Bolinas Lagoon Ecosystem Restoration Project Draft Feasibility Study Marin County, California, June 2002

VOLUME I
Draft Feasibility Study (In a separate volume in the KRIS edition of this report due to file size constraints)

DRAFT EIS/EIR (Included here, but we are missing most figures)

VOLUME II
Technical Appendices (Not available in this KRIS edition of this document)

EXECUTIVE SUMMARY

INTRODUCTION

This joint environmental impact statement/environmental impact report (EIS/EIR) evaluates the impacts on the environment that could result from the proposed Bolinas Lagoon Ecosystem Restoration Project, which would involve the removal of up to 1.5 million cubic yards (cy) of sediment from the bottom of Bolinas Lagoon. This estuarine lagoon is in Marin County, California, 12 miles northwest of San Francisco (Figure 1-1). The lagoon is owned by Marin County and is administered by Marin County Open Space District (MCOSD) and also falls within the jurisdictional boundaries of the Gulf of the Farallones National Marine Sanctuary (GFNMS).

This EIS/EIR has been prepared in accordance with the National Environmental Policy Act of 1969 (NEPA), (42 United States Code §§ 4321-4347 [1994]); the Council on Environmental Quality regulations implementing NEPA [40 Code of Federal Regulations [CFR] Parts 1500-1508); the California Environmental Quality Act (CEQA) of 1970, (California Public Resources Code [Cal. Pub. Res. Code] §§ 21000-21178.1), and implementing guidelines (California Code of Regulations title 14, §§ 15000-15387 [1999]), the US Army Corps of Engineers (Corps) NEPA Guidelines (33 CFR Part 230, 32 CFR Chapter 11), the National Marine Sanctuary Program Regulations, 15 CFR, Part 922, Subpart M, and the Marin County CEQA guidelines.

This EIS/EIR is being written as part of the Corps and MCOSD's Bolinas Lagoon Ecosystem Restoration Feasibility Study, which will evaluate the financial, environmental, and engineering feasibility of undertaking a sediment removal project in Bolinas Lagoon. The Corps is the lead NEPA agency, and MCOSD is the lead CEQA agency. Marin County owns Bolinas Lagoon Open Space Preserve, and MCOSD administers it with the technical advice and support of the Bolinas Lagoon Technical Advisory Committee. MCOSD and the Corps of Engineers are jointly funding the study, which will examine the effects of remediation strategies that counteract the long-term effects of sedimentation and will compare them with the alternative of taking no action against sedimentation. The Bolinas Ecosystem Restoration Feasibility Study (FS) is hereby incorporated by reference.

The EIS/EIR addresses the environmental impacts of two action alternatives and the No Action Alternative (called the No Project Alternative under CEQA). The two action alternatives consist of sediment removal and upland excavation sufficient to remove 1.5 million cy of sediment from Bolinas Lagoon, in order to restore the lagoon's sensitive intertidal and subtidal habitats to a self-sustaining condition.

Marin County and community residents near the proposed project area have identified certain resources to be of particular importance: Biological resources, geological resources, water quality, visual resources, and recreational resources. Project success is also a major concern.

PURPOSE AND NEED (CHAPTER 1)

Bolinas Lagoon fulfills a vital function in the California coastal ecosystem: It provides productive and diverse estuarine habitat for fish, waterfowl, shorebirds, marine mammals, and other wildlife and serves as an important stopover point for birds on the Pacific Flyway. Bolinas Lagoon has been filling in at an accelerated rate as a result of human activity since European colonization, and the mouth of the lagoon is predicted to begin closing intermittently within the next 50 years. The result of these closures would be a disruption in the flow of water in the lagoon, and the lagoon's value as estuarine habitat would decline. Uses of the lagoon for recreation, research, and foraging and breeding by sensitive species of birds, fish, and marine mammals would all suffer because of this decline in habitat volume.

The goals of this project are to increase tidal volume and to restore intertidal and subtidal habitat in Bolinas Lagoon to historic levels, in a manner that prevents the need for regular maintenance dredging during the project period. The lead agencies have evaluated the best available bathymetric data and aerial photographs of the lagoon to develop alternatives that would shift the lagoon's intertidal and subtidal volumes back to a point that is closer to where the lagoon would have been without the accelerated sedimentation rates of the past 150 years. Historical data helped to keep the design parameters within the historical context. That is, the alternatives were designed in a manner that allowed changes in intertidal and subtidal volume to be kept proportional so as not to create an "unnatural" condition in the lagoon. With these changes, the lagoon would have larger volumes of intertidal and subtidal habitat and increased tidal flow, which would in turn delay the potential closure of the inlet and would preserve the lagoon's valuable intertidal and subtidal habitats. Additional benefits of this project include preserving the lagoon for recreational uses and scenic value.

This project would address the impact of human activity on the lagoon and is intended to result in a lagoon that is neither fixed and unchanging nor in need of regular maintenance. On completion of the project, the lagoon would remain subject to natural variations in tidal volume, sediment input, seismic activity, and weather conditions but with a lower baseline of sediment than has existed since the mid-1950s.

PUBLIC INVOLVEMENT PROCESS

Public involvement is a key part of the EIS/EIR process. Methods to involve the public in the EIS/EIR process have included or will include the following:

- Publishing notices of public meetings in newspapers with a wide circulation and encouraging written comments;
- Publishing a notice of intent (NOI) in the Federal Register on April 9, 1998 (63 Fed. Reg. 17392); the NOI was sent to the California State Clearinghouse for distribution to state agencies. Its purpose is to notify the public that an EIS will be prepared and considered (40 CFR § 1508.22). The NOI also solicited guidance from these agencies as to the scope and content of the environmental information to be included in the EIR (CEQA Guidelines § 15375). A notice of preparation (NOP) was also prepared to notify the responsible, trustee, and involved federal agencies that an EIR will be prepared. The NOP was published on April 17, 2000, and the project was assigned the California State Clearinghouse Number of 2000042055.
- Sending scoping letters and project information to public agencies, public interest groups, and individuals;
- Holding a public hearing on scoping for the Bolinas Lagoon Ecosystem Restoration Feasibility Study on April 16, 1998, at the Stinson Beach Community Center; this meeting was attended by agency representatives and members of the public;
- Holding public informational meetings at the Stinson Beach Community Center on November 4, 1999, and November 30, 2000, and at the Bolinas Community Center on December 2, 2000, in order to keep the local community informed of the status of the Bolinas Lagoon Ecosystem Restoration Feasibility Study;
- Creating and maintaining a mailing list to disseminate information about the decision-making process;
- Making the draft and final EIS/EIR available to the public online at http://www.spn.usace.army.mil/projects/bolinas.html;
- Holding two public hearings on the draft EIS/EIR and providing a 45-day comment period; and
- Circulating the Final EIS/EIR for thirty days for public review of the adequacy of the responses to comments on the draft EIS/EIR.

