species
- To be compatible with adjacent land uses and wildlife habitats
- To provide for public access that is compatible with protection of natural resource values and local public access policies.

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ES-2.1 SITE DESCRIPTION

Several existing features of the Hamilton site have influenced development of the restoration alternatives and are discussed in this section: drainage conditions and freshwater inflows from adjacent properties, site subsidence, Novato Sanitary District facilities, the runway, existing biological resources, and the potential to expand the project onto the adjacent Bel Marin Keys Unit V property.

ES-2.1.1 Subsidence

The Hamilton site has subsided on average approximately 8 ft. since it was diked off from San Pablo Bay. Much of the site is below -5 ft. NGVD (National Geodetic Vertical Datum of 1929, which is the datum used throughout this report unless otherwise noted). This means that flood control levees will be needed to protect adjoining properties from tidal waters after the project is restored. It also means that imported fill material or interior dikes will be needed to construct site features such as seasonal wetlands or uplands.

ES-2.1.2 Drainage Conditions and Freshwater Inflows

Winter storm flows from several adjacent properties drain into HAAF and are conveyed via the perimeter drainage system to the Army pump station where the water is pumped out into San Pablo Bay. These inflows include two storm water outfalls from the New Hamilton Partners (NHP) development south of HAAF, Landfill 26 south of HAAF, Pacheco Pond storm overflows northwest of HAAF, and some surface drainage from Las Gallinas Valley Sanitary District lands south of HAAF, the SLC parcel and the California Quartet/Bel Marin Keys Unit V property north of HAAF. Most of these inflows will be able to drain through the restored wetlands (pumps may be required for some inflows). However, this Plan assumes that the U.S. Army resolves drainage issues for the adjacent Las Gallinas Valley Sanitary District lands to the south and the Bel Marin Keys Unit V property to the north

ES-2.1.3 Novato Sanitary District Facilities

The Novato Sanitary District (NSD) has two existing facilities on the SLC site: (1) an outfall pipe that crosses the site to the north of the boundary between the HAAF and SLC parcels and has a shallow water discharge approximately 900 feet offshore in San Pablo Bay, and (2) a dechlorination plant located about 1,300 feet west of the outboard levee (Figure ES-2). Utilities and an access road to these facilities are also present The Dechlorination plant and associated utilities are proposed to be relocated off the project site.

ES-2.1.4 Runway

The now-abandoned runway slopes gently downward from the northwest to the southeast and extends over the length of the southern side of HAAF. It is below sea level and estimated to be approximately 3-ft. thick concrete, so it will be buried in place.

ES-2.1.5 Existing Biological Resources

There are approximately 19.5 acres of existing seasonal wetlands on the HAAF parcel (including the 12.4 acre Landfill 26 mitigation site). Another 16 acres of seasonal wetlands are located on the SLC parcel. The perimeter drainage ditch contains another 1.2 acres of brackish marsh. Most of the HAAF site is grassland. There are approximately 120 acres of pickleweed (*Salicornia virginica*)-dominated tidal marsh on the bayward side of the outboard levee that separates the site from San Pablo Bay. Several special status species are known to occur at the site. Four species (California clapper rail, California black rail, San Pablo song sparrow, and salt marsh common yellowthroat) utilize the outboard tidal marsh. It is assumed that the salt marsh harvest mouse is also utilizing the outboard tidal marsh. Three other species (northern harrier, short-eared owl, and burrowing owl) use the wetlands and grasslands for foraging and/or nesting.

ES-2.1.6 Potential Project Expansion

The Conservancy is engaged in discussions with the owners of the Bel Marin Keys (BMK) Unit V property (see Figure ES-2) for possible inclusion in this restoration project. The BMK site is approximately 1,610 acres. Addition of this parcel would obviate the need for a flood control levee along the northern perimeter of the HAAF and SLC parcels, though a flood control levee would be required further to the north.

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ES-3.1 DEVELOPMENT OF THE PROJECT ALTERNATIVES

The design team together with the HRG initially generated four alternatives and narrowed these down to two alternatives (alternatives 1 and 2) for consideration in the Feasibility Analysis. Alternative 1, the Natural Gradient alternative, is the Preferred Alternative because it is the only alternative that meets all the project objectives. The Preferred Alternative is the subject of the Conceptual Restoration Plan. Alternative 2, the Natural Sedimentation alternative, is a viable approach that can be implemented if adequate volumes of dredged material are not available. Briefly, these alternatives are:

- Alternative 1 (Preferred Alternative): Natural Gradient. This alternative would restore a combination of tidal wetlands and nontidal wetlands and upland habitats that would drop in elevation from the upland perimeter down to San Pablo Bay. This alternative would utilize dredged material to raise site elevations to restore the non-tidal wetlands above the tidal plain and to accelerate formation of tidal wetland in areas that will be subject to tidal action. Section ES-4 describes this alternative in more detail.
- Alternative 2: Natural Sedimentation (Backup Alternative). This alternative consists of breaching the outboard levee and allowing natural sedimentation to restore tidal wetlands on the site. Two variations were considered: (1) tidal action would be restored to the entire site, and (2) a new levee would preclude tidal action from a portion of the site where nontidal wetlands would be restored. The design team and the HRG carried the second variation forward in the Feasibility Analysis. Section ES-5 describes the differences between this alternative and the Natural Gradient alternative.
- Alternative 3: Historic Condition (Incorporated Into Alternatives 1 and 2). This alternative would restore the historic condition at the site, based on maps from the mid-1800s: large numbers of interior tidal ponds intermixed within a vast expanse of intertidal marsh. This alternative would not provide seasonal wetlands and it would be difficult to construct interior tidal ponds. However, both the alternatives carried forward are expected to restore interior tidal pond features through natural processes.
- Alternative 4: Seasonal and Tidal Wetland (Dropped from Further Consideration). This alternative would restore tidal and nontidal wetlands. A levee would separate the nontidal wetlands, which would be created at existing site elevations, from the tidal wetlands, which would be created through placement of dredged material. The design team and the HRG eliminated this alternative based on an analysis that the nontidal wetlands should have priority for construction with dredged material and therefore a separator levee would not be necessary.

ES-4.1 DESCRIPTION OF THE PREFERRED NATURAL GRADIENT ALTERNATIVE

The Natural Gradient alternative is the preferred alternative for restoration at Hamilton because it is the only alternative that meets all the project objectives. This section presents an overview of the conceptual-level design for the Natural Gradient alternative.

ES-4.1.1 Overview of the Natural Gradient Alternative

The Natural Gradient alternative meets the project ecological objectives of 80 percent tidal wetlands and 20 percent nontidal wetlands and uplands. This section describes the ecology, hydrology and geomorphology of the habitats to be restored and it describes how each habitat will change over time due to the natural processes of sediment accretion, subsidence, settlement, and sea level rise. Figure ES-3 shows the layout of this alternative at completion of project construction, and Figures ES-4 and ES-5 show the site after 10 and 50 years, respectively. Table ES-1 summarizes the target habitats for the Natural Gradient alternative. This alternative relies on the site topography to drain water through the site, resulting in a design that minimizes the need for active management and maintenance.

Non-Tidal Habitat

Non-tidal habitat will be located on the northwestern portion of the project site (130 acres) and on the southeastern portion of the site (20 acres) (Figure ES-3). Three habitat types will be constructed with dredged material in these areas: uplands, seasonal ponds and wetlands, and a riparian corridor. However, as the dredged material settles (compacts in place) and subsides (compacts the underlying substrate) and sea level rises over time, the actual acreage of the non-tidal habitat will gradually decrease, with the lower elevations changing to tidal habitats. The seasonal ponds and wetlands will be interspersed across the non-tidal portion of the site as a result of topographic variability.

Uplands

Upland areas will be constructed around the site perimeter and will consist of the flood control levees and a buffer/wildlife corridor area. Upland areas will be vegetated by grasses, shrubs and trees established through natural colonization. Uplands will provide refuge for animals using the tidal wetlands, migratory corridors for animals, foraging habitats for many animals, and roosting and nesting habitats for many bird species such as the Burrowing Owl, Loggerhead Shrike, and Northern Harrier.

Seasonal Ponds and Wetlands

Seasonal ponds and wetlands will be constructed in the panhandle area in the northwestern portion of the HAAF parcel and in the "ballfields" area in the southeastern portion of the HAAF parcel. Formation of seasonal ponds and wetlands would rely on rainfall and flood flows for their water supply.

Water and soil salinities would vary throughout these seasonal wetland and ponded areas, providing for a range of plant community composition and ecological functions. The seasonal wetlands will primarily provide low herbaceous vegetation intermixed with shallow seasonal ponds and emergent wetland vegetation. The seasonal ponds will be open water areas with vegetated or unvegetated perimeters. These seasonal habitat will be intermixed and their extent and duration will vary from year to year depending on the local climate. The site will provide habitat for shorebirds and migratory waterfowl. Invertebrate abundances will be high, supporting a food web including shorebirds and waterfowl, as well as species normally found in upland grasslands.

Drainage Channel Riparian Corridor

A drainage channel will be constructed to provide gravity drainage for seasonal flows from the NHP outfalls, Landfill 26 and Pacheco Pond through the tidal marsh to San Pablo Bay (Figure ES-3). These channels would bisect the seasonal ponds and wetlands. The drainage channel would have emergent vegetation such as bulrush (*Scirpus* spp.), cattails (*Typha* spp.), and rush (*Juncus* spp.). Additionally, some riparian trees could become established along the drainage channel and form patches of riparian habitat. The riparian shrubs and emergent vegetation will provide habitat for song birds, raptor perching and cover for small mammals.

Evolution of the Non-Tidal Habitat

Three types of evolution are expected in the non-tidal habitats: ecological changes as vegetation and wildlife habitat colonize the new substrate, structural changes as the areas settle and subside and are subject to sea level rise, and hydrologic changes resulting from the structural changes. Ecological changes are likely to include continual changes in the plant community composition as the early pioneer species are augmented and in some cases replaced by secondary species and increases in wildlife use as food web complexity builds over time and migratory and resident wildlife species colonize the areas.

Structural changes will include differential settlement and subsidence of the placed dredged material. Hydrologic changes will result from the structural changes and fall into two categories: (1) depressions that pond water will form across the landscape as a result of the differential settlement, which will define the locations, extent and inundation regimes of the seasonal ponds and wetlands; and (2) as elevations drop and sea level rises, the lower elevations will become subject to infrequent tidal action and begin to develop a hydrologic regime associated with tidal pannes and high tidal marsh (see the next section describing the tidal wetland habitat). Figures ES-4 and ES-5 show the expected distribution of these habitat types ten and fifty years after project construction, respectively, illustrating how the total acreage of these habitats diminishes over time. All these evolutionary changes are considered beneficial and reflect the long-term ecological goals for the Hamilton site.

Tidal Habitat

Tidal habitats will be located on much of the HAAF parcel (428 acres) and on the SLC parcel (250 acres) (Figure ES-3). Six tidal habitat types will be created in this alternative. Intertidal mudflats and tidal pannes will be the initial habitat type when the levees are breached. Tidal marsh channels and subtidal open water will form on and within the intertidal mudflat. Lastly, tidal marsh and interior tidal ponds will form by natural processes as the system evolves over time. The estimated acreages of each habitat type at equilibrium (i.e., approximately at the conclusion of the 50-year planning horizon for the project) are shown in Table ES-2.

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Tidal Pannes

Tidal pannes are landscape features that pond water at the upland perimeter of tidal wetlands in the San Francisco Estuary. These pannes will be constructed adjacent to the non-tidal habitats at final elevations of about +4.5 ft. The hydrologic regime in the tidal pannes will include: (1) year-round infrequent tidal inundation during the higher monthly tides (spring tides); and (2) seasonal freshwater inputs from direct rainfall and runoff from adjacent areas. Tidal pannes typically dry between spring tides during the summer and fall dry seasons and may remain inundated during some or all of the winter and spring rainy season depending on local precipitation. Consequently, surface water and soil salinities tend to vary from nearly fresh to hypersaline, resulting in environmental stresses that limit vegetation colonization. Because tidal pannes occupy the topographic transition between tidal marshes and non-tidal habitat, both the total acreage and actual location of tidal pannes will change over time due to settlement, subsidence, and sea level rise (compare the tidal panne locations in Figures ES-3, ES-4 and ES-5).

During the very high tides that flood these pannes, ducks and larger waders might forage in these areas. Shorebirds may find some prey in these areas, particularly after inundation by very high tides, although most of the use of this habitat type would be by roosting gulls and shorebirds during normal high tide, when their preferred foraging areas are inundated.

Tidal Marsh

Tidal marsh will be the dominant habitat and eventually extend over most of the Hamilton site over time (Figure ES-5). The tidal marsh plain consists of low, middle, and high vegetated marsh plus channels and interior tidal ponds (described in subsequent sections). The Natural Gradient alternative will involve construction of only the "template" (Figure ES-3) upon which natural processes will then act to create the tidal marsh over time. This template consists of an intertidal mudflat constructed of primarily fine-grained dredged material placed at elevations at least one foot below the elevation at which "low" marsh vegetation begins to colonize, construction of internal peninsulas on the HAAF portion to promote rapid sedimentation, and introduction of tidal action through breaching the existing outboard levee. Dredged material would be placed at elevations ranging from a maximum of +2.0 ft. around the site perimeter down to 0.0 ft. nearest the locations for the levee breaches.

Tidal marsh will form on this "template" in two ways. First, it will progress from the edges inward as vegetation colonizes from the site perimeter in bands of "high" marsh and "middle" marsh (see Table ES-1). This process will start soon after construction since the appropriate elevations will exist around the entire site perimeter. Second, tidal marsh will form in the interior areas as sediment accretion raises site elevations up to where "low" marsh plant species can begin to colonize and spread (see Table ES-1). This form of marsh establishment will begin a few years after return of tidal action, once enough sedimentation has occurred. Over time, a fully vegetated marsh plain will colonize the site with elevations ranging between MHW to about one foot above MHHW. A dense network of channels and numerous interior tidal ponds will be interspersed throughout the site (see Figure ES-5).

The tidal wetlands are expected to provide habitat for a number of bird species, including several threatened or endangered species dependent on salt marsh habitats including the California black rail, California clapper rail, San Pablo song sparrow, and salt marsh common yellowthroat. Large numbers of raptors would also use the site, including the peregrine falcon, merlin, American kestrel, red-tailed hawk, northern harrier, and white-tailed kite.

The salt marsh harvest mouse, a state- and federal-endangered species, is expected to use salt marsh habitat dominated by pickleweed.

Channels

Slough channels in tidal marshes are the conduits through which tidal waters flow, carrying their load of sediment, nutrients, and aquatic organisms into and out of the marsh. Slough channels will form rapidly on the tidal mudflats. Channels will range in size from very large channels on the order of hundreds of feet in width that never empty completely to very small channels on the order of one foot or less in width that only are filled with water during higher tides. Formation of the medium and large slough channels will result in down-cutting into placed dredged material by tidal flows. Much of the eroded material will be redeposited elsewhere on the site, while some of the eroded material will be transported back into San Pablo Bay.

Slough channels can be either intertidal, in which case they drain at low tide, or subtidal, in which case they support open water at all times. Water depths and surface area vary continually throughout the rise and fall of the tides, thereby providing constantly changing environmental conditions. Channels thus support a diversity of ecological functions depending on channel size and tidal stage, ranging from shallow and deep open water areas to intertidal mudflats.

Channels within the restored tidal marsh system will greatly enhance the use of the area by fish entering from San Pablo Bay. A number of important game or commercial species would spend the early stages of their lives in such a tidal marsh, including Pacific herring, English sole, and striped bass. San Pablo Bay has been identified as designated critical habitat for the winter run of the Chinook salmon and fall-run Chinook salmon have been observed using the nearby Sonoma Baylands wetland restoration site.

Intertidal Mudflats

Intertidal mudflats will be the dominant habitat type initially and will gradually disappear as natural sedimentation raises the site to elevations suitable for tidal marsh vegetation colonization. Intertidal mudflat will initially extend over most of the tidal portions of the site (Figure ES-3) and will resemble the large mudflats with very gradual slopes found adjacent to Hamilton in San Pablo Bay. The sequence of evolution from intertidal mudflat to vegetated tidal marsh is described above. Intertidal mudflats will mostly be limited to the slough channels within the mature tidal marsh.

Mudflats typically support a high abundance of benthic organisms (i.e., the organisms that live in the mud and on its surface) that serve as a critical component of the food web of estuarine ecosystems. Numerous shorebirds are expected to feed on these benthic organisms at low tide primarily during migration and winter. A number of gulls are expected to forage in or around the marsh and mudflats as well, and Forster's and Caspian terns and ospreys would hunt for fish in offshore waters and marsh channels.

Subtidal Open Water

Subtidal open water areas support continuous open water throughout all tidal stages and exist where the elevations are below the Extreme Low Water (ELW) elevation. In the Natural Gradient alternative, subtidal open water areas will initially be limited to the levee breach and pilot channel in the outboard marsh (see Section ES-4.2.1 below). Subtidal open water areas will then increase fairly rapidly as tidal flows scour large slough channels into the site from the levee breach (see Table ES-2).

Subtidal open water areas provide foraging habitat for migratory and resident waterfowl, as well as brown pelicans and cormorants. These areas would also likely benefit those fish species listed above for the tidal marsh.

Interior Tidal Ponds

Interior tidal ponds are landscape features of mature, equilibrium tidal marshes in the San Francisco Estuary and were historical features at Hamilton. Interior tidal ponds are located atop "drainage divides," or higher areas on the marsh plain between adjacent slough channels. These drainage divides are directly analogous to ridge lines that divide watersheds in upland settings except that the height of drainage divides in tidal marshes is on the order of inches. Interior tidal ponds will not be constructed but instead are expected to form through natural processes within the middle and high marsh plain.

Interior tidal ponds have three water sources. Most prevalent are tidal inputs, typically from higher spring tides. Direct rainfall and emergent groundwater also contribute to surface ponding, while water is lost by surface drainage, groundwater infiltration, and evaporation.

Interior tidal ponds provide foraging habitat for numerous species of shorebirds and waterfowl.

ES-4.1.2 Constructing the Natural Gradient Alternative

Principal Engineering Aspects

Flood Control Levee

The Natural Gradient alternative requires construction of a flood control levee around most of the site that will tie into the existing NHP levee (Figure ES-3). The flood control levee crest elevation will be constructed to +12 ft., based on the estimated 100-year high tide elevation of +7.0 ft., expected settlement of up to 3.5 ft., and an expected 0.5 ft. of sea level rise. .

Tidal Berms

Earthen berms, 100 ft. in width, will be constructed along the interior of the flood control levees in tidal areas to provide erosion protection and additional habitat. These berms begin along the flood control levee slope at an elevation of +6 ft. and slope down toward the tidal marsh to an elevation of +2 ft. Because they are located at intertidal elevations, the tidal berms will provide an early colonization site for tidal marsh vegetation and thereby speed the process of marsh establishment.

Internal Peninsulas

A system of internal peninsulas is proposed for the HAAF parcel as part of the site template to accomplish three objectives: (1) reduce flood control levee erosion by decreasing internal wave heights, thereby reducing wave runup; (2) promote rapid sedimentation by limiting internal wave energy; and (3) guide the location of deep tidal slough channels away from the flood control levees and the wetlands covering the runway. The peninsulas will be separated from the site perimeter to limit predator access. Internal peninsulas will be located to provide a maximum fetch length of 3,000 ft. The location of the internal peninsulas are shown in Figure ES-3. Crest elevations will be +5 ft. with a top width of 10 ft. The peninsulas will be constructed with on-site borrow material and, if additional volumes are needed, with dredged material. The internal peninsulas are expected to have a 10-year design life, after which time sedimentation and vegetation colonization will have raised the surrounding marsh plain high enough so that the marsh rather than the peninsulas dampen internal wind waves. Over time as the peninsulas settle and subside into the tidal marsh, they will become high tide refugia within the middle and high marsh plains.

No internal peninsulas are proposed for the SLC parcel for three reasons. First, because the precise relationship of wind fetch length to limitations on marsh vegetation colonization is not certain, this project provides an opportunity to better evaluate this phenomenon. Second, the SLC parcel is smaller (250 acres) and its fetch distances are already within the 3,000 ft. range planned for the HAAF parcel. Finally, because the upper three feet of soil at the SLC parcel will be excavated for use as borrow material (see below), the peninsulas would have to be nearly 15 ft. tall to achieve the design crest elevation and would thus be difficult and expensive to construct. For these reasons, no internal peninsulas will be constructed on the SLC parcel and instead a tidal berm will be included adjacent to the flood control levee to protect it against erosion. The performance of the two parcels can be evaluated over time to improve our understanding of wind fetch processes on sedimentation and marsh vegetation colonization.

Levee Breaches and Pilot Channels

Two levee breaches are proposed, one for the HAAF site and another for the SLC site. Two breaches are needed because the outfall pipe alignment for the Novato Sanitary District currently bisects these two parcels and, unless the pipe is relocated, its protection requires the two parcels to be independent hydrologically (see Section ES-4.2.3 below). In addition to the levee breaches, pilot channels will be excavated through the outboard tidal marsh to provide unrestricted tidal exchange with San Pablo Bay. The pilot channels have been sited to cut through the narrowest portion of the outboard marsh in order to minimize impacts to this marsh. The dimensions of the levee breaches and pilot channels are presented in Table ES-4. The pilot channels will have the same depth as the levee breaches but will have narrower top widths in order to minimize construction impacts to the outboard marsh. Levee breach and pilot channel dimensions are sized for the equilibrium tidal prism, not the four times larger tidal prism when the levees are initially breached. This under-sizing is not expected to have adverse consequences on tidal exchange with San Pablo Bay nor on the evolution of the restored tidal marsh. Further analysis of the inlet dynamics is recommended for final design (see Section ES-7).

Lowering Outboard Levee

The existing outboard levee separating the HAAF and SLC parcels from San Pablo Bay will be lowered to varying elevations between +3.5 to + 5.0 ft. to provide high marsh and high tide refugia.

Borrow Materials

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Borrow materials are required to construct the flood control levee and adjacent tidal berm (about 1.57 million cubic yards [mcy]), internal peninsulas (about 93,000 cy), and NSD outfall pipe protection levee (about 73,000 cy), for a total need of approximately 1.73 mcy. The project will generate about 1 mcy by excavating the upper 3 ft. of the SLC parcel. The remaining 0.73 mcy will come from several sources, including in descending order of preference: (1) adjacent or nearby clean borrow soils for the internal peninsulas, (2) using dredged material for the tidal berms adjacent to the flood control levee, (3) reusing existing levee material for the new flood control levee, (4) constructing the flood control levee initially to less than final design height and then using material gained from later construction activities such as the levee breach, pilot channel excavation and lowering of the outboard levee, (5) using additional surface soils from the HAAF parcel if suitable, and (6) importing construction fill. Preliminary analyses indicate that the range of available sources should provide adequate soil volumes for all the construction needs, without relying upon the costly import of construction fill.

Interior Channel Formation Relative to Existing Paved Surfaces

The internal peninsulas are designed in part to "steer" the location of larger tidal slough channels away from buried paved surfaces that might interfere with channel development. However, in one location, the buried runway would be up to 1 ft. higher than anticipated channel depths. This interference is not considered significant since the channel should be able to increase in width to accommodate expected tidal flows. Three other paved areas in the revetment area north of the runway would be up to three feet higher than the anticipated channel depths. In these locations, removal of the paved surfaces is recommended to allow natural slough channel formation.

Existing Infrastructure

NSD Pipeline and Dechlorination Facility

Relocation of the dechlorination facility to the NSD treatment plant is part of the Natural Gradient alternative. Two options are available to accommodate the NSD pipeline: (1) construct a new access levee between the HAAF and SLC parcels to protect the pipe and allow continued access by NSD personnel, which is the default configuration, or (2) truncate the outfall pipe so that it discharges directly into the restored wetland. This latter alternative would allow the HAAF and SLC parcels to become a single hydrologic unit with one rather than two levee breaches, which would be a preferred variation to the proposed design. Discussions are ongoing with NSD.

Drainage Facilities

Future drainage patterns following project completion will differ from the existing conditions. Rather than being collected in the perimeter drainage ditch and routed to the pump station at the northeast corner of HAAF to be pumped into San Pablo Bay, the inflows will gravity drain through the uplands and wetlands to San Pablo Bay through the levee breach. These changes will require reconstructing existing flap-gated culverts at new, higher elevations, installation of a small pump for part of the Landfill 26 drainage, and reconstruction of flap-gated culverts from Pacheco Pond. The plan assumes that the U.S. Army, as part of base closure, will address drainage of the adjacent Las Gallinas Valley Sanitary District and California Quartet/Bel Marin Keys Unit V properties.

Dredged Material Engineering

The Natural Gradient alternative will use dredged material to raise the site to final elevations in the non-tidal areas and to target elevations in the tidal areas. This design alternative can use a combination of sand and fine-grained dredged material or only fine-grained dredged material in order to accommodate the range of potential dredged material sources in the San Francisco Bay. All dredged material considered for use at Hamilton will have chemical concentrations and sediment toxicity below levels that could harm wetland biota.

Comparing Use of Sandy Versus Fine-Grained Dredged Material

Dredging projects in the San Francisco Bay produce a range of grain sizes in the material dredged, ranging from fine-grained bay muds to coarser sands. These different material types have several differences in their properties for constructing wetland restoration projects and for supporting wetland ecosystems. The design of the Natural Gradient alternative takes these properties into account in determining the location, elevations, and relative amounts of each type of dredged sediment.

The non-tidal habitats will be constructed with a thick foundation of sandy dredged material capped by one to two feet of fine-grained dredged material. The tidal habitats will be constructed primarily with fine-grained dredged material, though sandy dredged material foundation could be used in the deeper portions of the site.

Dredged Material Volumes

Volumes of needed dredged material were calculated separately for the non-tidal and tidal portions of the site. The Natural Gradient alternative proposes to use sand and fine-grained dredged material in the non-tidal areas. A total of approximately 1.8 mcy of sand would be placed as the lower and thicker layer, and approximately 0.3 mcy of fine-grained material would be placed on top of the sand to provide the substrate for the seasonal ponds and wetlands. Several questions remain regarding the long-term behavior of this combination of dredged material to achieve the desired ecological objectives; additional studies will be performed prior to completion of final design to investigate these issues.

The Natural Gradient alternative proposes to use primarily fine-grained dredged material for the tidal wetlands, with the possibility that sand would be placed first in the deeper areas at least 1 ft. below the final constructed surface. Assuming that only fine-grained dredged materials are used, the HAAF tidal wetland area could accept up to 5.0 mcy and the SLC tidal wetland area could accept another 3.5 mcy, for a total capacity of up to 8.5 mcy. The Natural Gradient design could also be constructed using lesser total quantities of dredged material, with the difference being a longer time for evolution of the tidal wetlands because of the increased volume of natural sedimentation required.

Dredged Material Potential Sources

Potential sources of dredged material include both maintenance and new work dredging projects. Potential sources of new work dredging project material include the Port of Oakland -50 ft. project, Southhampton Shoal, and Concord Naval Weapons Station. These projects together could supply up to 10 mcy of sandy material and 9 mcy of fine-grained material. Potential sources of maintenance dredging material include up to 18 projects based on probable timing, location, dredging methods, material type, and material history. The average annual dredging volume of these 18 projects is 2.2 mcy, of which 1.7 mcy is fine grained and 0.5 mcy is sandy. Assuming a 3 to 5 year construction period for this project, between 6.6 and 11 mcy of maintenance dredged material could be available for Hamilton.

Dredged Material Offloading

Four options were considered for offloading dredged material at Hamilton: a deep water site, a shallow water site, dredging a deep water channel close to the site, and dredging a shallow water channel close to the site. The preferred alternative proposes that dredged material will be delivered by barge from the dredging locations, to an unloading pumpout facility located on a moored barge. A submerged pipeline will carry the dredged material in a slurry onto the site. The preferred approach is a deep water offloading facility sited in San Pablo Bay at -16 ft. MLLW, which would allow dredgers the maximum flexibility to use the largest available barges at all tidal stages. This deep water location would be 24,000 ft. from the site and would require booster pumps to move the slurry onto the site. A shallow water facility in San Pablo Bay at -8 ft. MLLW may also be located closer to the shore for use by smaller dredging projects, which would shorten the pumping distance to approximately 15,000 ft. These offloading facilities could be operated simultaneously to accommodate concurrent dredging projects. Options to dredge shallow or deep channels closer to the site were dropped from consideration because of the cost to dredge and maintain these channels.

Cost Estimate

The preliminary cost estimate for the Natural Gradient alternative considers two categories of costs: site preparation and dredged material placement. Site preparation costs include construction of the flood control levee, tidal berm, internal peninsulas, accommodation of the NSD pipeline and dechlorination facilities, levee breaches, outboard marsh pilot channels, relocation or removal of other utilities, seeding and planting, and any other grading needed. Not included in the cost estimate are demolition and removal of remaining structures at HAAF and SLC; it is assumed that the U.S. Army and others will complete these activities prior to property transfer. Site preparation costs are estimated at approximately $18 million. However, if the U. S. Congress designates Hamilton as a beneficial reuse site then 75 percent of these costs will be paid by the federal government (U.S. Army Corps of Engineers) and the remaining 25 percent would be the "local sponsor" cost share. Thus, the local sponsor cost would be $4.5 million.

Dredged material placement costs depend on a number of factors, including the relative proportions of sandy and fine-grained dredged material placed at the site. Costs also depend on the source of the dredged material (maintenance versus new work dredging) as it relates to the cost differential between placement at Hamilton and disposal at an in-bay location or the deep ocean site. This cost estimate assumes the total volume of dredged material needed to construct the site features is used. Dredged material placement costs attributable to the Hamilton project would range from approximately $14 million to $21 million. Because the larger dredging projects are co-sponsored by the federal government, if the U. S. Congress designates Hamilton as a beneficial reuse site then the 75 percent cost sharing described above will be paid by the federal government and the remaining 25 percent would be the local sponsor cost share. Thus, local sponsor costs would range between $3.5 million to $5.3 million.

The total project cost will therefore range from $32 million $39 million.

The local sponsor share would range from $6 million to $9.75 million.

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ES-5.1 NATURAL SEDIMENTATION ALTERNATIVE

The Natural Sedimentation alternative is not the preferred alternative but would be implemented if no dredged material becomes available for wetland restoration. This alternative meets many of the project goals and objectives with the exceptions discussed below. This alternative would not use dredged material and instead would rely on natural sedimentation to raise the site to elevations suitable for tidal marsh establishment. Non-tidal areas could not be constructed at elevations above the limits of tidal influence because of the lack of fill material; consequently, an additional levee would be constructed across the southeastern limit of the panhandle area and managed perennial and seasonal ponds and wetlands would be created behind this new levee with the use of water control structures (Figure ES-6).

The major differences in the Natural Sedimentation alternative are:

- the 80/20 split of tidal and non-tidal habitat cannot be achieved (see Section ES-5.1)
- the non-tidal habitats are significantly different hydrologically and ecologically and do not include the transitional uplands and corridor areas (see Section ES-5.2)
- the non-tidal habitats would require active management in perpetuity
- no tidal pannes would be created
- the internal peninsulas would be located to achieve 2,000 ft. fetch lengths rather than the 3,000 ft. of the Natural Gradient alternative, to account for the greater water depths of the unfilled tidal portions of the site, and
- the timeline for establishment of tidal wetlands is longer (see Section ES-6.0).
- the cost of constructing the project would be approximately $15 million.

The remaining project components are identical to the Natural Gradient alternative and thus are not described here.

ES-5.1.1 Mix of Tidal and Non-Tidal Habitat

The Natural Sedimentation alternative does not use dredged material to raise site elevations above tidal influence, therefore it is limited in its ability to establish non-tidal habitat. Instead of the target of 80 percent tidal and 20 percent non-tidal habitat that the HRG established, the Natural Sedimentation alternative provides approximately 92 percent tidal wetlands and 8 percent non-tidal managed seasonal ponds and wetlands and perennial open water and emergent marsh.

ES-5.1.2 Description of the Non-Tidal Habitat

Under the Natural Sedimentation alternative, the non-tidal habitats would be constructed at existing grade behind a "cross panhandle" levee fitted with water control structures. The water supply for these areas would be rainfall, freshwater inputs from Landfill 26, one of the NHP outfalls, and Pacheco Pond and controlled tidal flows through a gated culvert. Storm outflows into the tidal wetland would occur by gravity drainage during low tide through separate flap-gated culverts (see Figure ES-6). Because no dredged material would be used in this alternative, no uplands and wildlife corridor areas would be created and thus there would not be a "natural gradient" from the upland to tidal portions of the site; instead, the restored wetlands would end abruptly at the levees. The non-tidal wetlands would be largely perennial emergent marsh and open water areas rather than the goal of mainly seasonal ponds and wetlands.