Areas of Controversy

Key issues that were raised during the community scoping process were taken into account, and those public comments on issues relevant to the NEPA/CEQA process have been incorporated into this draft EIS/EIR's analysis. These issues are not necessarily controversial, but they represent issues of concern to the community.

In Appendix A is a summary table of the major issues of concern, the individuals who expressed concern, and the general locations in this document where the concerns are addressed. Written comments taken during the public scoping process for the draft EIS/EIR have been summarized into key issues of importance. Only issues that raise significant environmental impact concerns are addressed in the EIS/EIR, as provided in NEPA, the CEQ regulations for implementing NEPA, CEQA, and the CEQA guidelines. The issues are summarized below.

- Sources of sediment in the lagoon: Many commenters believe sediment buildup in the lagoon is continuing and is a result of erosion in the watershed. However, the watershed study commissioned by the Corps in 2001 (see Technical Appendix A) showed that erosion in the watershed is only a minor source of sediment in the lagoon.
- Need for watershed-level action: Some members of the public commented that the lagoon's sedimentation problems stem from erosion in the watershed. Many commenters have requested that the project include watershed-level actions to resolve erosion. Given the conclusions of the watershed study, the lead agencies have opted not to pursue watershed-level actions because the watershed is not a significant source of sediment for the lagoon.
- Appropriateness of dredging: Some commenters argued that the Corps has chosen the dredging option too swiftly and that further studies are needed to determine whether less invasive methods might restore the lagoon.
- Human activities that have affected the lagoon: Some stakeholders argue that the project should be focused on repairing the damage that human beings have done to the lagoon, particularly by removing the Caltrans turnouts, the upland area in PGC Delta, and some of the areas filled when the Seadrift development was constructed in the 1960s.
- Seadrift: Some commenters want the Seadrift Lagoon opened up to public access. Other commenters believe that the construction of Seadrift itself was the beginning of the lagoon's major problems.

Public Review

The public review period for this draft EIS/EIR is 45 days under both CEQA and NEPA; comments will be responded to in a final EIS/EIR. NEPA provides for a 30-day no action period after publication of the final EIS.

Draft EIS/EIR

The public is invited to review and comment on this draft EIS/EIR. The Corps and Marin County will publish a notice of availability in the Federal Register and in the local press. Public notices or copies of the EIS/EIR will be mailed to agencies with jurisdiction and private individuals or organizations that have expressed an interest in the project. Marin County will file a notice of completion (required under CEQA) with the State Office of Planning and Research. On the day the notice of completion is filed, the 45-day public comment period will begin, which will provide the public with an opportunity to review the document and to offer comments.

The public is invited to send written comments on the draft EIS/EIR to Tim Haddad, Marin County Community Development Agency, 3501 Civic Center Drive, San Rafael, CA 94903, and to Roger Golden, US Army Corps of Engineers, San Francisco District, 333 Market Street, 7th Floor, San Francisco, CA 94105.

Two public hearings will be held during the 45-day review period to hear comments on the draft EIS/EIR. The time and place of the hearings will be announced in the media and are noted in the transmittal letter accompanying this document.

Final EIS/EIR

A final EIS/EIR, in which the comments received on the draft EIS/EIR are discussed, will be published and made available for review. A notice of availability of the final EIS/EIR will be published in the Federal Register and in a public notice.

During the NEPA 30-day no action period, the public and agencies may comment on the adequacy of responses to comments and the final EIS/EIR. After that time, the Corps will sign a record of decision, detailing their decision regarding the proposed project. This 30-day period will also fulfill Marin County's requirement for a final EIR public review and comment period before the Planning Commission considers it for recommendation to the Board of Supervisors for Certification of the final EIS/EIR as complete and adequate. The Planning Commission will consider its recommendation for certification of the final EIS/EIR (and any comments and responses on the final EIS/EIR as an amendment to the final EIS/EIR) in a public meeting, before they consider their recommendation for action on the project to the board. The final EIR will be presented to the Marin County Parks, Open Space and Cultural Commission for recommended action on the EIS/EIR and the project, then to the Board of Directors of MCOSD for certification and final action during or after the 30-day federal review period.

Proposed Action and Alternatives (Chapter 2)

The alternatives consist of two project alternatives, which would both remove over 1,400,000 cy of wet sediment and upland fill from selected areas all over the lagoon, and the No Action/No Project Alternative. Aspects of the project alternatives that have yet to be fully developed include construction planning, scheduling sediment removal, and identifying specific adaptive management techniques to evaluate and respond to changes in the lagoon ecosystem and hydrology as a result of project activity.

The two project alternatives are similar and vary only with regard to excavation in Pine Gulch Creek Delta (PGC Delta) and the total amount of sediment and vegetation to be removed from the project area. Schedules have yet to be finally determined, but wildlife using the lagoon may limit construction to only a few months in the summer and fall. The two project alternatives are known as the Riparian Alternative and the Estuarine Alternative. The Estuarine Alternative is identified in the Bolinas Feasibility Study as the National Ecosystem Restoration Plan, and the Riparian Alternative is identified as the Locally Preferred Plan, because it was developed in consultation with local scientists and stakeholders.

Section 2.5 of this report, and Sections 4, 5, and 6 of the Feasibility Study, discuss the development of alternatives which were considered and removed from consideration.

Riparian Alternative

Both project alternatives would involve removing wet sediment from locations all over the lagoon and dry soil and vegetation from the adjacent upland. In some areas vegetation, including mature trees and shrubs, would be removed. As many as 100 acres of jurisdictional wetlands would be converted to lower intertidal or subtidal habitat. Full construction is estimated to take three to four months per year for up to nine years; the short construction periods are designed to limit impacts on sensitive species in the lagoon. Construction schedules have not yet been developed, but for the purposes of this EIS/EIR, construction is estimated to require approximately 60 working days per year, including 33 days of round-the-clock dredging per year. Wet sediment would be removed from the lagoon floor by a cutter head suction dredge, which would remove sediment in a liquid slurry from the floor of the lagoon, while upland soils would be removed by land-based excavators. The slurry would be pumped from the dredge through a flexible pipeline over the end of Stinson Beach sand spit to one of two transport barges, or scows, anchored in Bolinas Bay. Once filled with slurry, each scow would be towed by a tugboat to the San Francisco Deep Ocean Disposal Site (SFDODS), which is roughly 55 miles away, west of the Farallon Islands.

Upland sites would be excavated with land-based excavating machinery, such as bulldozers, loaders, and cranes. The removed materials would be dry and therefore could be transported by dump trucks rather than by barge. The disposal location for dry soil is the Redwood Landfill in Novato, California. Vegetative debris removed from upland sites would also be disposed of at Redwood Landfill.

Sediment removal in the lagoon under this alternative would reopen old channels or create new ones to increase hydraulic exchange within the lagoon. Under the Riparian Alternative, dredging would take place in the lagoon in the North Basin, Main Channel, Kent Island, Bolinas Channel, Pine Gulch Creek (PGC) Delta, and South Lagoon

Channel. Additionally, dry land excavation would take place at Dipsea Road, the Highway 1 fills, and PGC Delta.

Based on the expected volume of material to be dredged and the dredge's average rate, 300 days of round-the-clock dredging would be needed to complete the dredging element of this alternative. Over nine years, this averages out to 33 days per year of dredging.

Limited dredging windows are available, based on sensitive species activity in Bolinas Lagoon. An open window for excavation in PGC Delta exists between July and October; an open window for Kent Island exists between August and September. The Highway 1 fills, Dipsea Road, and the South Lagoon Channel could be excavated any time between August and February, but there are no open windows for excavation in the Bolinas Channel, the Main Channel, or the North Basin. The lead agencies will consult with the US Fish and Wildlife Service, National Marine Fisheries Service, the California Department of Fish and Game, and GFNMS to identify dredging windows for these areas that minimize impacts on sensitive species. Based on sensitive species activity, it is likely that most excavation in the lagoon would take place between July and October.

Table ES-1 shows excavation information by project element.

Estuarine Alternative

The Estuarine Alternative is identical to the Riparian Alternative except for the excavation in PGC Delta; excavation under the Estuarine Alternative would take out greater amounts of vegetation, upland soils, and wet sediment than under the Riparian Alternative. This would require removing 11 acres of intertidal and upland habitat in the delta, including 7 of the 17 acres of riparian habitat in the delta. More jurisdictional wetlands would be lost under this alternative, possibly as much as 10 acres more than under the Riparian Alternative. Implementing the Estuarine Alternative is estimated to last approximately nine years, and a somewhat greater amount of wet sediment would be taken out of the lagoon. The same types of machinery and disposal locations would be used, and the same schedule limitations would apply.

Table ES-2 provides a summary of excavation information by project element for the Estuarine Alternative.

No Action/No Project Alternative

The No Action/No Project Alternative would entail taking no further action to address sedimentation in the lagoon but would leave in place existing management plans and policies. This would include the Bolinas Lagoon Management Plan, existing management plans and policies administered by other authorities, such as GFNMS, GGNRA, and Pt. Reyes National Seashore, as well as applicable state and federal resources management laws and regulations. Evaluating this alternative includes determining the future impact of these plans and policies in the absence of any dredging or other sediment removal activities in the lagoon.

Table ES-3 compares the results of the two project alternatives with the No Action Alternative, and Table ES-4 compares long-term impacts on habitat totals in the lagoon.

Environmentally Superior Alternative

NEPA requires that an environmentally preferable alternative be identified, and CEQA requires that an environmentally superior alternative be identified. The Riparian Alternative would be the environmentally superior alternative, because this alternative would achieve the project goals, unlike the No Action Alternative, and would create fewer impacts as compared to the Estuarine Alternative. The Riparian Alternative would result in seven significant and unmitigated impacts and 11 significant but mitigated impacts, compared to the Estuarine Alternative, which would result in eight significant and unmitigated impacts and 14 significant and mitigated impacts. The Riparian Alternative would meet the project goal of increasing tidal volume in Bolinas Lagoon, would in the long term produce the same acreages of subtidal and intertidal habitat as the Estuarine Alternative, would result in fewer significant impacts, would result in the loss of ten fewer acres of jurisdictional wetlands, and would not conflict with the Marin County Local Coastal Plan.

Table ES-1
Riparian Alternative Project Elements

	Excavation Footprint (acres)	Excavation Volume (wet and dry) (cy)	Volume of Vegetative Debris (cy)	Deepest Level of Excavation (NGVD)[1]	Days of Dredging (at 200 cy/hour, 24 hours/day)	Barge Loads to SFDODS	Truckloads of Dry Soil to Redwood Landfill	Truckloads of Chips to Redwood Landfill
North Basin	136	458,550 (wet)	N/A	-4 ft	96	612	N/A	N/A
Main Channel	38	216,250 (wet)	N/A	- 4 ft	45	289	N/A	N/A
Bolinas Channel	16	130,800 (wet)	N/A	- 5 ft	28	175	N/A	N/A
Kent Island	124	376,750 (wet)	3,800	- 2 ft	79	503	N/A	320
Pine Gulch Creek Delta	86	149,100 (wet), 9,550 (dry)	850	- 1 ft	31	199	800	71
Highway 1 Fills	4	4,800 (dry)	N/A	0 ft	N/A	N/A	405	N/A
Dipsea Road	8	37,700 (dry)	N/A	0 ft	N/A	N/A	3150	N/A
South Lagoon Channel	18	89,250 (wet)	N/A	- 4 ft	19	119	N/A	N/A
Totals	430	1,420,700 (wet), 52,050 (dry)	3,800	N/A	296	1897	4,355	391

[1] NGVD is the land datum typically used on US Geological Survey topographic maps. NGVD is commonly referred to as mean sea level because it was based on the average of the mean tide levels at selected locations. However, because it is a national datum, 0 ft NGVD may not necessarily equate to mean sea level in Bolinas Lagoon.

Table ES-2
Estuarine Alternative Project Elements

	Excavation Footprint (acres)	Excavation Volume (wet and dry) (cy)	Volume of Vegetative Debris (cy)	Deepest Level of Excavation (NGVD)[1]	Days of Dredging (at 200 cy/hour, 24 hours/day)	Barge Loads to SFDODS	Truckloads of Dry Soil to Redwood Landfill	Truckloads of Chips to Redwood Landfill
North Basin	136	458,550 (wet)	N/A	-4 ft	96	612	N/A	N/A
Main Channel	38	216,250 (wet)	N/A	- 4 ft	45	289	N/A	N/A
Bolinas Channel	16	130,800 (wet)	N/A	- 5 ft	28	175	N/A	N/A
Kent Island	124	376,750 (wet)	3,800	- 2 ft	79	503	11,000	320
Pine Gulch Creek Delta	103	155,950 (wet), 34,750 (dry)	11,300	- 1 ft	31	208	2,900	950
Highway 1 Fills	4	4,800 (dry)	N/A	0 ft	N/A	N/A	405	N/A
Dipsea Road	8	37,700 (dry)	N/A	0 ft	N/A	N/A	3,150	N/A
South Lagoon Channel	18	89,250 (wet)	N/A	- 4 ft	19	119	N/A	N/A
Totals	447	1,427,550 (wet) 77,250 (dry)	15,100		298	1906	17,455	1,270

[1] NGVD is the land datum typically used on US Geological Survey topographic maps. NGVD is commonly referred to as mean sea level because it was based on the average of the mean tide levels at selected locations. However, because it is a national datum, 0 ft NGVD may not necessarily equate to mean sea level in Bolinas Lagoon.