The seasonal wetland and fully aquatic habitats created in this alternative will have variable salinities. The dominant plant species in this system will be salt-tolerant plants that will reach their maximum productivity from early spring to late summer. Plant species that will likely be found in the saline seasonal wetlands include salt grass, pickleweed, fat-hen (*Atriplex triangularis*), brass buttons (*Cotula coronopifolia*), gumplant (*Grindelia humilus*), alkali bulrush (*Scirpus maritumus),* and alkali heath.

The diversity and types of wildlife species occurring in these habitats would depend in large part on the extent of the habitats, the depth and extent of water, and the type and amount of vegetation present. The presence of shallow water, even on a seasonal basis, would provide suitable foraging habitat for many shorebirds (especially during high tide, when tidal mudflats are inundated), gulls, waders, and dabbling ducks. If salt marsh vegetation (such as pickleweed, salt grass, or gumplant) is well developed, then bird species such as the savannah sparrow or song sparrow might nest in these habitats. Black rails might nest in the seasonal wetlands adjacent to broader pickleweed tidal marshes. Salt marsh harvest mice are expected to occur in seasonal wetlands if sufficient cover of pickleweed is present. If grasses dominate, then more upland mammals (e.g., western harvest mice, deer mice, and California voles) would be expected to occur.

ES-6.1 TIMELINE FOR TIDAL WETLAND RESTORATION

Both project alternatives rely on natural sedimentation to raise the tidal portions of the site to marsh plain elevations. Because no dredged material will be used, no tidal pannes will be constructed as part of the Natural Sedimentation alternative. The Natural Sedimentation alternative begins at existing site elevations, which average -5 ft. at the HAAF site and -8 ft. at the SLC (after excavating the upper 3 ft. of soils as borrow material). However, the Natural Gradient alternative establishes initial site elevations at 0 to +2 ft. through placement of dredged material. The major differences between the two alternatives for establishing tidal marsh, then, are (1) the total amount of natural sedimentation needed and thus the elapsed time required to fill the site and (2) the time needed to place dredged material.

Sedimentation rates are a function of (1) the suspended sediment supply in the inflowing tidal waters, which varies seasonally and from year to year, (2) site elevations, with higher elevations having less tidal inundation and thus less opportunity for sediments to deposit, and (3) sediment resuspension due to wind waves and tidal flows.

To predict the time required to reach marsh plain elevations, a brief analysis was performed relating expected sedimentation rates to site elevations. Prediction of long-term sedimentation rates is difficult and uncertain. Thus, the analysis generated a range of time to reach target elevations based on a range of expected sediment concentrations. Two ecologically meaningful target elevations were considered: MHW, which is the upper elevation for cordgrass-dominated low marsh and the lower elevation for pickleweed-dominated middle marsh, and MHHW, which is the upper elevation for middle marsh and the lower elevation for high marsh comprised of a mixture of salt-tolerant plant species. Finally, the analysis included an assumption that the outboard levee would be breached four years later under the Natural Gradient alternative, which is the expected upper limit of time to place the dredged material.

Combining these factors of estimated construction time with the expected sedimentation rates, the anticipated time required to reach the MHW and MHHW elevations on average are presented in Table ES-5. Because the estimates have a margin of error of at least five years, all times are rounded to the nearest five-year increments. Near the tidal inlet (termed the "front marsh" in Table ES-5), the Natural Gradient alternative accelerates reaching the MHW average elevation from between no difference to five years, and the MHHW average elevation from between no difference to ten years, relative to the Natural Sedimentation alternative. Away from the tidal inlet (termed the "back marsh" in Table ES-5), the Natural Gradient alternative accelerates reaching the MHW average elevation from between five and ten years, and the MHHW average elevation from between five and fifteen years, relative to the Natural Sedimentation alternative. These results are shown as a comparative project timeline in Figure ES-7.

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ES-7.1 CONSIDERATIONS FOR FUTURE STUDY

Additional Information Needs Related to Base Closure, Novato Sanitary District Facilities, and Adjacent Properties

Following is a listing of further studies that are desirable to clarify issues related to the Hamilton Wetlands Restoration project.

- It is necessary to know how the Army base closure and transfer process plans to resolve issues of contaminants on site and the availability of clean fill material onsite. This information will affect quantity and cost estimates for levee, peninsula, and tidal berm construction.
- It is necessary to know how the Army base closure and transfer process plans to resolve the perimeter drainage issues, in particular flow from adjacent areas.
- A feasibility study of options for resolving issues related to the Novato Sanitary District's dechlorination station and outfall line is needed. It should include an assessment of the ramifications of levee and internal berm construction above and adjacent to the existing pipeline, and the potential advantages of having the pipeline discharge to the site.
- The SLC site wetlands delineation needs to be quantified.
- Including the portion of the GSA Phase II property between Landfill 26 and the seasonal wetlands in the project needs to be considered to make the area topographically and hydrologically contiguous and functionally integrated and omit the flood control levee in that area
- There is a need for further investigation into regional opportunities to expand the restoration area to include the California Quartet Bel Marin Keys Unit V parcel.
- Further investigation and coordination with the NHP is required to define the acceptable methods and elevations for material placement on and adjacent to the NHP's levee, so that settlements of the levee and of nearby structures are not significantly impacted.

Wetland Design Development Studies

Following is a listing of additional studies that are needed to be implemented to refine the conceptual designs and performance estimates included in this report.

- Conduct site-specific geotechnical investigations to establish the basis for final levee design.
- Conduct field investigations at other wetland sites to evaluate levee performance in regard to stability, settlement and scour/erosion.
- Once the specific dredging projects (at least the major contributors) supplying material to this project have been identified, evaluate and decide on the potential off-loader locations and the contracting methods for material off-loading and placement.
- Refine estimates of the time frame for tidal wetlands evolution by:

- Conducting detailed hydrodynamic and sediment transport modeling to refine the estimates of the rate and distribution of sedimentation
- Gathering additional existing data and conducting field monitoring to refine estimates of suspended sediment supply to the tidal wetlands
- Conducting field investigations at several reference tidal marshes created using dredged materials
- Conducting field investigations of other restored tidal marshes to assess vegetation colonization rates

- Conduct field investigations at several reference San Francisco Bay tidal marshes created using dredged materials to optimize the target fill elevations.
- Refine the internal peninsula design based on further investigation of wind-wave impacts on sedimentation rates, vegetation colonization rates, and peninsula erosion and subsidence.
- Evaluate the expected persistence of the internal peninsulas using field reconnaissance at other wetland locations.
- Conduct detailed hydrodynamic modeling of inlet dynamics to characterize the potential for scour in and adjacent to the inlet.
- Conduct field surveys of other wetland locations and geomorphic analysis to assess the evolution of the tidal wetland inlet channel across the marsh and mudflat.
- Characterize the effects of removing some or all of the outboard levee on wave action, flooding, and wetland development.
- Conduct field surveys to observe vegetation and hydrologic characteristics of analogous seasonal wetlands created on sand and dredged Bay Mud substrates in order to refine the seasonal wetlands design. The design of the upper layers of the seasonal wetlands fill will require further analysis to define the material type and placement requirements that will result in acceptable permeability and ponding characteristics.
- Conduct field surveys to observe the topography, hydrology, and salinity of reference tidal pannes in order to refine the tidal panne design.
- Specify design features (invert elevation, flow capacity, etc.) for the hydraulic control structure(s) between Pacheco Pond and the panhandle necessary to mitigate for potential flood impacts and/or improve Pacheco Pond flood conditions.
- The results of the Section 204 Study of the Hamilton Project by the U.S. Army Corps of Engineers, San Francisco District should be considered and/or incorporated into subsequent and final project designs.
- During subsequent project investigations and the final design the dredged material supplies for the project need further detailed evaluation, planning and coordination.

Table ES-1 Target Habitats

Habitat	Typical Flora	Typical Animals	Typical Birds	Special Status Species	Potential Nuisance Species	Elevation Range	Water Source	Frequency of Inundation
Upland	Annual & perennial grasses (including *Leymus triticoides*), forbs, shrubs	Mule deer, jack rabbit, California vole, broad-handed mole, lizards, snakes, fox, raccoon, striped skunk	raptors, sparrows, warblers, mourning dove, Anna's hummingbird, finches, California towhee	Burrowing owl, loggerhead shrike, northern harrier	Trees would threaten levee integrity	above 7 ft (100 year high tide)	Precipitation, localized runoff & drainage	No standing water
Seasonal Wetland	Unvegetated areas interspersed with grasses, rushes, bulrushes, forbs, cattail, pickleweed	Pacific treefrog, common garter snake, gopher snake, Botta's pocket gopher, gray fox, coyote, raccoon, aquatic invertebrates	shorebirds, dabbling ducks, wading birds, raptors, passerines	Salt sarsh common yellowthroat, northern harrier	A monoculture covering the entire area would be undesirable. Feral cats, unleashed dogs, red fox.	above 5 ft. (above representative spring tide)	Precipitation, localized runoff & drainage, estuary	Seasonal. Infrequently with extreme tides or tides coupled with storm surge.
Tidal Panne	Primarily unvegetated, seasonal algae	Aquatic invertebrates, minimal use by mammals, reptiles and amphibians, due to lack of cover	primarily shorebirds and gulls, occasionally ducks and wading birds	Salt marsh bird's beak (at edges), western snowy plover, California least tern		4.5 ft. (representative spring tide)	Precipitation and tidal flooding from estuary	Seasonal, with spring tides and other extreme tidal events
Tidal Marsh Ponds	Unvegetated	Copepods, cladocera, small fish	shorebirds, dabbling ducks, wading birds			approx. 3 to 4 ft.	Precipitation and tidal flooding from estuary	Normally inundated, can dry in summer between spring tides
Tidal Marsh	**Low marsh:** cordgrass **Mid-marsh:** pickleweed **High marsh:** salt grass, gum plant	Common garter snake, gopher snake, western harvest mouse, deer mouse, California vole	Rails, marsh wren, sparrows, raptors	California clapper rail, black rail, salt marsh harvest mouse, San Pablo song sparrow, salt marsh common yellowthroat, peregrine falcon	Perennial pepperweed in high marsh and East Coast cord grass in low marsh. Asiatic clam and mitten crab.	**Low marsh:** MT (0.61ft) to MHW (2.86 ft.) **Mid-marsh:** MHW to MHHW (3.43 ft.) **High Marsh:** MHHW to 4.5 ft.	Estuary	**Low marsh:** twice daily tidal action **Mid-marsh:** at least daily high tide **High Marsh:** monthly spring tides
Intertidal Mudflats	Algae	Polychaetes, amphipods, snails, clams, fish (when inundated)	Dunlin, plovers, sandpipers, dowitchers, yellowlegs, long-billed curlew, willet, marbled godwit, ducks (when inundated)		Asiatic clam	MT (0.61 ft) to MLLW (-2.63 ft)	Estuary	Daily tidal cycle
Channels and Subtidal	**Channels:** may have fringe of cordgrass or bulrush **Subtidal:** algae, eel grass	Shrimp, planktonic and benthic invertebrates, fish	Diving ducks, pelicans, cormorant	California brown pelican, Sacramento splittail, striped bass, green sturgeon, Chinook salmon, steelhead trout	Non-native fish species and invertebrates	**Channels:** MHHW to ELW **Subtidal:** Below ELW	Estuary	**Channels:** daily tidal cycle **Subtidal:** permanently submerged

(1) MT = mean tide, MHW = mean high water, MHHW = mean higher high water, MLLW=mean lower low water, ELW=extreme low water

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Table ES-2
ESTIMATED EQUILIBRIUM TIDAL WETLAND HABITAT TYPES

Channel Characteristics	Channel Order					Total
	1	2	3	4	5	
HAAF Site						
Total Length of Channels (ft)	141,109	46,046	13,148	4,597	1,300	206,200
Average top width at MHHW (ft)	2	6	22	80	269	--
Average Depth below MHHW (ft)	1.0	3.2	8.0	10.5	11.8	--
Subtidal Habitat (acres)	-	-	5.8	8.2	7.9	21.9
Intertidal Habitat (acres)	6.5	6.3	0.8	0.3	0.1	14.0
Marsh plain (acres)	--	--	--	--	--	376.5
SLC Site						
Total Length of Channels (ft)	65,974	26,035	8,990	3,801	1,300	106,100
Average top width at MHHW (ft)	2	6	22	80	200	--
Average Depth below MHHW (ft)	1.0	3.2	8.0	10.5	9.9	--
Subtidal Habitat (acres)	-	-	4.0	6.7	5.9	16.6
Intertidal Habitat (acres)	3.0	3.6	0.6	0.2	0.1	7.5
Marsh plain (acres)	--	--	--	--	--	188.1

Note: Calculations assume a total drainage density of 500 feet/acre and constant bifurcation ratio. The inlet channel length is not included in the subtidal channel acreage.

PA-01 0763

Table ES-3
TIDAL CHARACTERISTICS AT HAMILTON ARMY AIRFIELD

(based on Petaluma River Entrance Tide Gauge #941-5252)

	NGVD Datum (feet)	MLLW Datum (feet)
100-year high tide	7.00	9.63
10-year high tide	6.00	8.63
Mean highest annual tide	4.68	7.31
Mean Higher High Water (MHHW)	3.43	6.06
Mean High Water (MHW)	2.86	5.49
Mean Tide Level (MTL)	0.61	3.24
Mean Low Water (MLW)	-1.63	1.00
Mean Lower Low Water (MLLW)	-2.63	0.00

Note: NGVD is mean sea level of 1929. Tidal terms are defined in Appendix B.

Sources: USACE SFD (1984), Tides and Currents tide prediction software, and National Oceanic and Atmospheric Administration (NOAA) tidal benchmark data.