Table ES-3
Dredging Alternative Results

Alternative	Volume of Excavated Material (cy)	Dredged Footprint (acres)	Lagoon Tidal Prism (cy)	Tidal Prism Compared to 1998 (cy)	Closure Index[1]
No Project (1998)	N/A		5,126,588	N/A	10.5
Estuarine Alternative (2008)	1,504,800	447	6,567,513	+1,440,925	8.1
Riparian Alternative (2008)	1,472,750	430	6,559,185	+1,432,597	8.1
No Action/No Project (2008)	0	0	4,883,508	-243,0800	11.2
No Action/No Project (2058)	0	0	3,841,791	-1,284,797	16.1

Source: Romanoski 2002

Note: [1]Inlet closure is possible at an index of 15.

Table ES-4
Lagoon Habitat Totals after Construction

Alternative	Subtidal Habitat Acreage	Subtidal Habitat Volume (cy)	Intertidal Habitat Acreage	Intertidal Habitat Volume (cy)	Upland Habitat Acreage
No Project (1998 conditions)	146.39	523,318	848.53	3,584,714	238.10
Estuarine Alternative					
2008	284.47	890,366	832.87	5,460,468	117.47
2018	205.82	627,984	873.01	5,355,085	165.11
2038	184.78	590,921	864.34	4,728,183	190.96
2058	166.01	557,866	856.61	4,169,080	214.01
Riparian Alternative					
2008	285.39	894,995	827.31	5,448,416	121.97
2018	205.41	627,264	872.84	5,342,896	165.61
2038	184.37	590,201	864.17	4,715,994	191.46
2058	165.6	557,146	856.44	4,156,891	214.51
No Action					
2008	134.45	502,281	843.61	3,228,889	252.77
2018	123.07	482,246	838.92	2,890,014	266.74
2038	102.03	445,183	830.25	2,263,112	292.59
2058	83.26	412,128	822.52	1,704,008	315.64

Affected Environment (Chapter 3)

The affected environment section of the document describes the present physical conditions within the area of the proposed action. The area, or region of influence, is defined for each environmental issue based on the overall extent of physical resources that may be affected directly or indirectly by the proposed action and appropriate guidelines of regulatory agencies or common professional practice. This section of the EIS/EIR describes the baseline conditions for each environmental resource against which the potential impacts of the proposed action are compared.

Environmental Consequences and Major Conclusions (Chapter 4)

The environmental consequences section of the document describes the potential significant environmental consequences, or impacts, of each alternative. Mitigation measures are also identified for any impact determined to be significant. The purpose of this section is to provide the public, interested agencies, and decision-makers with a clear understanding of the environmental impacts associated with the projects. In compliance with CEQA, any impacts that are determined to be significant and unmitigable are called out separately. Beneficial impacts are also described for each alternative. In the draft EIS/EIR, 22 separate direct and indirect significant impacts from the two project alternatives were identified. Cumulative impacts are discussed below.

Summary of Significant Unavoidable Adverse Impacts

Eleven separate unavoidable significant adverse impacts have been identified and analyzed for all three alternatives, and these impacts are summarized in Table ES-5. As discussed in the specific resource area discussions in Chapter 4, the project alternatives would result in seven or eight significant unavoidable environmental impacts. Table ES-5 summarizes the unavoidable significant impacts for the project alternatives and the No Action Alternative. These impacts are described in more detail in Table 2-7, which summarizes the potentially significant impacts of the project alternatives and the No Action Alternative.

Summary of Less than Significant Adverse Impacts

The significant impacts identified in the EIS/EIR that would be reduced to a less than significant level through the implementation of mitigation measures are as follows:

- Hydrology and groundwater—4.2.2 (Construction), 4.2.3 (Long-Term Circulation), 4.2.4 (Construction), 4.2.6 (Flooding);
- Biological—4.3.3 (California red-legged frog);
- Geology—4.4.1 (Erosion of the Tidal Inlet Channel and Banks), 4.4.2 (Inlet Channel Narrowing or Closure);
- Cultural—4.5.1 (Damage to Undiscovered Cultural Resources);
- Public access and recreation—4.6.1 (Lagoon Recreation Access), 4.6.2 (Lagoon Recreation Access);

Table ES-5
Significant Unavoidable Impacts

Riparian Alternative	Estuarine Alternative	No Action/No Project Alternative

Impact 4.2.1. Subsidence impacts from earthquake activity. A strong earthquake would cause liquefaction of the sand spit and probably a general leveling of the lagoon bottom, as well as widespread destruction of structures underlain by sandy sediments. While not an impact of the project, these conditions would form the backdrop for additional hydraulic effects related to the project.	Impact 4.2.1. Seismic and subsidence impacts. A strong earthquake would cause liquefaction of the sand spit and probably a general leveling of the lagoon bottom, as well as widespread destruction of structures underlain by sandy sediments. While not an impact of the project, these conditions would form the backdrop for additional hydraulic effects related to the project.	Impact 4.3.5. Loss of habitats. Under the No Action Alternative, sediment would continue to build up and fill in open water areas within the lagoon, which in turn would decrease the extent of tidal inundation, diminish water quality, and degrade existing habitat values. Over time, this would result in the loss of open water, salt marsh, riparian, and transitional habitats and associated plant and animal species.
Impact 4.3.1: Impact on Benthic Invertebrates. Dredging activities would directly disrupt benthic communities in the lagoon bottom and would indirectly affect animal life, such as birds and fish that feed on benthic invertebrates.	Impact 4.3.1: Impact on Benthic Invertebrates. Dredging activities would directly disrupt benthic communities in the lagoon bottom and would indirectly affect animal life, such as birds and fish that feed on benthic invertebrates.	Impact 4.2.5: Lagoon Closure. Under the No Action Alternative, the PGC Delta is projected to continue to aggrade and expand, and the tidal prism of the lagoon would continue to decrease. Temporary or intermittent closure of the inlet channel is predicted as soon as 2058. However, the changes in water quality and loss of a significant water resource (the lagoon) would be of a magnitude that would be considered significant if they were caused by human action.
Impact 4.3.2: Loss of Jurisdictional Wetland Approximately 100 acres of jurisdictional wetland would be destroyed and converted to mudflat or open water under this alternative.	Impact 4.3.2: Loss of Jurisdictional Wetland. Over 100 acres of jurisdictional wetland would be destroyed and converted to mudflat or open water under this alternative.	Impact 4.6.3. Long-term impacts: lagoon recreation access. Fishing and bird watching in the lagoon would be affected by the significant reductions in intertidal and subtidal habitat predicted by the Corps to result from taking no action to address sedimentation. Similarly, kayaking would be adversely affected by a reduction in subtidal and intertidal habitat and an expansion of upland habitat
Impact 4.3.3 Loss of Black Rail Habitat.: Excavation of salt marsh habitat would cause significant impacts to the state-listed as threatened California black rail.	Impact 4.3.3 Loss of Black Rail Habitat.: Excavation of salt marsh habitat would cause significant impacts to the state-listed as threatened California black rail.	

Table ES-5
Significant Unavoidable Impacts *(continued)*

Riparian Alternative	Estuarine Alternative	No Action / No Project Alternative
Impact 4.12.1. Alteration of terrain and water. During and after project construction, immediate impacts would include significantly altering the terrain of the lagoon by changing the lagoon shoreline at Pine Gulch Creek and Dipsea Road and along Highway 1; immediate impacts would also include changes in water flow, volume, location, and possibly color all through the lagoon.	Impact 4.7.2. Consistency with countywide plan and LCP. Because the Estuarine Alternative does provide for vegetation removal in the riparian protection area of Pine Gulch Creek, there would be a significant impact.	
Impact 4.12.2. Short-term changes in vegetation. Removal over 100 acres of upland habitat, including all the vegetation on Kent Island would significantly change the view from the eastern and northern shores of the lagoon, as well as from viewing locations along Highway 1 and along the hiking trails on Bolinas Ridge.	Impact 4.12.1. Alteration of terrain and water. During and after project construction, immediate impacts would include significantly altering the terrain of the lagoon by changing the lagoon shoreline at Pine Gulch Creek and Dipsea Road and along Highway 1; immediate impacts would also include changes in water flow, volume, location, and possibly color all through the lagoon.	
Impact 4.12.3. Long-term changes in vegetation. Compared to the No Action Alternative in 2058, this alternative would result in there being 100 fewer acres of upland habitat, 34 acres more of intertidal habitat, and 82 acres more of subtidal habitat.	Impact 4.12.2. Short-term changes in vegetation. Removing over 100 acres of upland habitat, including all the vegetation on Kent Island, would significantly change the view from the eastern and northern shores of the lagoon, as well as from viewing locations along Highway 1 and along the hiking trails on Bolinas Ridge.	
	Impact 4.12.3. Long-term changes in vegetation. Compared to the No Action Alternative in 2058, this alternative would result in there being 100 fewer acres of upland habitat, 34 acres more of intertidal habitat, and 82 acres more of subtidal habitat.	

- Land use—4.7.1 (Compatibility with Uses at the Project Site);
- Air quality—None;
- Onshore traffic and transportation—None;
- Marine traffic and transportation—None;
- Noise—4.11.1 (Noise from Dredging), 4.11.2 (Noise from Vegetation Clearing Activity);
- Aesthetics and visual resources—4.12.4 (Light and Glare), 4.12.5 (Changes to Existing Visual Quality); 4.12.6 (Changes in Terrain);
- Public services and utilities—None; and
- Socioeconomics—None.

Effects Found to be Less Than Significant

The following issues have been found to be less than significant. These effects are discussed in Chapter 4, as required by NEPA.

- Air quality—Truck, dredging, and shipping emissions are well below the Clean Air Act conformity thresholds.
- Onshore traffic and transportation—None. Levels of service would not be exceeded for the preferred alternative of routing traffic along Novato Boulevard.
- Marine traffic and transportation—Ship traffic would not be impeded or delayed substantially in the project area.
- Public services and utilities—The project would not exceed current service capabilities and would not increase demand for public services.
- Socioeconomics—The project would not employ large numbers of people and would not increase the need for new housing. Impacts to local businesses, such as those geared to tourism, would be less than significant because excavation would be designed and timed to allow for continuing recreational activities.

Cumulative Impacts (Chapter 5)

Chapter 5, Cumulative Impacts, addresses what effects the proposed action would have on the environment, when combined with other past, present, and reasonably foreseeable actions. Reasonably foreseeable cumulative projects are listed and impacts are identified by resource category. Less than significant cumulative impacts from the project alternatives are discussed for hydrology and groundwater, biological resources, cultural resources, recreation resources, onshore transportation, noise, aesthetics and visual resources, public services and utilities, and socioeconomics.

Other Required Analysis (Chapter 6)

The other required analysis section describes the impacts for other areas specifically required by NEPA and CEQA. These requirements consist of identifying and analyzing significant unavoidable impacts, growth-inducing impacts (NEPA/CEQA), the relationship between short-term uses and long-term productivity (NEPA), any irreversible or irretrievable commitment of resources (NEPA) or significant irreversible environmental changes (CEQA), and Environmental Justice (NEPA).

Summary of Growth-Inducing Impacts

As discussed in Section 6.3, the purpose of the proposed project is to correct a hundred and fifty years of increased sedimentation in Bolinas Lagoon by restoring the lagoon to a more self-sustaining condition. The project would have no discernible impact on economic development or population growth in the surrounding area. Marin County has strictly limited development in west Marin, and there are no elements of either project alternative that are expected to increase development in the project area, to extend urban services into west Marin, to remove obstacles to development, or to set a precedent for additional growth.

Summary of Significant Irreversible Changes or Irretrievable Commitments of Resources

Excavating in the PGC Delta, Kent Island, Dipsea Road, and the Highway 1 fills would produce a permanent change in those areas. Also, excavation of the North Basin, Main Channel, Bolinas Channel, and South Lagoon Channel would result in permanent changes to the lagoon's hydrology. This excavation would essentially be irreversible. The project would not require a large commitment of nonrenewable resources, other than the fuels required to power the project machinery, nor would it include highway construction or other improvements that would provide access to a previously inaccessible area.

Issues to be Resolved

The issues shown below remain to be resolved.

Choice of Alternative

The lead agencies must choose one of the alternatives described in Section 2 of this EIS/EIR, and decide upon appropriate mitigation to minimize the environmental impact of the chosen alternative. The lead agencies are not required to choose the environmentally superior/preferable alternative. If they do not choose the alternative with the least environmental impact, however, they must make specific findings regarding any significant impacts in order to support that choice. A mitigation and monitoring plan must be developed as well, in order to address any impacts that can be mitigated to a less than significant level.

Project Design

Project design issues must be resolved before construction can begin. Specifics that must be decided include the route by which upland soils will be taken for disposal, the order of excavation, the periods during which excavation would take place in the lagoon, and an overall construction schedule.