Table ES-4
INITIAL TIDAL WETLAND INLET DIMENSIONS

	HAAF Site Inlet Dimensions		SLC Site Inlet Dimensions	
	Levee Breach	Outboard Marsh Pilot Channel	Levee Breach	Outboard Marsh Pilot Channel
Cross-Sectional Area (ft^2)	2,500	1,600	1,200	800
Channel Depth (ft, bottom elevation)	- 8.5	-8.5	-5.5	-5.5
Channel Top Width (ft)	280	165	220	100
Channel Bottom Width (ft)	155	40	120	20
Channel Side Slope (H:L)	1:4	1:5 - 1:10	1:4	1:5 - 1:10
Channel Length (ft)	200	800	50	200
Channel Excavation Volume (yd^3)	25,500	24,900	7,900	3,400
Channel Surface Area (acres)	1.3	3.0	0.5	0.6

PA-01 0765

Table ES-5
TIME (YEARS) REQUIRED FOR SEDIMENTATION TO REACH AVERAGE TIDAL PLAIN ELEVATIONS[a]

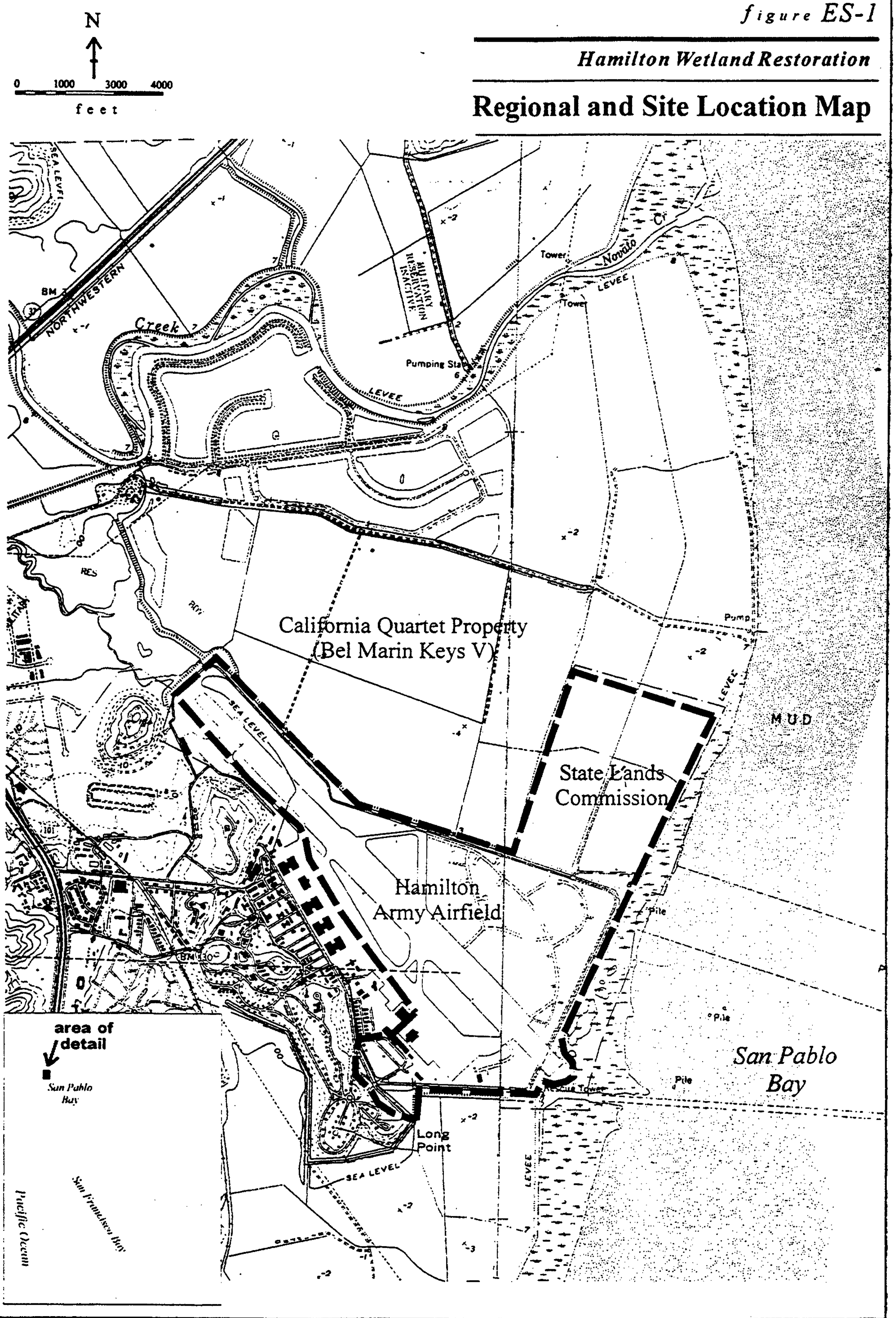
	Natural Gradient Alternative for HAAF and SLC[b]		Natural Sedimentation Alternative[a] for Front Marsh HAAF[d]		Natural Sedimentation Alternative[c] for Back Marsh HAAF[e] and SLC[f]	
	200 mg/l	350 mg/l	200 mg/l	350 mg/l	200 mg/l	350 mg/l
1. Years After Breach Outboard Levee (based on expected sedimentation rates)						
MHW	15	5	25	10	30	15
MHHW	25	10	40	15	45	20
2. Years After Start Project (reflects actual construction times shown in Figure 7-1)						
MHW	22	12	28	13	33	18
MHHW	32	17	43	18	48	23
3. Amount of Time Saved to Reach Target Elevations with natural gradient alternative relative to natural sedimentation alternative (years in #2 above for natural sedimentation minus natural gradient, rounded to nearest five years)						
MHW	na	na	5 (28-22)	0 (13-12)	10 (33-22)	5 (18-13)
MHHW	na	na	10 (43-32)	0 (18-17)	15 (48-32)	5 (23-18)

(a) = Estimated times are rounded to the nearest 5 year mark
(b) = Assumed average starting elevation of +1 foot
(c) = Assumed average starting elevation of -5 feet. HAAF
(d) = Front marsh is wetland areas closest to inlet
(e) = Back marsh is wetland area furthest from the tidal inlet (see Figure 5-5)
(f) = SLC starting elevation at -8

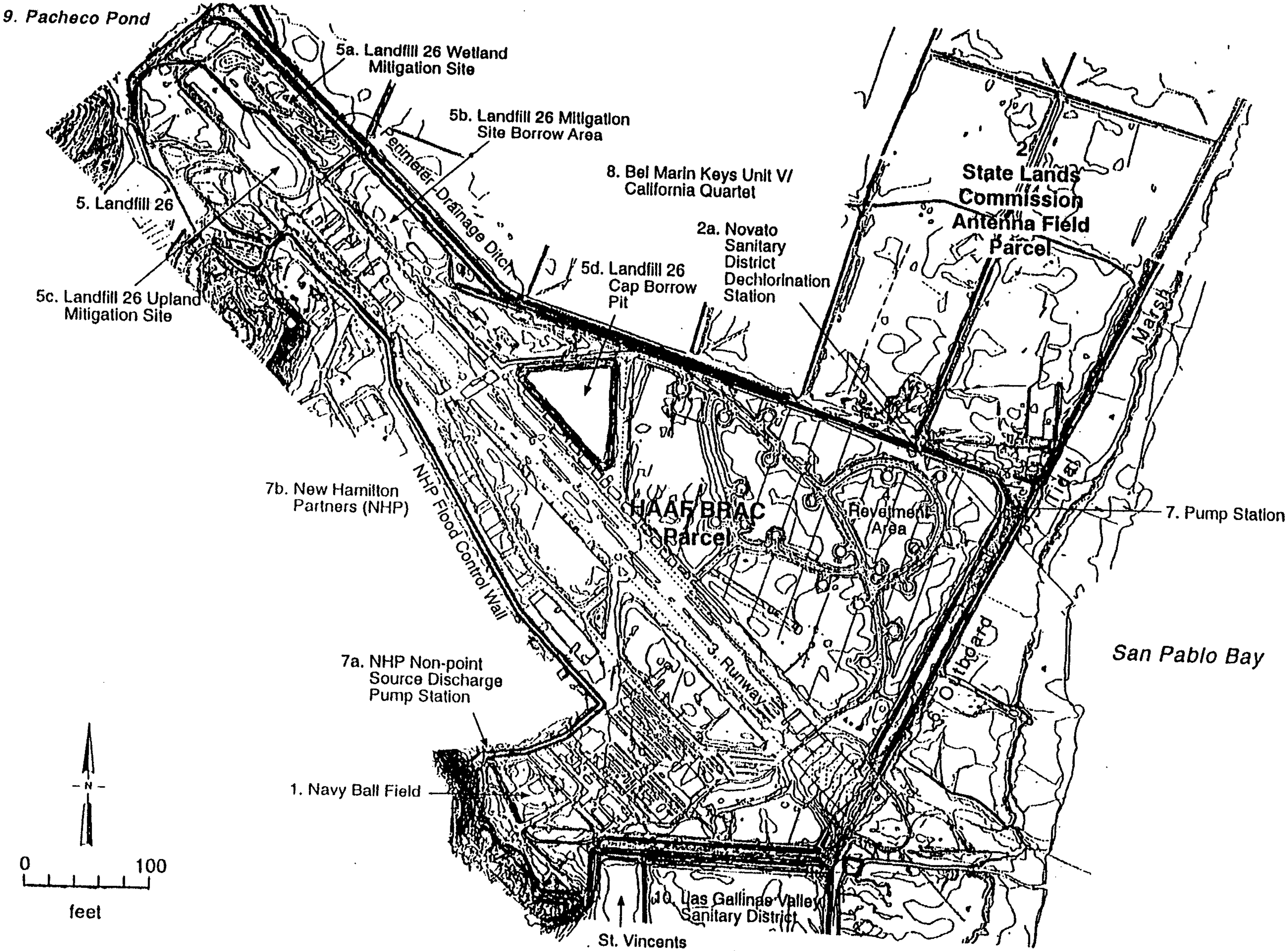
figure ES-1

Hamilton Wetland Restoration

Regional and Site Location Map

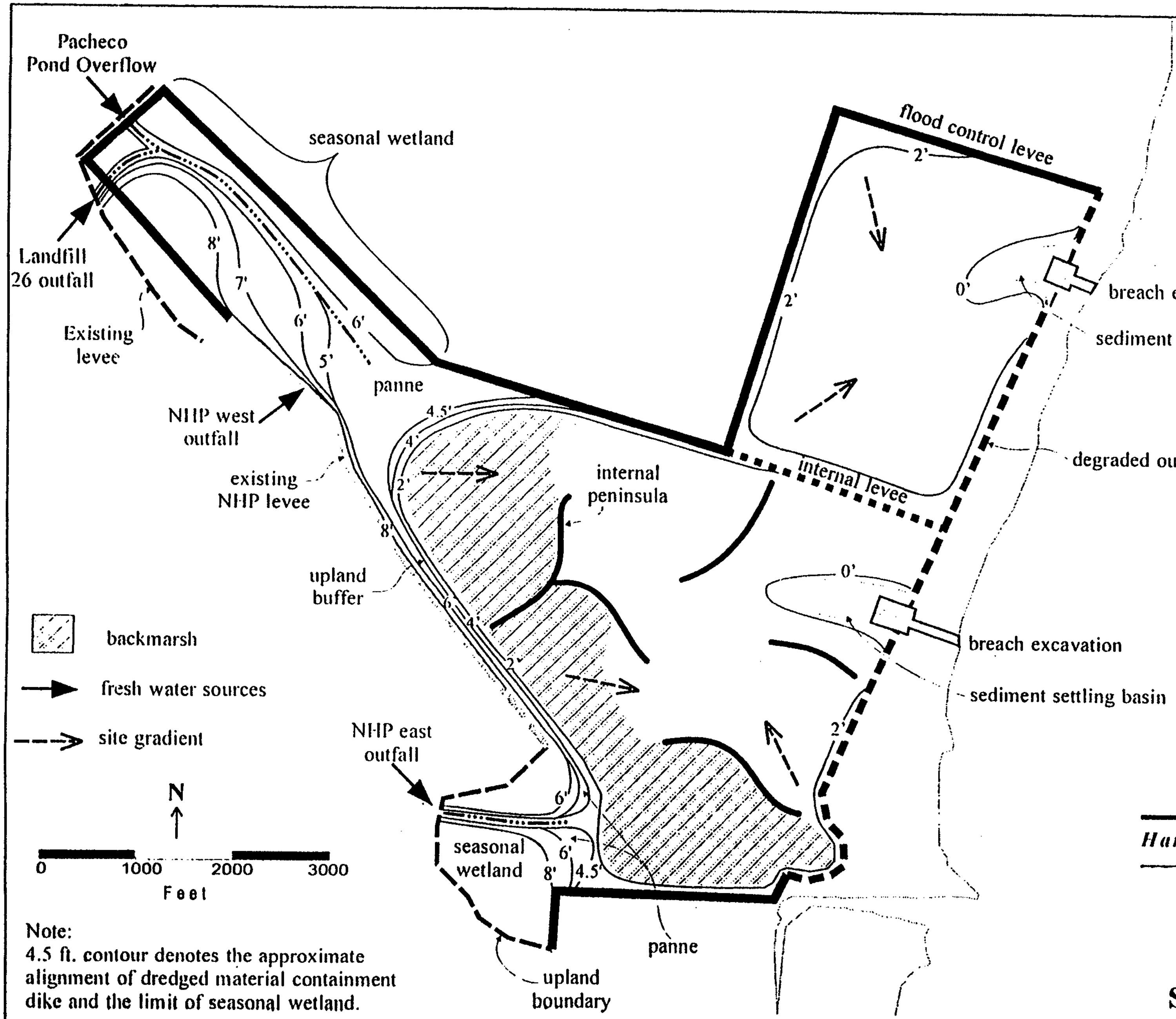


PA-01 0767



Project No. 971185NA	Hamilton Hamilton Wetlands Conceptual Plan	SITE PLAN	Figure ES-2
Woodward-Clyde			

971185NA-22DO/040398/gos



Note:
4.5 ft. contour denotes the approximate alignment of dredged material containment dike and the limit of seasonal wetland.