Permitting

Required permits, including those from the Gulf of the Farallones National Marine Sanctuary, the National Marine Fisheries Service, the California Department of Fish and Game and the California Coastal Commission, must be completed before the project begins.

Mitigation and Monitoring Plans

The project proponents will need to adopt appropriate mitigation measures identified in this EIS/EIR and to prepare a mitigation and monitoring or reporting plan, as required by CEQA.

Consultation and Coordination (Chapter 7)

Federal, state, and local agencies were consulted prior to and during preparation of this EIS/EIR. Agencies were notified of the proposed project by mailings; by scheduled public meetings, by publication of an NOI/NOP announcing preparation of a joint EIS/EIR, as required by NEPA and CEQA; and by public scoping meetings. The agencies' viewpoints were solicited with regard to activities within their jurisdiction. A table in Chapter 7 provides a list of required consultation actions before the project can begin.

References, List of Preparers (Chapters 8, 9)

The final chapters of this EIS/EIR include a list of documents and personal communications used in the preparation of this document and a list of the preparers of this document and their qualifications.

CHAPTER 1
PURPOSE OF AND NEED FOR ACTION

1.1 INTRODUCTION

This joint environmental impact statement/environmental impact report (EIS/EIR) evaluates the impacts on the environment that could result from the proposed Bolinas Lagoon Ecosystem Restoration Project, which would involve the removal of up to 1.5 million cubic yards (cy) of sediment from the bottom of Bolinas Lagoon. This estuarine lagoon is in Marin County, California, 12 miles northwest of San Francisco (Figure 1-1). The lagoon is owned by Marin County and is administered by Marin County Open Space District (MCOSD) and also falls within the jurisdictional boundaries of the Gulf of the Farallones National Marine Sanctuary (GFNMS).

Authority for the study to restore tidal interchange in Bolinas Lagoon is found in Section 142 of the Water Resources Development Act (WRDA) of 1976 (P.L. [Public Law] 94-587), as amended by Section 705 of the WRDA of 1986 (P.L. 99-662). This statute authorized the Secretary of the Army to act through the Chief of Engineers to investigate the environmental restoration of Bolinas Lagoon. In 1996 the United States House of Representatives Committee on Transportation and Infrastructure directed the Chief of Engineers to study the potential for "ecosystem protection, enhancement and restoration and related purposes at Bolinas Lagoon, California" (Corps 1997a). This EIS/EIR is being written as part of the US Army Corps of Engineers (Corps) Bolinas Lagoon Ecosystem Restoration Feasibility Study (FS), which will evaluate the financial, environmental, and engineering feasibility of undertaking a sediment removal project in Bolinas Lagoon. The FS is hereby incorporated by reference.

This document has been prepared in accordance with the California Environmental Quality Act (CEQA) of 1970, California Public Resources Code (Cal. Pub. Res. Code) §§ 21000-21178.1, and implementing guidelines, California Code of Regulations title 14, §§ 15000-15387 (1999); Marin County Environmental Review Guidelines; National Environmental Policy Act (NEPA) of 1969, 42 United States Code (U.S.C.), §§

1-1 Project Location

4321-4370d; the Council on Environmental Quality (CEQ) regulations on implementing NEPA, 40 Code of Federal Regulations (CFR), Parts 1500-1508 (1998); and the National Marine Sanctuary Program Regulations, 15 CFR, Part 922, Subpart M.

The CEQA lead agency for the proposed project is the County of Marin. The NEPA lead agency is the Corps. A list of other federal, state, and local agencies that would be involved in the project approval and implementation process is provided in Chapter 7.

Marin County owns Bolinas Lagoon Open Space Preserve, and MCOSD administers it with the technical advice and support of the Bolinas Lagoon Technical Advisory Committee (BLTAC). MCOSD and the Corps of Engineers are jointly funding the study, which will examine the effects of remediation strategies that counteract the long-term effects of sedimentation and compare them with the alternative of taking no action against sedimentation.

1.2 PURPOSE AND NEED

1.2.1 Need for the Project

Bolinas Lagoon fulfills a vital function in the California coastal ecosystem: it provides productive and diverse estuarine habitat for fish, waterfowl, shorebirds, marine mammals, and other wildlife and serves as an important stopover point for birds on the Pacific Flyway. Bolinas Lagoon has been filling in at an accelerated rate as a result of human activity since European colonization, and the mouth of the lagoon is predicted to begin closing intermittently within the next 50 years. The result of these closures would be a disruption in the flow of water in the lagoon, and the lagoon's value as estuarine habitat would decline. Humans use the lagoon for recreation and research, and sensitive species of birds, fish, and marine mammals use it for foraging and breeding; all would suffer because of this decline in habitat volume.

Bolinas Lagoon is an example of an estuarine habitat that is rapidly disappearing along the Pacific Coast flyway; as such, it fulfills a vital function in the lifecycle of migratory and resident birds, marine mammals, marine and anadromous fish, and other plant and animal species. The lagoon provides habitat, feeding, and breeding areas for hundreds of migratory and resident species. The ecological function the lagoon serves has become increasingly important in the past century, as coastal wetlands in California have been lost through development. For the past 150 years, tidal prism, the volume of water entering and leaving the lagoon during a tidal cycle, declined at a noticeable rate. Potential tidal prism is defined as the volume of water that would enter and exit the lagoon in a tidal cycle if the elevation of high tide and low tide within the lagoon matched the elevation of high tide and low tide in the ocean, where the water surface rises and falls uniformly. Effective tidal prism is defined as the volume of water that actually enters and exits the lagoon during a tidal cycle. Flow alterations stemming from inlet size, friction within the lagoon, wind, and other factors cause the effective tidal prism to be less than the potential tidal prism.

According to estimates by the Corps, the lagoon has lost nearly 40 percent of its effective tidal prism since 1968 (Table 1-1) and will continue to lose tidal prism in the immediate future, although at a slower rate (Table 1-2). The loss of tidal prism is reflected by more subtle changes in volume and acreage of habitat types in the lagoon.

Table 1-1
Measured Lagoon Tidal Prism and Habitat Changes[1]

Year	Potential Tidal Prism (cy)	Effective Tidal Prism (cy)	Intertidal Habitat (cy)	Subtidal Habitat (cy)	Upland Habitat (Acres)
1968	6,196,800	5,213,800	5,580,300	641,300	156
1998	4,908,600	3,212,900	3,584,700	523,300	238
Change	-1,288,200	-2,000,900	-1,995,600	-118,000	+82
% Change	-21%	-38%	-35%	-18%	+52%

Source: Corps 2001
[1]Volumes are estimated to be accurate to the nearest thousand.