figure **ES-3**

Hamilton Wetland Restoration

Natural Gradient Alternative

Initial Conditions:
Site Template Year T+0

hml.cdr

DRAFT

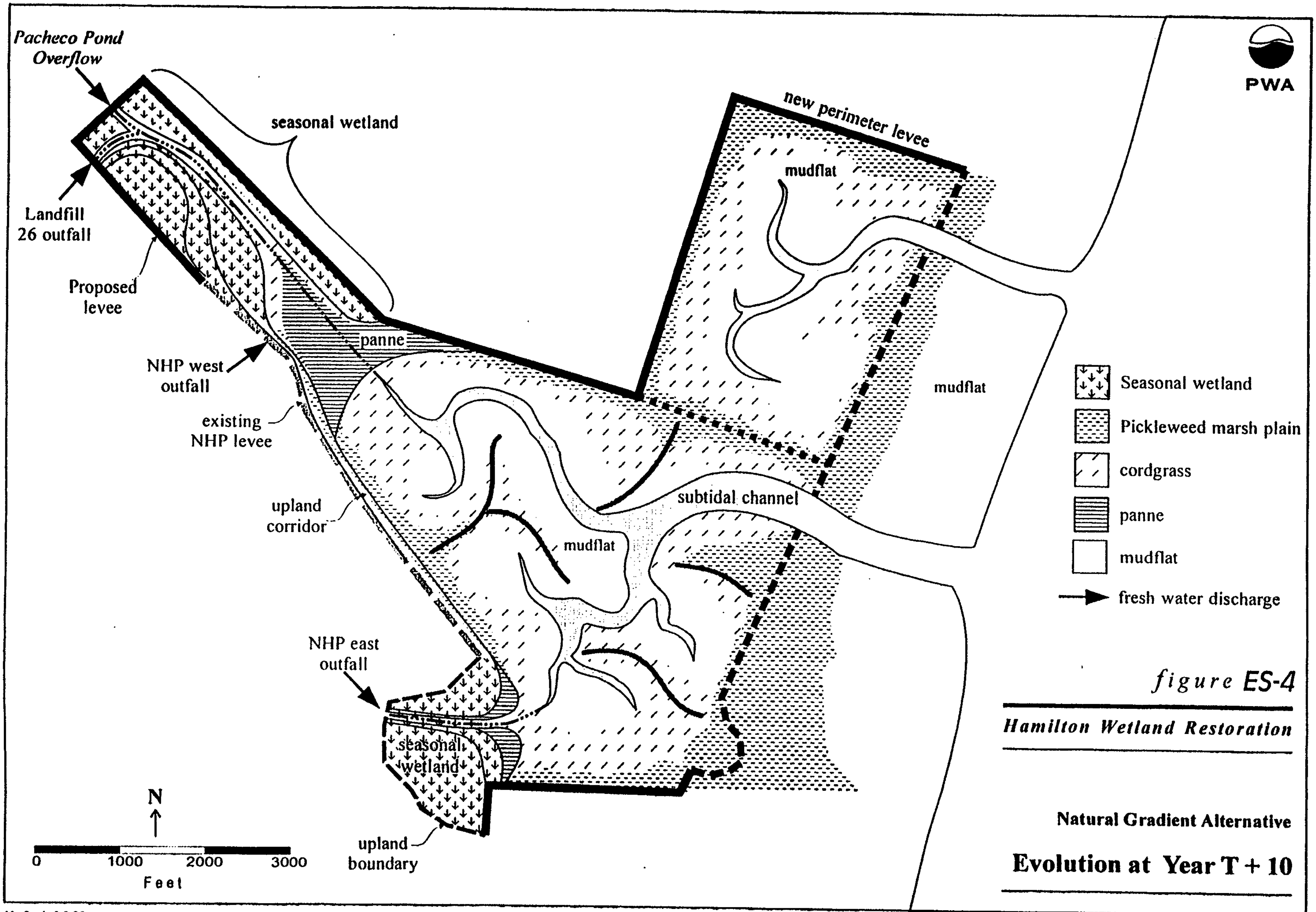


figure ES-4

Hamilton Wetland Restoration

Natural Gradient Alternative

Evolution at Year T + 10

Hm2.cdr 2.9.98

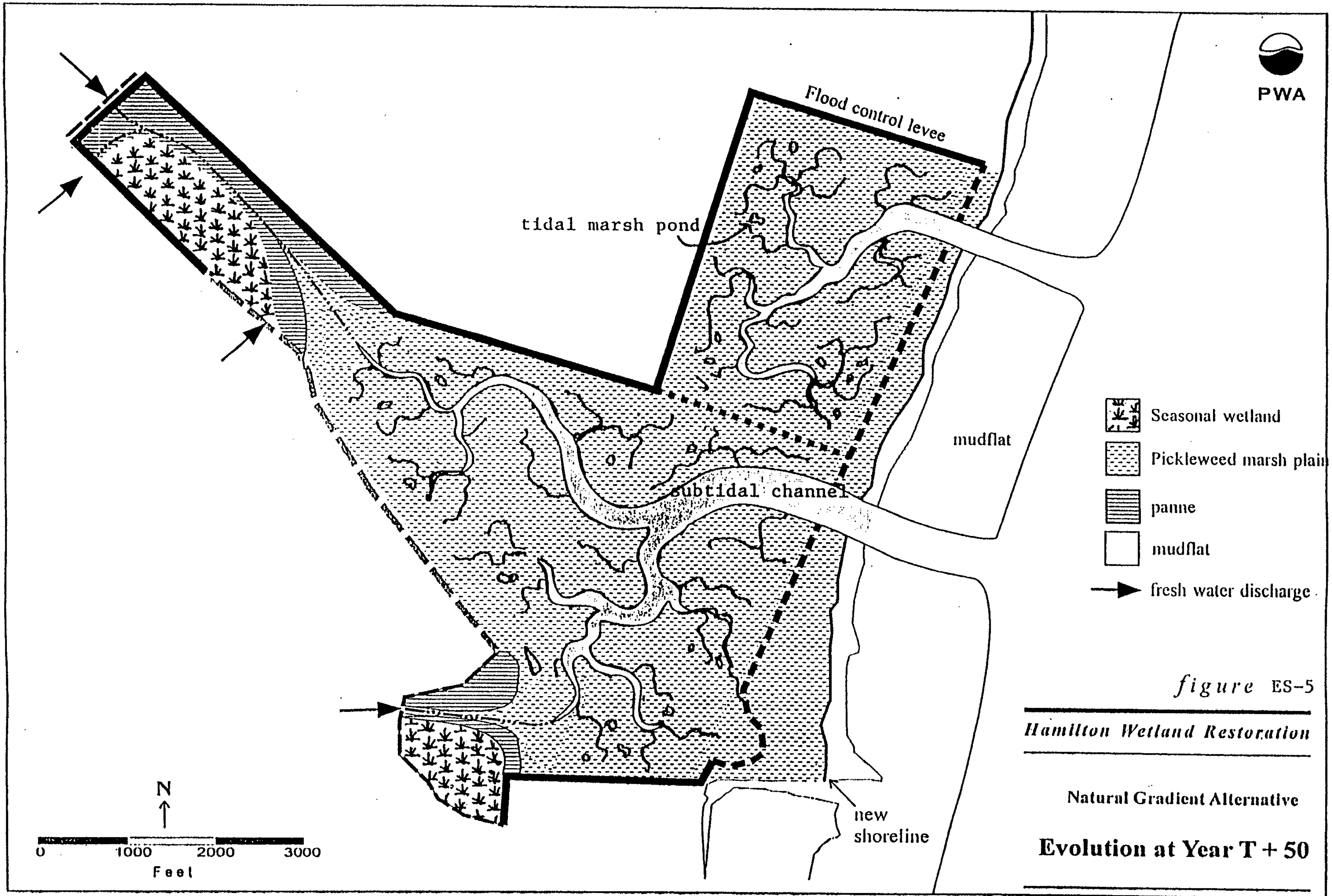


figure ES-5

Hamilton Wetland Restoration

Natural Gradient Alternative

Evolution at Year T + 50

Hm3.cdr 2.10.98

DRAFT

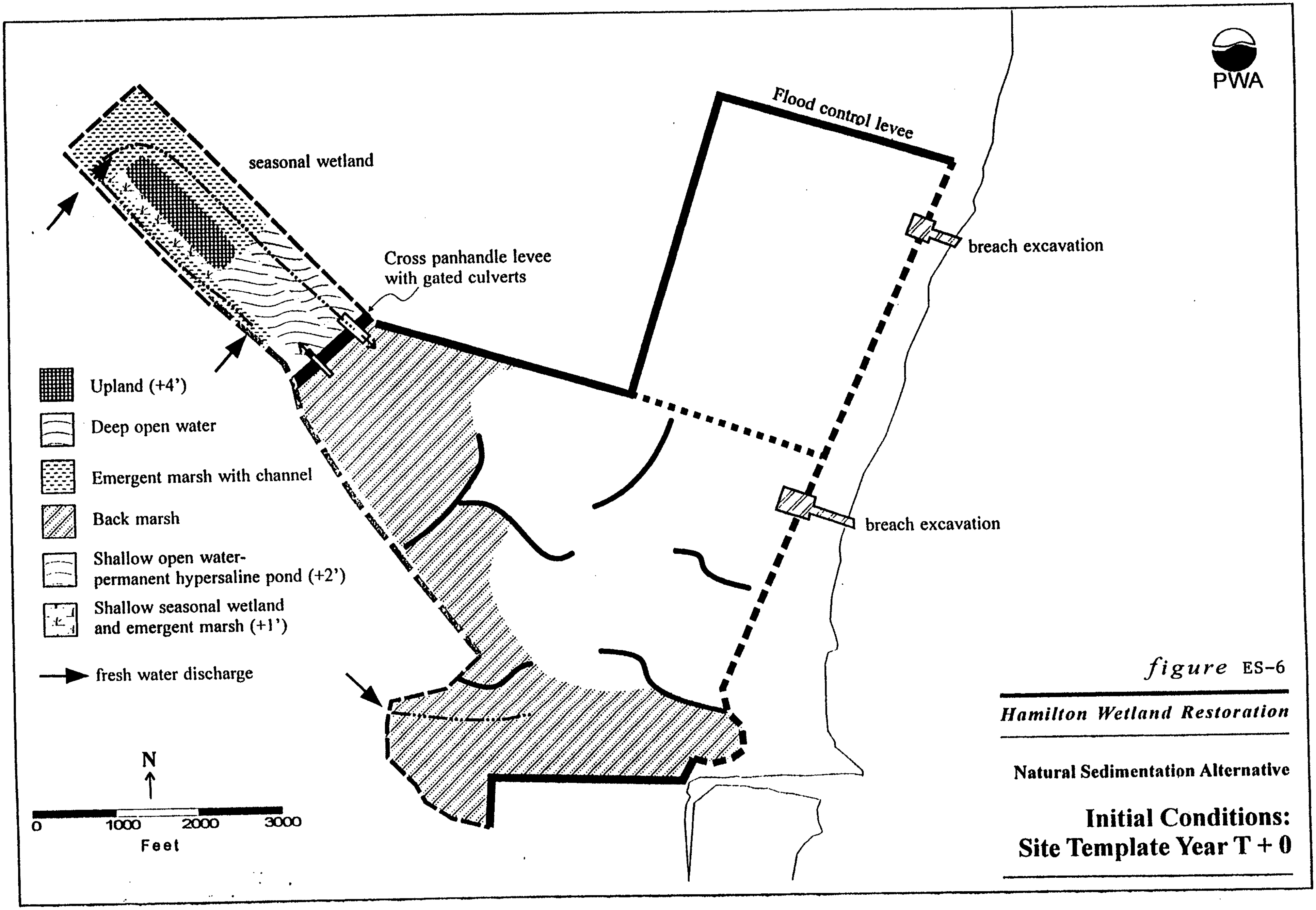


figure ES-6

Hamilton Wetland Restoration

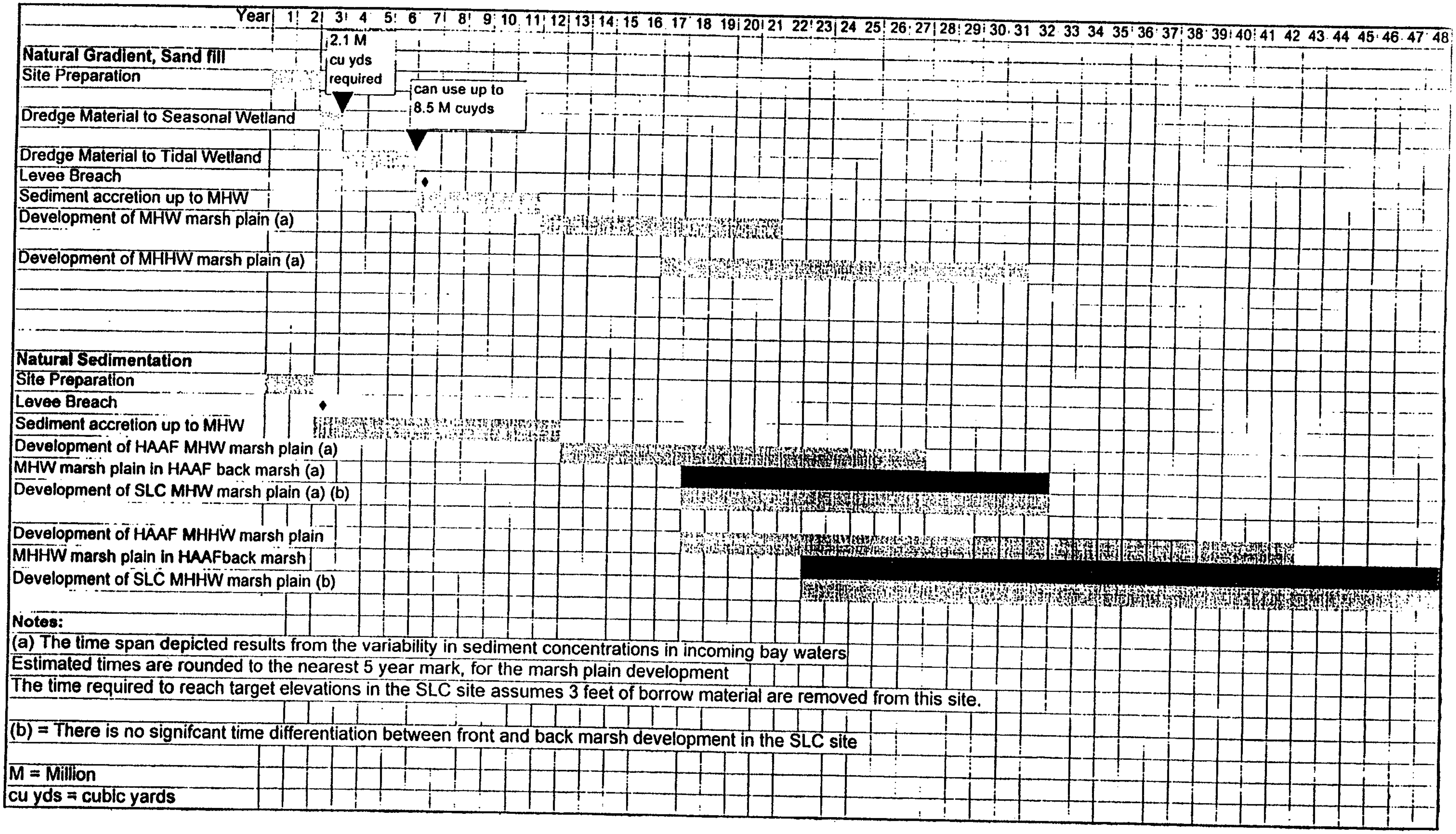
Natural Sedimentation Alternative

Initial Conditions:
Site Template Year T + 0

Hm5.cdr 2.10.98

DRAFT

Figure ES-7 Timeline Comparison, Tidal Wetland Creation



Appendix B.
Supporting Information

PA-01 0783

Marin County Board of Supervisors
Resolution No. 98-114

PA-01 0785

RESOLUTION NO. 98-114

RESOLUTION OF THE MARIN COUNTY BOARD OF SUPERVISORS DECLARING THEIR SUPPORT OF THE COASTAL CONSERVANCY'S ACQUISITION OF THE PROPERTY KNOWN AS BEL MARIN KEYS UNIT 5 LOCATED IN THE NOVATO AREA

WHEREAS, the California State Coastal Conservancy ("Conservancy") is a principal participant in the development of the Hamilton Wetlands Conceptual Restoration Plan ("Restoration Plan"); and,

WHEREAS, the Restoration Plan identifies the Bel Marin Keys Unit 5 ("BMK 5") parcel as a potential candidate property for inclusion in the restoration area; and,

WHEREAS, the Conservancy, through its staff, and California Quartet, a California Limited Partnership which owns the Bel Marin Keys Unit 5 parcel, have been and are currently engaged in independent negotiations regarding the Conservancy's acquisition of Bel Marin Keys Unit 5; and,

WHEREAS, California Quartet and the Conservancy staff desire the County of Marin's support of the aforementioned potential acquisition of the Bel Marin Keys Unit 5 parcel by the Conservancy; and,

WHEREAS, the Conservancy staff has advised California Quartet and the County that it intends to recommend to the governing Board of Conservancy that the property be used for wetland habitat restoration and preservation and/or agriculture if the acquisition is consummated: and,

WHEREAS, the Conservancy desires a determination by the County of Marin that Conservancy's acquisition of the BMK 5 parcel for such purposes is consistent with and supported by the adopted Countywide Plan; and,

WHEREAS, the Countywide Plan designates the BMK 5 parcel as Agriculture and Conservation and locates it within the Bayfront Conservation Zone.

NOW, THEREFORE, BE IT RESOLVED THAT the Marin County Board of Supervisors finds and determines that the Conservancy's acquisition of the BMK 5 property for the purposes of wetland habitat restoration and preservation and/or agriculture is consistent with and supported by the adopted Marin Countywide Plan; and,

IT IS FURTHER RESOLVED THAT the Marin County Board of Supervisors supports and encourages acquisition of the BMK 5 parcel by the Conservancy for the purposes listed above and recommends that if the Conservancy determines to acquire the BMK property under the San Francisco Bay Area Conservancy Program established under Public Resources Code § 31160, the acquisition should be a priority project under that Program.

PASSED AND ADOPTED at a regular meeting of the Board of Supervisors of the County of Marin held this 11th day of August, 1998 by the following vote

AYES: Supervisors Moore, Brown, Kinsey, Rose, Kress

NOES: none

ABSENT: none

President, Board of Supervisors

ATTEST:

Clerk

doc·presgbmr.res

PA-01 0787

Letter to the California Coastal Conservancy from the U.S. Army

PA-01 0789

DEPARTMENT OF THE ARMY
HEADQUARTERS UNITED STATES ARMY FORCES COMMAND
1777 HARDEE AVENUE SW
FORT MCPHERSON GEORGIA 30330-1062

REPLY TO
ATTENTION OF

Base Realignment and Closure Division

OCT 20 1998

Ms. Terri Nevins
California Coastal Conservancy
Project Manager
1330 Broadway, 11th Floor
Oakland, California 94612-2530

Dear ~~Ms. Nevins~~: Terri

The purpose of this letter is to formally convey the Army's position, as agreed to by the California Coastal Conservancy, (CCC) regarding the unresolved issues within Article 4 of the Draft Memorandum of Agreement - Conditions to Transfer.

The Army commits to the following:

DRAINAGE

(a) Slide gate. The existing slide gate blocking drainage from St. Vincents, Las Galinas Sanitary District, and United States Navy property onto Hamilton Army Airfield (HAAF) will be permanently closed prior to property transfer. In an effort to administratively and legally resolve this matter, the Army will secure a letter of acceptance for the redirected Navy/Coast Guard storm water onto the adjacent property. This letter will be requested in return for the Army paying for a portion of the costs to repair/rebuild the St. Vincents pump station as a condition of blocking future drainage onto the airfield.

(b) Three 30" corrugated steel pipes. Evidence presented by representatives of California Quartet properties and the U.S. Army Corps of Engineers indicates that no drainage flows through these pipes. Therefore, based upon the agreement of CCC to leave these in place if substantial drainage onto HAAF does not occur, the Army will not remove these pipes. If new data suggests that there is substantial drainage through these pipes, the Army will remove them.

(c) Drainage from State Lands Commission (SLC) property. Upon transfer of this property to SLC, the Army reserved the right to block drainage of surface water from this property onto HAAF. This right will be transferred from the Army to CCC.

(d) Landfill 26 drainage. The Army will construct a lift station to drain the Landfill 26 watershed area. The lift station will be compatible with the implementation of the Hamilton Wetlands Restoration Project (HWRP). The Army and the City of Novato are presently negotiating an agreement that envisions the City operating and maintaining the lift station as a condition of its use of the Landfill 26 area for recreational purposes.

(e) California Quartet properties drainage. It is the Army's intent to obtain a letter from the adjacent California Quartet property owner indicating that they do not object to the future construction of a levee that will block the flow of any storm water drainage from the California Quartet properties onto HAAF. A site walk with the California Quartet's engineering consultant on October 22, 1998 will be used to validate drainage assumptions and provide the basis for securing this letter. However, in the event that this letter cannot be secured based upon this review, the Army will undertake the additional steps necessary to ultimately secure a letter of acceptance to block future storm water drainage from this adjacent property.

CONTAMINANTS OF CONCERN

(a) The Army will remove asbestos from the buildings located on the airfield parcel if, due to the requirements of the HWRP, there is potential for a release to the environment from the disposal or demolition of these buildings.

(b) Because the buildings on the property are scheduled for non-residential use, the Army will neither inspect for nor abate any hazards of lead based paint that may be present in buildings on the property.

CONTINUED ACCESS THROUGH GSA PHASE II PROPERTY. The Army will convey to the State a temporary, high impact easement for construction purposes, and a permanent, low impact easement for monitoring, management and maintenance purposes across the

General Services Administration (GSA) Phase II property in order to carry out and manage the wetlands restoration project. In the event Aberdeen Road access is discontinued and relocated on the GSA Phase II property, the Army will work with the City of Novato to ensure the relocated access road will be constructed to meet the minimum acceptable standards agreed to by the Army and CCC, taking into account the mitigation measures that would be required.

NEPA ANALYSIS. The Army will conduct any NEPA analysis that may be required for any federal actions listed above.

We are confident this letter provides you with the necessary information to finalize the Feasibility Report for the HWRP.

We will continue to work with you to finalize the Memorandum of Agreement (MOA). Based on the CCC's timeline in presenting the MOA to the board of directors, a signed agreement is not expected until January 1999.

If you have any questions or need further information, please contact Ms. Libette Garcia at (404)464-6374.

Sincerely,

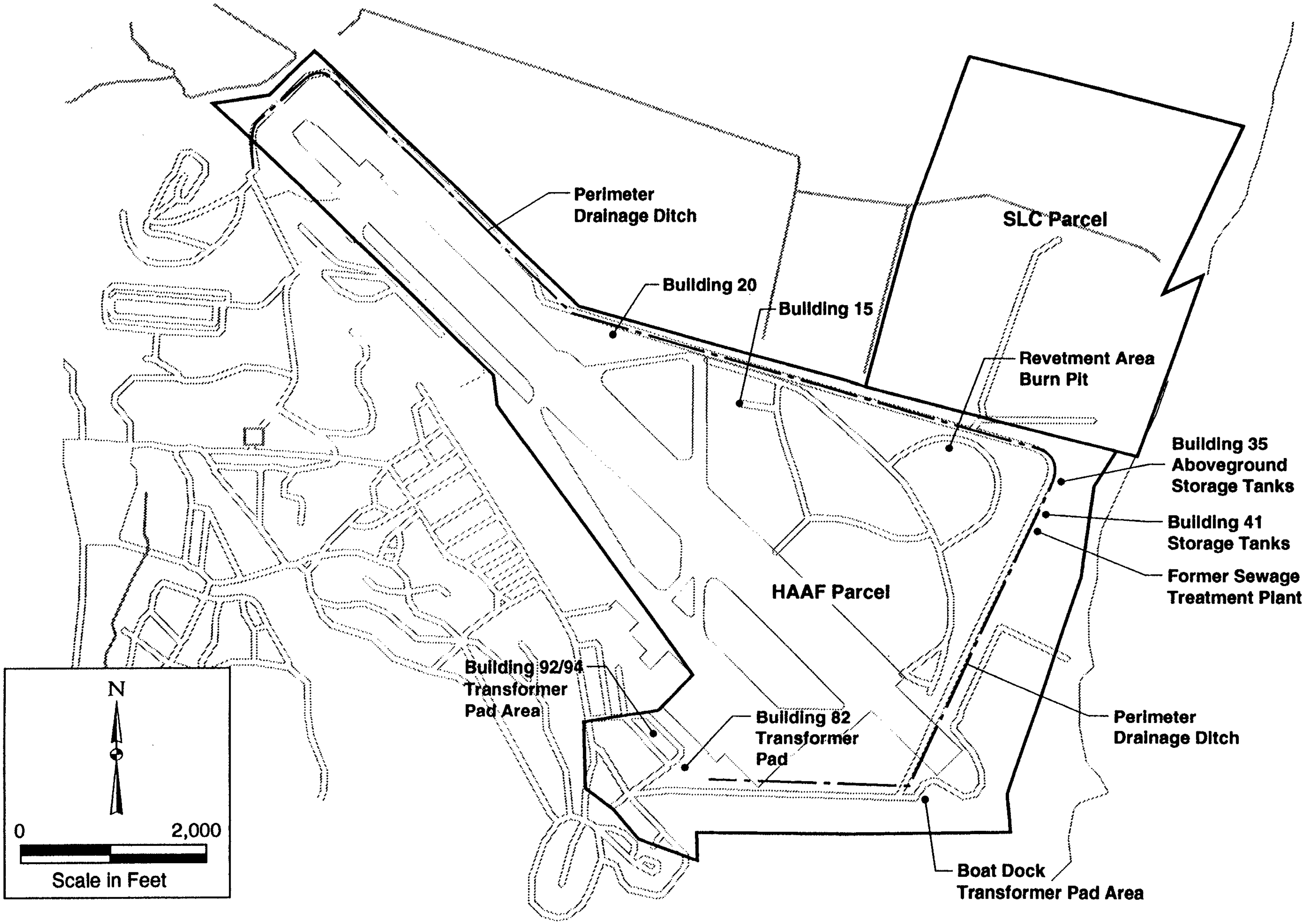
Arden J. Roberts
Acting Chief, Base Realignment
and Closure Division

Copies Furnished:

Department of the Army, BRAC Office (LTC Evans)
Headquarters, Corps of Engineers (Mr. Rohde)
San Francisco District Corps of Engineers (Mr. Nicholson)
Sacramento District Corps of Engineers (Mr. Montag)
Director of Public Works, I Corps and Fort Lewis (Mr. Hanna)
Hamilton Army Airfield BEC (Mr. Keller)
Forces Command Engineers (Mr. Nicholson/Mr. Morgan/Mr. Hill)
Forces Command Staff Judge Advocate (LTC Comodeca)

PA-01 0793

Figure I. HAAF Parcel Soil Remediation Sites



Jones & Stokes Associates, Inc.

Figure 1
HAAF Parcel Soil Remediation Sites

Appendix C.
Draft Conceptual Maintenance, Monitoring, and Adaptive Management Plan for Hamilton Wetland Restoration Project, October 19, 1998

Hamilton Wetland Restoration Project

DRAFT CONCEPTUAL MAINTENANCE, MONITORING, AND ADAPTIVE MANAGEMENT PLAN

October 19, 1998

INTRODUCTION

This plan provides a general framework for maintaining and monitoring the success of the Hamilton Wetlands Restoration Project. Included is guidance for monitoring levee performance, site hydraulics, biological success, and water quality. This conceptual plan will be greatly expanded and quantified in the detailed design phase of the study.

This plan covers the period after the completion of construction. At the beginning of this period, dredged material will have been placed and the bayward levee breached. Maintenance and monitoring during construction will be described in the plans and specifications for construction. Monitoring of sediments for contaminants will be completed prior to levee breaching.

The Corps of Engineers will participate in the monitoring program for 13 years after the end of construction. Subsequent monitoring under the detailed plan will be the responsibility of the non-federal sponsor.

Monitoring of biological, hydrological, topographic, bathymetric, and chemical conditions will track the evolution of the site after breaching of the bayward levee. Periodic comparisons of measured conditions with expected conditions will determine whether the development of the site is progressing as planned.

Restoration goals and objectives for the project are qualitative statements in the EIR/EIS regarding expected future conditions. Quantitative standards intended to measure progress towards these goals and objectives will be developed later for the detailed maintenance, monitoring, and adaptive management plan.

LEVEES

Monitoring

SETTLEMENT. Monitoring of settlement of the levees due to foundation consolidation should be performed annually by means of precision level surveys of settlement monuments installed during construction. The greatest rate of settlement is expected to occur during the first ten years after the levees are constructed. The data should be reduced, plotted, and compared with the expected design rate. Settlement monitoring of the levees should continue annually until the analyses of the survey data shows that the rate and amount of settlement are within design expectations. At that time the frequency of settlement monitoring may be adjusted to longer intervals of time. If the rates and amount of settlement are unacceptable, then corrective measures should be recommended and action taken.

ANNUAL INSPECTIONS. During the first few years after breaching of the bayward levee, a walkover inspection of the levees should be performed twice annually for pre- and post-winter conditions. Subsequently, the frequency of inspection can be reduced to one annual post-winter inspection. The reduced frequency would be based upon determining that the performance of the levee features, and of the site in general, are in accordance with design expectations.

The inspection should look for erosion problems such as rills, gullies, and other evidence of erosion on the newly constructed levees, and for evidence of burrowing mammals. Burrowing mammals, when present in large enough numbers, are detrimental to the overall stability of a levee. Burrowing mammals should be eradicated when infestations endanger the perimeter levee system, and the damage repaired. The breach openings should also be inspected for any obstructions or debris that would limit tidal flows. The walk over inspection should document the implementation of previously recommended corrective actions (or the lack thereof) and the effectiveness of that action.

The annual inspections may be supplemented as necessary following a major storm event or an earthquake of magnitude 5 or greater located within 50 miles of the project, or a smaller magnitude event if specific reports of local damage are received.

CROSS SECTIONS. Surveyed cross-sections of the perimeter levees and any water-side, wave-erosion protection berms should be performed annually until they have stabilized, but no less than five years after the breaching of the bayward levee. Supplemental surveys should be made after a severe storm event or a major El Nino winter.

INSPECTION REPORT. An inspection report should be written for each inspection documenting the observations and finding, recommended maintenance action items, and actions taken. In general, the monitoring and inspection report should include but not be limited to the following:

A. A site map indicating the areas of significant findings and/or observations.

B. Condition of the breaches, once they are created, noting obstructions and debris.

C. Condition of the levees and any recent repairs, noting any unusual, abnormal, or unexpected conditions or occurrences that could bear on the effectiveness of the structure.

D. Results of the settlement monitoring and interpretation of the data.

E. Condition of hard structures, culverts, and pipelines.

F. Condition of access and service roads, especially areas where problems are likely to develop.

G. Availability of emergency supplies necessary for immediate repairs of major storm related damages.

H. An emergency action plan that includes phone numbers and means of contacting operating personnel.

I. Maintenance measures taken (date, temporary measures taken, permanent repairs, ect.) and the cost of maintenance an operations for the report period.

J. A summary of findings, proposed corrective actions, and a maintenance plan to implement those actions.

Maintenance

Maintenance will consist of corrective action in response to problems identified when monitoring levee conditions as described in the section on monitoring above. Actions could include adding material to compensate for excessive settling or erosion, repair of earthquake damage, reinforcing the levee surface to withstand erosion in problem areas (to the minimum extent necessary), repair of drainage structures, or control of burrowing rodents. Any rodent-control efforts will need to be carefully planned and executed to avoid negative impacts on adjacent habitats and wildlife. Such efforts would be confined to levees; rodent populations in other habitat areas including berms would not be controlled except under unusual conditions.

HYDRAULICS

Monitoring

DREDGED MATERIAL FILL ELEVATION AND TIDAL SEDIMENTATION. The surface elevation of the dredged material fill after consolidation will be an important determinant of the success of the project. Proper development of the tidal marsh requires that the fill elevation be low enough to allow additional sedimentation and development of tidal channels on the site after breaching of the bayward levee. If significant portions of the fill are above the intended elevation, formation of small marsh channels will be inhibited and the eventual quality of the marsh habitat will be reduced. In contrast, if the fill elevation is lower than intended, the only negative impact would be a delay in marsh development while additional sedimentation raises the grade level to the intended elevation.

Dredged material deposited on the site will consolidate over time, with the fastest consolidation occurring initially. The degree of consolidation and its duration will depend upon the texture and depth of the dredged material. By the time that the bayward levee is breached, most consolidation will have already occurred. During the next several years, some additional consolidation may occur and could counteract tidal sediment deposition during that period.

While monitoring the surface elevation of the fill material during and immediately after completion of disposal is important, this is part of the construction process and is not part of post-construction monitoring. Measurement of the fill elevation as part of the post-construction monitoring of the site will commence upon the breaching of the bayward levee, and will continue thereafter primarily to measure ongoing sedimentation on the site. These elevation data will also provide the baseline for measuring the physical development of the marsh plain and channels following the introduction of tidal action.

Monitoring of sediment deposition rates and patterns will provide useful information regarding the accuracy of predictive sedimentation models and will help to quantify the acceleration of marsh restoration achieved by using dredged material. This information will be important in future decisions regarding the use of dredged material in marsh restoration projects. Information regarding sediment deposition patterns will also assist in understanding changes in vegetation patterns as the marsh develops and will provide a basis for evaluating the effectiveness of the interior peninsulas in accelerating sediment deposition. The techniques to be used in monitoring site elevations will be determined during the detailed design stage, but could include transects across the site and/or resistivity staffs as used at the Sonoma Baylands project.

EXTERIOR TIDAL CHANNELS. To provide initial tidal access to the site, channels will be excavated to connect the site to the waters of San Pablo Bay. These channels will be large enough to provide substantial tidal circulation, but will be smaller than the initial equilibrium size. As the tidal hydrology of the site and its connecting channels evolves, the channels are expected to increase in size until they are in equilibrium with the tidal prism of the site. As the tidal prism eventually decreases due to sedimentation on the site, the channels will decrease in size in response.

To ensure that the site is developing properly, the geometry of these channels will be monitored periodically and will be compared to expected conditions.

TIDAL REGIME. The intent of the project is to create a tidal marsh with physical and biological conditions similar to natural marshes in the general area. The creation and maintenance of a normal tidal regime is a very important component of restoration, as tidal action and suspended sediment circulation are essential to the creation and maintenance of tidal marsh topography and vegetation.

The progress of the site's tidal regime towards reference conditions will be monitored using appropriate recording equipment. Measurements of tide elevations will be recorded periodically or continuously at locations within the site and at a nearby reference location. The tidal regime and tidal prism will be determined from these measurements.

PENINSULA CREST ELEVATIONS. The peninsulas are intended as temporary features to reduce wind and wave fetch, direct tidal flows away from levees, and encourage sedimentation. They are expected to gradually erode away and eventually disappear. The elevation of the peninsula crests will be periodically measured to monitor their progress towards specified standards.

INTERNAL CHANNEL DEVELOPMENT. Tidal channels are the most important physical feature of a tidal salt marsh. The extent, pattern, and density of the channel system determines many other attributes of the marsh, including hydrology, vegetation distribution, and habitat values. It is therefore important to document these attributes of channel development in the Hamilton restoration project for use in the design of future wetland restoration projects.

Channel development will be mapped from aerial photographs taken during appropriate tidal conditions. Transects may also be useful in measuring the development of these channels.

Maintenance

Maintenance will consist of removal of any debris that obstructs tidal flows, and maintenance of any monitoring equipment in the area. Corrective action to ensure the proper physical development of tidal habitats is covered under *Adaptive Management*, below.

WATER QUALITY

Monitoring and Maintenance

Water quality parameters to be monitored will include salinity, temperature, and dissolved oxygen. Measurements will be taken at several locations within the site and in the connecting channels. Due to the substantial tidal exchange that should exist immediately after breaching, water quality should be comparable to that in adjacent parts of the bay. If water quality deficiencies are substantial and persistent, remedial actions will be developed and implemented if practicable.

BIOLOGICAL RESOURCES

Monitoring

MARSH DEVELOPMENT. Marsh development will be determined by measuring physical parameters (hydrology and topography/bathymetry) and biological parameters (plant and animal life). Monitoring of physical parameters is discussed under hydraulics, above.

Monitoring of vegetation will include periodic measurements of the extent, location, composition, and density of marsh vegetation. Measurement techniques are expected to include aerial photography and field surveys. Actual conditions will be compared to predicted conditions. Monitoring data will be analyzed to identify possible reasons for differences between observed and predicted conditions.

After five years of monitoring, the development rate of tidal marsh will be analyzed to determine whether the standard of 6 acres of new tidal marsh within the first 10 years is likely to be achieved. Similar reviews of tidal marsh development will be conducted in years 10 and 15 if it appears that further action is needed to meet tidal marsh restoration standards.