Table 1-2
Predicted Lagoon Tidal Prism and Habitat Changes[1]

Year	Potential Tidal Prism (cy)	Effective Tidal Prism (cy)	Intertidal Habitat (cy)	Subtidal Habitat (cy)	Upland Habitat (acres)
1998	4,908,600	3,212,900	3,584,700	523,300	238
2058	3,682,200	1,741,100	1,677,400	410,600	317
Change	-1,226,400	-1,471,700	-1,907,300	-112,700	+79
% Change	-25%	-46%	-53%	-22%	+33%

Source: Corps 2001
[1] Volumes are estimated to be accurate to the nearest thousand.

1.2.2 Purpose of the Project

The goals of this project are to increase tidal volume and to restore intertidal and subtidal habitat in Bolinas Lagoon to historic levels, in a manner that prevents the need for regular maintenance dredging during the project period. The lead agencies have evaluated the best available bathymetric data and aerial photographs of the lagoon to develop alternatives that would shift the lagoon's intertidal and subtidal volumes back to a point that is closer to where the lagoon would have been without the accelerated sedimentation rates of the past 150 years. Historical data helped to keep the design parameters within the historical context. That is, the alternatives were designed in a manner that allowed changes in intertidal and subtidal volume to be kept proportional so as not to create an "unnatural" condition in the lagoon. With these changes, the lagoon would have larger volumes of intertidal and subtidal habitat and increased tidal flow, which would in turn delay the potential closure of the inlet and preserve the lagoon's valuable intertidal and subtidal habitats. Additional benefits of this project include preserving the lagoon for recreational uses and scenic value.

This project would address the impact of human activity on the lagoon and is intended to result in a lagoon that is neither fixed and unchanging nor in need of regular maintenance. Upon completion of the project, the lagoon would remain subject to natural variations in tidal volume, sediment input, seismic activity, and weather conditions, but with a lower baseline of sediment than has existed since the mid 1950s.

1.2.3 Long-Term Project Implementation

This EIS/EIR is intended to document the most likely environmental consequences of the Bolinas Lagoon Ecosystem Restoration project. This EIS/EIR also identifies specific mitigation measures which the lead agencies would commit to implementing, in compliance with NEPA and CEQA. The environmental impacts described in this document, as limited by the project design and mitigation measures, address various scenarios of environmental consequences of the project. Nevertheless, because the project feasibility is still under study, it is possible that project construction or implementation could change, which could result in changes to project impacts.

In addition, because the project could take approximately 9 years to complete, local stakeholders are working with the project sponsors to prepare an Adaptive Management Plan (AMP), discussed in more detail in Section 2.3.2, that would provide for interim monitoring and mitigation to increase project efficiency and limit adverse environmental impacts during project construction.

Because the AMP would be intended to further limit potential environmental impacts of the project, no impacts beyond those described in this EIS/EIR would be anticipated and it is unlikely that further environmental documentation would be necessary to implement AMP recommendations.

If the implementation of the AMP were to result in recommendations to the lead agencies that would exceed the parameters of the project as described in this EIS/EIR, or potentially result in impacts beyond those identified in this EIS/EIR, the lead agencies would retain the discretion of adopting or refusing these recommendations. Adoption of any recommendations that substantially change the scope of the project or the mitigations necessary to limit adverse impacts would require supplemental NEPA/CEQA documentation. This documentation could take the form of an Environmental Assessment/Initial Study, Supplemental EIS/EIR, or some other document tiered off this EIS/EIR.

1.3 Project Area

The estuary Bolinas Lagoon covers 1,100 acres (MCOSD 1996). The lagoon is a haven for wildlife, including dozens of species of birds, fish, and marine mammals. It is roughly triangular and is approximately three miles long by one mile wide. Much of the lagoon bottom is exposed at low tide.

Estuarine lagoons generally have a relatively short life span in geologic terms. The natural progression of such lagoons is to fill in and gradually become transformed, first into wetland habitat and then into upland habitat. Geophysicists have estimated that seismic activity along the San Andreas fault has increased the lagoon's tidal volume at sufficiently frequent intervals to keep the lagoon open for far longer than it would have been without such influences. Section 3.4 discusses the geological setting of Bolinas Lagoon, particularly the lagoon's proximity to the San Andreas Fault.

The watershed surrounding the lagoon, which is primarily in public ownership, is mostly undeveloped land, open to the public for recreation and environmental education (MCOSD 1996). Marin County limits residential and commercial development on the western side of the county, so there is little development in the area surrounding the lagoon. The two unincorporated residential communities within the watershed, Stinson Beach and Bolinas, are on the southeastern and southwestern shores of the lagoon, respectively.

East of the lagoon the land rises fairly rapidly to Bolinas Ridge, 1,800 feet above sea level; west of the lagoon the land rises less rapidly to the broad expanse of Bolinas Mesa. A number of creeks drain the east side of the watershed, but most of the western and northern sections of the watershed drain into Pine Gulch Creek, which enters the lagoon just north of downtown Bolinas.

In 1998, the United States Fish and Wildlife Service (USFWS) designated Bolinas Lagoon as a Wetland of International Importance, consistent with protocols established at the Convention on Wetlands of International Importance held in Ramsar, Iran, in 1971 (Ramsar 2000). The California State Assembly has also recognized Bolinas Lagoon's local and regional ecological importance (California Assembly 1997). In 1981 Bolinas Lagoon was designated as part of the GFNMS, which is administered by the National Oceanographic and Atmospheric Administration (NOAA).

For the purposes of this EIS/EIR, the lagoon is considered to have three types of habitat: Upland habitat, which is not usually covered by water at high tide; intertidal habitat, which may be exposed at low tide but covered by water at high tide; and subtidal habitat, which is always under water. Lagoon habitats are defined in relation to elevation above or below mean sea level, such that upland habitat is all areas in the lagoon above a certain elevation, subtidal habitat is all areas of the lagoon below a certain elevation, and intertidal habitat is the area above the subtidal boundary and below the upland boundary. Habitat acreages and volumes have been calculated based on 1998 elevations; therefore, under these conditions, upland habitat is from 2.54 to 7.00 feet above the National Geodetic Vertical Datum (ft NGVD), intertidal habitat is from -1.36 to 2.54 ft NGVD, and subtidal habitat is anything below -1.36 ft NGVD. However, as tidal prism in the lagoon changes, so will water elevations change, and habitat boundaries will have to be recalculated as the project progresses. Upland habitat is primarily measured in acres; intertidal and subtidal habitat are often measured in volume by cubic yards because they are calculated with upper and lower boundaries.