USE BY BIRDS. As intertidal mudflat and marsh habitats develop along with associated invertebrate fauna, use of these habitats by birds should gradually become similar to usage occurring on nearby intertidal habitats. As seasonal wetlands develop, winter use by waterfowl and shorebirds should become similar to such use on nearby seasonal wetlands. Periodic bird surveys will document trends in use of the site by birds in comparison to a nearby reference site and will provide an indication of the success of habitat restoration.

USE BY FISHES. Fish surveys early in the restoration process will document the initial suitability of the site for fishes. Ongoing surveys will document continued use of the site by fishes as marsh and channel formation occur.

USE BY ENDANGERED SPECIES (CALIFORNIA CLAPPER RAIL AND SALT MARSH HARVEST MOUSE). As marsh and channel development progress, habitats for the California clapper rail and the salt marsh harvest mouse are expected to gradually develop. After suitable habitat has developed over a portion of the site, periodic surveys will document the extent of these habitats and the presence of these species. Surveys will be coordinated with the U.S. Fish and Wildlife Service and the California Department of Fish and Game to ensure compliance with endangered species laws and regulations.

BENTHIC MACROINVERTEBRATES. Development of a benthic macroinvertebrate community should occur rapidly after the initial establishment of tidal action on the site. The presence of a thriving benthic macroinvertebrate community (together with abundant fish and bird populations) will indicate that the site is ecologically healthy even if it has not yet developed substantial tidal marsh habitat. However, the composition of this community can be expected to change rapidly and unpredictably due to normal natural fluctuations, which would lessen the value of monitoring trends in these species.

Surveys of benthic macroinvertebrates will be conducted during the first year after breaching to document the colonization of the site by these species. Additional surveys may be conducted later if site deficiencies arise.

VEGETATION IN SEASONAL WETLAND AND UPLAND AREAS. Development of appropriate vegetation in these areas will be monitored through field surveys. Success criteria will be based upon the establishment of appropriate native species and vegetative cover.

PA-01 0805

Maintenance

Maintenance in non-tidal areas will be directed towards encouraging appropriate native plant species and minimizing the presence of exotic plant species of particular concern such as pampas grass, broom, and yellow star thistle. Management techniques may include mowing, burning, manual removal of unwanted plants, and herbicides if needed. Mowing and manual removal have been effective so far at suppressing unwanted upland plant species at the Sonoma Baylands project, and herbicides have not been necessary. Control of non-native predators (feral cats and/or red foxes) may also be needed.

Biological maintenance in tidal areas will primarily be passive, with natural processes allowed to gradually restore habitats. However, tidal areas (and uplands) may be invaded by the non-native perennial pepperweed *Lepidium latifolium*. Control of this plant is uncertain and can not be guaranteed. Herbicides would most likely be required in any attempt to control this species, should it invade the site.

ADAPTIVE MANAGEMENT

Adaptive management is a term which has been used to mean various things. As used here, it is an approach to resource management in which management goals remain the same, but management objectives and techniques may be modified in response to feedback (such as monitoring results) from the system being managed. Adaptive management recognizes that human knowledge regarding biological and physical systems is limited and that these systems may not always behave as expected. When a management or restoration project is to be implemented but there is some uncertainty regarding the response of the system to particular actions, adaptive management provides a way for management actions to respond to feedback from the system being managed.

Adaptive management will be implemented if specific restoration standards are not met or if it appears that actual conditions will diverge sufficiently far from intended conditions to threaten the achievement of overall project goals. Funding for adaptive management will be included in the project cost estimates so that this option will be available in the future if needed.

Should the development of the site fail to meet quantitative standards to be stated in the detailed monitoring plan, action to correct these shortfalls will be undertaken if such action could reasonably be expected to assist in the achievement of these standards. Corrective action could include vegetation management, predator management, topographic modifications such as creation of or enlargement of channels, or levee repairs or modifications.

Appendix D.
Plant and Animal Species Lists

Table D-1. Wildlife Species Mentioned in the Text

Common Name	Scientific Name
Fish	
Chinook salmon	*Oncorhynchus tshawytscha*
Longfin smelt	*Spirinchus thaleichtys*
Mosquito fish	*Gambusia affinis*
Northern anchovy	*Engraulis mordax*
Speckled sanddab	*Citharichthys stigmaeus*
Staghorn sculpin	*Leptocottus armatus*
Steelhead	*Oncorhynchus mykiss*
Threespine stickleback	*Gasterosteus aculeatus* ssp.
Reptiles	
Aquatic garter snake	*Thamnophis couchi*
Gopher snake	*Pituophis melanoleucus*
Western fence lizard	*Sceloporus occidentalis*
Birds	
American coot	*Fulica americana*
American kestrel	*Falco sparverius*
American crow	*Corvus brachyrhynchos*
Barn swallow	*Hirundo rustica*
Brewer's blackbird	*Euphagus cyanocephalus*
Burrowing owl	*Athene cunicularia*
California quail	*Callipepla californica*
California brown pelican	*Pelecanus occidentalis californicus*
California clapper rail	*Rallus longirostis obsoletus*
California black rail	*Laterallus jamaicensis coturniculus*
Double-crested cormorant	*Phalacrocorax auritus*
European starling	*Sturnus vulgaris*
Great blue heron	*Ardea herodias*
Great egret	*Casmerodius albus*

Table D-I. Continued

Common Name	Scientific Name
Killdeer	*Charadrius vociferus*
Mallard	*Anas platyrhynchos*
Northern harrier	*Circus cyaneus*
Northern mockingbird	*Mimus polyglottos*
Red-tailed hawk	*Buteo jamaicensis*
Red-winged blackbird	*Geothlypis trichas sinuosa*
Ring-necked pheasant	*Phasianus colchicus*
Saltmarsh common yellowthroat	*Circus cyaneus*
San Pablo song sparrow	*Melospiza melodia samuelis*
Savannah sparrow	*Passerculus sandwichensis*
Sora	*Porzana carolina*
Turkey vulture	*Cathartes aura*
Virginia rail	*Rallus limicola*
Western meadowlark	*Sturnella neglecta*
Willet	*Catoptrophorus semipalmatus*
Mammals	
Black-tailed hare	*Lepus californicus*
Black-tailed deer	*Odocoileus hemionus*
California vole	*Microtus californicus*
Coyote	*Canis latrans*
Desert cottontail	*Sylvilagus audubonii*
Raccoon	*Procyon lotor*
Salt marsh harvest mouse	*Reithrodontomys raviventris*
Striped skunk	*Mephitis mephitis*

Table D-2.
Plant Species Mentioned in the Text

Common Name	Scientific Name
Alkali bulrush	*Scirpus robustus*
Alkali heath	*Frankenis grandiflora*
Black mustard	*Brassica nigra*
Blackberry	*Rubus* sp.
Brass buttons	*Cotula coronopifolia*
Bristly ox-tongue	*Picris echioides*
California cordgrass	*Spartina foliosa*
Cattail	*Typha* sp.
Common pickleweed	*Lepidium nitidum*
Cordgrass	*Spartina* sp.
Coyote brush	*Baccharis pilularis*
Creeping wildrye	*Elymus triticoides*
Curly dock	*Rumex crispus*
Eucalyptus	*Eucalyptus* sp.
Fat-hen saltplant	*Atriplex patula* ssp. *hastata*
Gumplant	*Grindelia* sp.
Marin knotweed	*Polygonum marinense*
Mediterranean barley	*Hordeum geniculatum*
Perennial ryegrass	*Lolium perenne*
Point Reyes bird's-beak	*Cordylanthus palustris*
Ripgut brome	*Bromus rigidus*
Rush	*Juncus* sp.
Ryegrass	*Lolium* sp.
Salt marsh bulrush	*Scirpus maritimus*
Saltgrass	*Distichlis spicata* var. *stricta*
Sedge	*Carex tumulicola*
Sheep sorrel	*Rumex acetosella*
Six-weeks fescue	*Vulpia myuros*
Soft bird's-beak	*Cordylanthus mollis* ssp. *mollis*
Tall fescue	*Festuca arundinacea*
Western goldenrod	*Euthamia occidentalis*
Wild oats	*Avena fatua*
Yellow star-thistle	*Centaurea solstitialis*

Table D-3.
Special-Status Plant and Animal Species that Occur or Have Potential to Occur in or near the Hamilton Wetland Restoration Project Area

Common and Scientific Name	Legal Status[a] Federal/State/CNPS	Habitat Requirements	Distribution in California	Occurrence in the Project Area
Plants				
California suaeda (*Suaeda california*)	PE/--/1B	Margins of coastal salt marsh	Extirpated from San Francisco Bay area; known only from Morro Bay	None observed during rare plant surveys at HAAF
Fragrant fritilary (*Fritilaria liliacea*)	SC/--/1B	Coastal prairie, coastal scrub, valley and foothill grassland; often on serpentinite	Central coastal counties	Habitat at HAAF and the project area not likely to be suitable; none observed during rare plant surveys at HAAF
Marin dwarf-flax (*Hesperolinon congestum*)	T/T/1B	Serpentine soils in grassland or chaparral habitats	San Francisco Bay area	No suitable habitat at HAAF and studya area; none seen during field surveys at HAAF
Marin knotweed (*Polygonum marinense*)	SC/--/3	Coastal salt marsh	Marin, Napa, and Sonoma Counties	None observed during rare plant surveys at HAAF
Mason's quilwort (*Liliaeopsis masonii*)	SC/R/1B	Brackish and freshwater marshes and swamps, riparian scrub	San Francisco Bay and Delta areas	No suitable habitat in the project area; none observed during rare plant field surveys at HAAF
Mount Tamalpais jewelflower (*Strepanthus glandulosus* spp. *pulchellus*)	SC/--1B	Chaparral and grasslands with serpentine soils	Marin County	No suitable habitat; none observed during rare plant field surveys at HAAF
Petaluma popcornflower (*Plagiobothrys mollis* var. *vetitus*)	SC/--/1A	Habitat requirements uncertain; possibly salt marsh or mesic grasslands	Known only from type speciment in 1988 near Petaluma	None observed during rare plant surveys at HAAF
Point Reyes bird's-beak (*Cordylanthus maritimus* ssp. *palustris*)	SC/--1B	Salt marshes	Northern California coastal counties	None observed at HAAF during rare plant field surveys

Common and Scientific Name	Legal Status[a] Federal/State/CNPS	Habitat Requirements	Distribution in California	Occurrence in the Project Area
Round-headed beaked-rush (*Rhynchospora globularis*)	--/--/2	Freshwater marsh	Sonoma County	None observed during field surveys
Soft bird's-beak (*Cordylanthus mollis* ssp. *mollis*)	SC/R/1B	Upper marsh elevations that are regularly inundated but above area receiving daily flooding	San Francisco Bay area counties	None observed during field surveys
Sonoma alopecurus (*Alopecurus aequalis* var. *sonomensis*)	SC/--/1B	Wet meadows, freshwater marsh, and riaprian scrub	Marin and Sonoma Counties	Habitat unlikely to occur in the project area; none observed during rare plant field surveys at HAAF
Suisun thistle (*Cirsium hydrophilium* var. *hydrophilum*)	E/--/1B	Brackish tidal marsh and salt marsh	Solano County	None observed during rare plant field surveys at HAAF
Swamp harebell (*Campanula californica*)	SC/--/1B	Freshwater marsh, bogs, and mesic sites in conifer forests and grasslands	Central and northern counties of California	Habitat unlikely to occur in the project area; none observed during rare plant field surveys at HAAF
Thurber's reed grass (*Calamagrostis crassiglumis*)	SC/--1B	Freshwater and mesic sites in coastal prairie	Northern California counties	None observed during rare plant field surveys at HAAF
Invertebrates				
California freshwater shrimp (*Syncaris pacifica*)	E/E/--	Occurs in coastal streams	Coastal northern California	No records; no suitable stream habitat
Ricksecker's water scavenger beetle (*Hydrochara rickseckeri*)	SC/--/--	Occurs in streams	San Francisco Bay area	No records; nearest record is at Bolinas; no suitable habitat at HAAF
San Francisco fortail damselfly (*Ischnura gemina*)	SC/--/--	Occurs in slow-moving streams and channels	San Francisco Bay area	No records; drainage channel near HAAF is considered marginal-quality habitat

Common and Scientific Name	Legal Status[a] Federal/State/CNPS	Habitat Requirements	Distribution in California	Occurrence in the Project Area
Marin elfin butterfly *(Incisalia mossii)*	SC/--/--	Occurs in Marin County where Pacific stonecrop occurs	Marin County	No records; Pacific stonecrop was not found in the project area; no suitable habitat is present
Fish				
Tidewater goby (*Eucyclogobius newberryi*)	E/SSC/--	Shallow lagoons and lower reaches of streams	Coastal California	Observed at mouth of Novato Creek in 1945, although not assumed to be present any longer; tidal marshes in the project area and channel at HAAF are considered marginal-quality habitat
Sacramento splittail (*Pogonichthys macrokepidotus*)	PT/SSC/--	Generally restricted to tidal freshwater and low-salinity habitats	Generally upstream of San Pablo Bay	No records; no suitable habitat in the project area
Longfin smelt (*Spirinchus thaleichthys*)	SC/SSC/--	Spawns in lower Sacramento-San Joaquin River and Suisun Bay; prespawning adults and juveniles inhabit shoal areas of San Pablo Bay	Lower Sacramento-San Joaquin River, Suisun Bay, and San Pablo Bay	Could occur in or near the tidal marsh at and adjacent to HAAF
Central Valley Steelhead (*Oncorhynchus mykiss*)	T/SSC/--	Spawns in fresh water; juveniles rear in fresh and estuarine water before migrating to the ocean	Central Valley rivers and streams	Juveniles migrating to the ocean may use these areas to rear
Chinook Salmon: winter-run, spring-run, fall and late fall-run (*Oncorhynchus tshawytscha*)	E/E/-- PE/C/-- PT/SSC/--	Spawns in fresh water; juveniles rear in fresh and estuarine water before migrating to the ocean	Central Valley rivers and streams	Juveniles migrating to the ocean may use these areas to rear; San Pablo Bay is within the critical habitat defined for winter-run chinook salmon

Common and Scientific Name	Legal Status[a] Federal/State/CNPS	Habitat Requirements	Distribution in California	Occurrence in the Project Area
Amphibians				
California tiger salamander (*Ambystoma californiense*)	C/SSC/--	Small ponds, lakes, or vernal pools in grasslands and oak woodlands for larvae; rodent burrows, rock crevices, or fallen logs for cover for adults and for summer dormancy; does not occur in brackish water or saltwater habitats	Central Valley, including Sierra Nevada foothills, up to approximately 1,000 feet, and coastal region from Butte County south to Santa Barbara County	No records; no suitable freshwater habitat; not expected to occur in the project area
California red-legged frog (*Rana aurora draytonii*)	T/SSC/--	Permanent and semipermanent aquatic habitats, such as creeks and coldwater ponds, with emergent and submergent vegetation and riparian species along the edges; may estivate in rodent burrows or cracks during dry periods	Found along the coast and coastal mountain ranges of California from Shasta County to San Diego County; Sierra Nevada from Butte County to Fresno County	No records from surveys conducted in the HAAF or BMKV (Environmental Science Associates 1993) area; no suitable freshwater habitat; not expected to occur in the project area
Foothill yellow-legged frog (*Rana boylii*)	SC/SCC/--	Creeks or rivers in woodlands or forests with rock and gravel substrate and low overhanging vegetation along the edge; usually found near riffles with rocks and sunny banks nearby	Occurs in the Klamath, Cascade, north Coast, south Coast, and Transverse Ranges; through the Sierra Nevada foothills up to approximately 6,000 feet (1,800 meters) south to Kern County	No records; no suitable habitat
Western spadefoot toad (*Scaphiopus hammondii*)	SC/SCC/--	Shallow streams with riffles and seasonal wetlands, such as vernal pools in annual grasslands and oak woodlands	Sierra Nevada foothills, Central Valley, Coast Ranges, coastal counties in southern California	No records; no suitable freshwater habitat; not expected to occur in the project area

Common and Scientific Name	Legal Status[a] Federal/State/CNPS	Habitat Requirements	Distribution in California	Occurrence in the Project Area
Reptiles				
Northwestern pond turtle (*Clemmys marmorata marnorata*)	SC/SCC/--	Woodlands, grasslands, and open forests; occupies ponds, marshes, rivers, streams, and irrigation canals with muddy or rocky bottoms and with watercress, cattails, water lilies, or other aquatic vegetation	In California, range extends from Oregon border of Del Norte and Siskiyou Counties south along the coast to San Francisco Bay, inland through Sacramento Valley, and on the western slope of Sierra Nevada; range overlaps with that of southwestern pond turtle through the Delta and Central Valley to Tulare County	No records; could occur in Pacheco Pond, but none were seen during field surveys
Southwestern pond turtle (*Clemmys marmorata pallida*)	SC/SCC/--	Woodlands, grasslands, and open forests; occupies ponds, marshes, rivers, streams, and irrigation canals with muddy or rocky bottoms and with watercress, cattails, water lilies, or other aquatic vegetation	Occurs along the central coast of California east to the Sierra Nevada and along the southern California coast inland to the Mojave and Sonora Deserts; range overlaps with that of the northwestern pond turtle throughout the Delta and in the Central Valley from Sacramento County to Tulare County	No records; could occur in Pacheco Pond, but none were seen during field surveys
California horned lizard (*Phrynosoma coronatum frontale*)	SC/SSC/--	Grasslands, woodlands, and shrublands	Northern California, north of Los Angeles County	No records; potential low-quality habitat exists at HAAF; none were seen during field surveys

Common and Scientific Name	Legal Status[a] Federal/State/CNPS	Habitat Requirements	Distribution in California	Occurrence in the Project Area
Birds				
California brown pelican (*Pelecanus occidentalis californicus*)	E/E/--	Nests on coastal cliffs; forages in deep water	Coastal California	No suitable nesting habitat; salt marsh in the HAAF area could provide seasonal foraging habitat; could occur year round in open water, but on an irregular basis; none observed during field surveys
Double-crested cormorant (*Phalacrocorax auritus*)	--/SSC/--	Winters along the entire California coast and inland over the Coast Ranges into the Central Valley from Tehama County to Fresno County; a permanent resident along the coast from Monterey County to San Diego County, along the Colorado River, Imperial, Riverside, Kern, and King Counties, and the islands off San Francisco; breeds in Siskiyou, Modoc, Lassen, Shasta, Plumas, and Mono Counties; also breeds in the San Francisco Bay area and in Yolo and Sacramento Counties	Rocky coastlines, beaches, inland ponds, and lakes; needs open water for foraging, and nests in riparian forests or on protected islands, usually in snags	No records; no suitable nesting habitat; observed just outside the saltwater marsh and in the wider channels in the marsh at HAAF

Common and Scientific Name	Legal Status[a] Federal/State/CNPS	Habitat Requirements	Distribution in California	Occurrence in the Project Area
Ferruginous hawk (*Buteo regalis*)	SC/SSC/--	Open terrain in plains and foothills where ground squirrels and other prey are available	Does not nest in California; winter visitor along the coast from Sonoma County to San Diego County, eastward to the Sierra Nevada foothills and southeastern deserts, the Inyo-White Mountains, the plains east of the Cascade Range, and Siskiyou County	Potential winter visitor; could occur irregularly and in low numbers in the project area
Northern Harrier (*Circus cyaneus*)	--/SSC/--	Grasslands, meadows, marshes, and seasonal and agricultural wetlands providing tall cover	Throughout lowland California; has been recorded in fall at high elevations	No records; two harriers were observed foraging in the salt marsh during 1994; another harrier was observed nesting in the HAAF area during 1994 surveys
White-taile kite (*Elanus leucurus*)	--/FP/--	Low foothills or valley areas with valley or live oaks, riparian areas, and marshes near open grasslands for foraging	Lowland areas west of Sierra Nevada from head of Sacramento Valley south, including coastal valleys and foothills to western San Diego County at the Mexico border	No records; nearest known nesting site is approximately 0.5 mile northwest of Novato; suitable foraging habitat occurs in grassland, agricultural, and marsh habitats; minimal nesting habitat occurs in the project area

Common and Scientific Name	Legal Status[a] Federal/State/CNPS	Habitat Requirements	Distribution in California	Occurrence in the Project Area
Bald eagle (*Haliaeetus leucocephalus*)	T/E/--	In western North America, nests and roosts in coniferous forests and woodlands within 1 mile of a lake, a reservoir, a stream, or the ocean	Nests in Siskiyou, Modoc, Trinity, Shasta, Lassen, Plumas, Butte, Tehama, Lake, and Mendocino Counties and in the Lake Tahoe Basin; reintroduced into the central coast area; winter range includes the rest of California, except the southeastern deserts, very high altitudes in the Sierras, and east of the Sierra Nevada south of Mono County; range expanding into the western Sierra Nevada foothills	No records; no suitable nesting habitat in the project area; not a known wintering area
American peregrine falcon (*Falco preregrinus anatum*)	E/E/--	Nests and roosts on protected ledges of high cliffs, usually adjacent to lakes, rivers, or marshes that support large populations of other bird species	Permanent resident of the north and south Coast Ranges; may summer on the Cascade and Klamath Ranges south through the Sierra Nevada to Madera County; winters in the Central Valley south through the Transverse and Peninsular Ranges and the plains east of the Cascade Range	No suitable nesting habitat; potential occasional visitor during migration and in winter

Common and Scientific Name	Legal Status[a] Federal/State/CNPS	Habitat Requirements	Distribution in California	Occurrence in the Project Area
California black rail (*Laterallus jamaicensis coturniculus*)	SC/T/--	Tidal salt marshes associated with heavy growth of pickleweed; also occurs in brackish marshes or freshwater marshes at low elevations	Permanent resident in the San Francisco Bay and east-ward through the Delta into Sacramento and San Joaquin Counties; small populations in Marin, Santa Cruz, San Luis Obispo, Orange, Riverside, and Imperial Counties	The tidal marsh provides high-quality nesting and foraging habitat; observed in the salt marsh at HAAF (Garcia per. comm.)
California clapper rail (*Rallus longirostris obsoletus*)	E/E/--	Restricted to salt marshes and tidal sloughs; usually associated with heavy growth of pickleweed; feeds on mollusks removed from mud in sloughs	Marshes around San Francisco Bay and east through the Delta to Suisun Marsh	Tidal marsh provides high-quality nesting and foraging habitat; observed in salt marsh at HAAF(Garcia per. comm.)
Western snowy plover (coastal population) (*Charadrius alexandrinus nivosus*)	T/SCC/--	Nests on open, flat beaches and alkali flats; forages on beaches and mudflats	Coastal California	No records; no suitable nesting habitat; could forage in seasonal wetlands ad mudflats in the project area
California least tern (*Sterna antillarum browni*)	E/E/--	Nests on sandy, upper ocean beaches, and occasionally uses mudflats; forages on adjacent surf line, estuaries, or the open ocean	Nests on beaches along the San Francisco Bay and Delta and along the southern California coast from southern San Luis Obispo County south to San Diego County	No records; no suitable nesting habitat; could forage in shallow water beyond the salt marsh
Short-eared owl (*Asio flammeus*)	--/SSC/--	Nests and forages in grasslands and marsh habitats	Throughout lowland California	No records; salt marsh at HAAF is suitable nesting and foraging habitat

Common and Scientific Name	Legal Status[a] Federal/State/CNPS	Habitat Requirements	Distribution in California	Occurrence in the Project Area
Western burrowing owl (*Athene cunicularia hypugea*)	SC/SSC/--	Rodent burrows in sparse grassland, desert, and agricultural habitats	Lowlands throughout California, including the Central Valley, northeastern plateau, southeastern deserts, and coastal areas; rare along south coast	Formerly nested along the edges of the runway and levees at HAAF; none observed during 1994 field surveys, but reported by HAAF staff in 1995; could be a winter visitor, irregular visitor, or resident
Little willow flycatcher (*Empidonax traillii brewsteri*)	SC/E/--	Riparian areas and large, wet meadows with abundant willows for breeding; usually found in riparian habitats during migration	Summer range includes a narrow strip along the eastern Sierra Nevada from Shasta County to Kern County and another strip along the western Sierra Nevada from El Dorado County to Madera County; widespread in migration	No records; no suitable nesting habitat occurs in the project area
Saltmarsh common yellowthroat (*Geothlypis trichas sinuosa*)	SC/SSC/--	Freshwater marshes in summer and salt or brackish marshes in fall and winter; requires tall grasses, tules, and willow thickets for nesting and cover	Found only in the San Francisco Bay area in Marin, Napa, Sonoma, Solano, San Francisco, San Mateo, Santa Clara, and Alameda Counties	Suitable habitat occurs in tidal marshes in the project area; observed near the HAAF area in coastal salt marsh

Common and Scientific Name	Legal Status[a] Federal/State/CNPS	Habitat Requirements	Distribution in California	Occurrence in the Project Area
Bell's sage sparrow (*Amphispiza belli belli*)	SC/SCC/--	Prefers chaparral habitats dominated by chamise	Western Sierra foothills from El Dorado County south to Mariposa County, inner Coast Ranges from Shasta County southward, extending to coastal area from Marin County to San Diego County; from southern San Benito County to San Bernardino County; absent from innermost Coast Ranges and desert slopes of San Gabriel and San Bernardino Mountains	No records; no suitable habitat
San Pablo song sparrow (*Melospiza melodia samuelis*)	SC/SCC/--	Brackish and tidal marshes supporting cattails, tules, various sedges, pickleweed, and riparian scrub	Restricted to San Pablo Bay area	Suitable tidal marsh habitat occurs in the project area; observed in saltmarsh habitat during 1994
Mammals				
Suisun ornate shrew (*Sorex ornatus sinuosus*)	SC/SSC/--	Tidal, salt, and brackish marshes containing pickleweed, grindelia, bulrushes, or cattails; requires driftwood or other objects for nesting cover	Restricted to San Pablo Bay and Suisun Bay, both in Solano County	No records; not likely to occur in the project area

Common and Scientific Name	Legal Status[a] Federal/State/CNPS	Habitat Requirements	Distribution in California	Occurrence in the Project Area
Greater mastiff bat (*Eumops perotis callifornicus*)	SC/SSC/--	Roosts and breeds in deep, narrow rock crevices; may also use crevices in trees, buildings, and tunnels; forages in a variety of semiarid to arid habitats	Occurs along the eastern San Joaquin Valley from El Dorado County through Kern County; also found along the south Coast, Peninsular, and Transverse Ranges from San Francisco to the Mexico border	No records; no known suitable roosting sites in the study area
Long-eared myotis (*Myotis evotis*)	SC/--/--	Woodlands	Sierra Nevada, Klamath Mountains, Coast Ranges, and Transverse and Peninsular Ranges	The project area is at the edge of the species' range; no suitable roosting sites
Fringed myotis (*Myotis thysanodes*)	SC/--/--	Open woodlands	Sierra Nevada, Klamath Mountains, Coast Ranges, and Transverse and Peninsular Ranges	The project area is at the edge of the species' range; no suitable roosting sites
Long-legged myotis (*Myotis volans*)	SC/--/--	Most common in woodlands and forests above 4,000 feet, but occurs from sea level to 11,000 feet	Mountains throughout California	The project area is at the edge of the species' range; no suitable roosting sites
Yuma myotis (*Myotis yumanensis*)	SC/--/--	Roosts colonially in a variety of natural and human-made sites, including caves, mines, buildings, bridges, and trees; in northern California, maternity colonies are usually in fire-scarred redwoods, pines, or oaks; forages for insects over water bodies	Considered common and widespread in northern California; colonies known from Marin and San Francisco Counties	The project area is at the edge of the species' range; no suitable roosting sites

Common and Scientific Name	Legal Status[a] Federal/State/CNPS	Habitat Requirements	Distribution in California	Occurrence in the Project Area
Pacific western big-eared bat (*Plecotus townsendii townsendii*)	SC/SSC/--	Roosts in caves, tunnels, mines, and dark attics of abandoned buildings; very sensitive to disturbances and may abandon a roost after onsite visit	Coastal regions from Del Norte County south to Santa Barbara County	No records; no known suitable roosting sites in the project area
Saltmarsh harvest mouse (*Reithrodontomys raviventris*)	E/E/--	Brackish and salt marshes; primarily associated with pickleweed	San Francisco, San Pablo, and Suisun Bays; western most portion of the Delta	Suitable habitat exists along the salt marshes in the project area; assumed to occur in the salt marsh in the project area
Point Reyes jumping mouse (*Zapus trinotatus orarius*)	SC/SSC	Wet, marshy areas and closed forests	Confined to the Point Reyes area	No records; no suitable habitat

Note: Unless otherwise indicated, all survey results are taken from U.S. Army Corps of Engineers 1996.

[a] Status explanations:

Federal

E	=	listed as endangered under the federal Endangered Species Act.
T	=	listed as threatened under the federal Endangered Species Act.
PE	=	proposed for federal listing as endangered under the federal Endangered Species Act.
PT	=	proposed for federal listing as threatened under the federal Endangered Species Act.
C	=	species for which USFWS has on file sufficient information on biological vulnerability and threat(s) to support issuance of a proposed rule to list, but issuance of the proposed rule is precluded.
SC	=	species of concern; species for which existing information indicates it may warrant listing but for which substantial biological information to support a proposed rule is lacking.
--	=	no listing.

State

E	=	listed as endangered under the California Endangered Species Act.
T	=	listed as threatened under the California Endangered Species Act.
R	=	listed as rare under the California Native Plant Protection Act. This category is no longer used for newly listed plants, but some plants previously listed as rare retain this designation.
FP	=	fully protected under the California Fish and Game Code.

SSC	=	species of special concern in California.
--	=	no listing.

California Native Plant Society

1A	=	List 1A species: presumed extinct in California.
1B	=	List 1B species: rare, threatened, or endangered in California and elsewhere.
2	=	List 2 species: rare, threatened, or endangered in California but more common elsewhere.
3	=	List 3 species: plants about which more information is needed to determine their status.
--	=	no listing.

Appendix E.
Construction Vehicle, Employee, and Worker Trip Estimates

PA-01 0829

Appendix E. Construction Vehicle, Employee, and Worker Trip Estimates

This appendix describes the three-step methodology used to estimate the number of construction vehicles (step one), employees (step two), and worker commute trips (step three) associated with levee construction (years 1 and 2) at the Hamilton wetland restoration project site. The number of workers and worker trips would be lower during years 3 through 6 than during years 1 and 2 because the activities associated with wetland restoration would require less construction equipment and fewer employees than would levee and berm construction.

Step One

In step one, the type and number of construction vehicles needed for levee construction were estimated. For this project, a maximum of eight scrapers and two compactors/ rollers would be needed for levee construction. These estimates are based on the total levee square footage and a 2-year time period to complete construction of the levees. Scrapers were assumed to be the primary type of equipment because they would be used to create the levees and berms using existing soil at the project site. The use of more than eight scrapers for this project could result in congestion problems because the vehicles would start to interfere with each other. A maximum of two compactors/rollers would be needed to compact soil as the levees are built up by the scrapers.

In addition to the scrapers and rollers, one loader and two dump trucks were assumed to be needed because a portion of the total levee fill may be obtained from locations such as Hamilton Army Airfield at distances that prevent the use of scrapers to obtain the needed fill material. Additional support equipment, including a fuel supply truck, a water supply truck (for wetting down dry soil), a maintenance worker vehicle, and a pickup truck for the project supervisor, would be required. Seventeen construction vehicles would be used during the peak of levee construction.

Step Two

In step two, the number of employees was estimated. Those estimates assumed one employee per construction vehicle for a total of 17 employees.

Step Three

In step three, the number of daily worker trips was estimated. Thirty-eight daily trips were estimated for this project: 15 trips during the morning commute, 15 trips during the evening commute, and eight trips during the lunch hour. The 15 trips during the morning and evening commutes assume that 13 workers commute in single-occupant vehicles and that four workers commute in two double-occupant vehicles. During the lunch hour, eight of the 15 vehicles were assumed to be used to buy lunch and run errands.

Conclusions

The highest level of worker commute trips would be generated during the first 2 years. During that time, levees and berms would be constructed. That construction effort would require a maximum of 17 workers and would generate 15 trips during the morning and evening commute periods and eight trips during the lunch hour. This low level of trip generation would cause a less-than-significant traffic impact at nearby intersections. In addition, these trips represent short-term increases in trip generation that would occur only during the peak construction periods (during the first 2 years of the project).