Estuarine lagoons sometimes close if the flow of water through the lagoon opening, or inlet, is not powerful enough to prevent the accumulation of sediment in the inlet. This flow of water through the lagoon opening is a function of the tidal prism, the width of the inlet, the force of the tide and wave action, and the volume and velocity of freshwater entering the lagoon from elsewhere. Figures 1-2 and 1-3 show some of the changes in the lagoon's morphology, or functional shape, over the past 150 years. The Corps has evaluated the current rate of tidal prism loss in the lagoon and has produced an estimated closure index, based on the history of the lagoon and estimates of future tidal prism loss. Based on these studies, the Corps estimates that the lagoon could close under certain circumstances as soon as 2058 if no action is taken. This closure would likely be temporary, but even such temporary closures reduce tidal exchange and affect habitat levels. If the lagoon were to close permanently, all tidal exchange would necessarily stop, and vital habitat for sensitive species would be lost. Section 3 of this EIS/EIR includes a detailed discussion of the sensitive species that reside in or stop over in the lagoon.

Resource categories have been identified by the community, Marin County, and the Corps as being of particular importance and include biological resources (terrestrial, aquatic, wetlands, and sensitive species), cultural resources (including archaeological sites along the shores of the lagoon), water quality, and recreational opportunities in the lagoon and the watershed (Figure 1-4).

1.4 Use of a Joint CEQA / NEPA Document

This joint EIS/EIR fulfills the requirements of CEQA and NEPA to assess the potential environmental impacts of the proposed sediment removal project. Both CEQA and NEPA encourage use of a joint EIS/EIR. CEQA encourages the use of a joint document to meet the requirements of both CEQA and NEPA (Cal. Pub. Res. Code § 2103.7, CEQA Guidelines § 15226). NEPA requires federal agencies to cooperate with state and local agencies to the fullest extent possible to reduce duplication among NEPA, state, and local requirements, including joint environmental impact statements (40 CFR § 1506.2).

Requirements of an EIR and an EIS are similar and generally parallel each other, but they do differ. For example, CEQA allows alternatives to the proposed project to be analyzed in less detail, while NEPA requires a substantially similar level of detail in the analysis for each alternative. CEQA requires a monitoring plan for identified mitigation measures to be provided in the findings, while NEPA does not. CEQA requires identifying an environmentally superior alternative, and NEPA requires identifying an environmentally preferable alternative. Under CEQA, socioeconomic impacts are not typically considered, except as they may cause a secondary physical impact, while under NEPA, they are discussed. NEPA also requires a discussion of the relationship between short-term uses of the human environment and the maintenance and enhancement of long-term productivity. All of these requirements are addressed in this joint document.

1-2 Current Configuration of Bolinas Lagoon

1-3 Historic Structure of Bolinas Lagoon

1-4 Bolinas Lagoon and Watershed

1.4.1 Intended Uses of EIS/EIR

The lead agencies, in consultation with the BLTAC and the Habitat Evaluation Expert Panel (HEEP), will develop an AMP following completion of this EIS/EIR. The AMP will be designed to track potential impacts of the project and to redesign the project as necessary to limit impacts described in this EIS/EIR.

Future management planning activities concerning Bolinas Lagoon, such as updates of the Bolinas Lagoon Management Plan, would also be likely to use the EIS/EIR and the technical appendices as references or guides.

1.5 Public Involvement Process

Public involvement is a key part of the EIS/EIR process. Methods to involve the public in the EIS/EIR process have included or will include the following:

- Publishing notices of public meetings in newspapers with a wide circulation and encouraging written comments;
- Publishing a notice of intent (NOI) in the Federal Register on April 9, 1998 (63 Fed. Reg. 17392), followed by a notice of preparation (NOP) on April 5, 2000. These notices were sent to the California State Clearinghouse for distribution to state agencies. Their purpose is to notify the public that an EIS/EIR will be prepared and considered (40 CFR § 1508.22). These notices also solicited guidance from these agencies as to the scope and content of the environmental information to be included in the EIS/EIR (CEQA Guidelines § 15375). The California Clearinghouse Number referencing the NOP is #2000042055. Appendix A contains copies of the NOI and NOP.
- Sending scoping letters and project information to public agencies, public interest groups, and individuals;
- Holding a public hearing on scoping for the FS and development of the EIS/EIR on April 16, 1998, at the Stinson Beach Community Center; this meeting was attended by agency representatives and members of the public.
- Holding public informational meetings at the Stinson Beach Community Center on November 4, 1999, and November 30, 2000, and at the Bolinas Community Center on December 2, 2000, in order to keep the local community informed of the status of the FS;
- Creating and maintaining a mailing list to disseminate information about the decision-making process;
- Making the draft and final EIS/EIR available to the public online at http://www.spn.usace.army.mil/projects/bolinas.html; and
- Holding two public hearings on the draft EIS/EIR and providing a 45-day comment period.

Public Review

The public review period for this draft EIS/EIR is 45 days under both CEQA and NEPA; comments will be responded to in a final EIS/EIR. NEPA provides for a 30-day no action period after publication of the final EIS.

Draft EIS/EIR

The public is invited to review and comment on this draft EIS/EIR. The Corps and Marin County will publish a notice of availability (NOA) in the Federal Register and in the local press. Public notices will be mailed to those on the mailing list, and Marin County will file a notice of completion (required under CEQA) with the State Office of Planning and Research. On the day the notice of completion is filed, the 45-day public comment period will begin, which will provide the public with an opportunity to review the document and to offer comments.

The public is invited to send written comments on the draft EIS/EIR to Tim Haddad, Marin County Community Development Agency, 3501 Civic Center Drive, San Rafael, CA 94903, and to Roger Golden, US Army Corps of Engineers, San Francisco District, 333 Market Street, 7th Floor, San Francisco, CA 94105.

Two public hearings will be held during the 45-day review period to hear comments on the draft EIS/EIR. The time and place of the hearings will be announced in the media and are noted in the transmittal letter accompanying this document.

Final EIS/EIR

A final EIS/EIR, which discusses the comments received on the draft EIS/EIR, will be published and made available for review. A NOA of the final EIS/EIR will be published in the Federal Register and in a public notice.

During the NEPA 30-day no action period, the public and agencies may comment on the adequacy of responses to comments and the final EIS/EIR. After that time, the Corps would sign a record of decision (ROD), detailing its decision regarding the proposed project. This 30-day period will also fulfill Marin County's requirement for a final EIR public review and comment period before the Planning Commission recommends that the Board of Supervisors certify the Final EIS/EIR as complete and adequate. The Planning Commission will consider its recommendation for certifying the final EIS/EIR in a public meeting before recommending that the Board of Supervisors take action on the project. The final EIR will be presented to the Marin County Planning Commission and the Marin County Parks, Open Space and Cultural Commission, for approval, then to the Board of Directors of MCOSD for certification during or after the 30-day federal review period.

SECTION 2
PROPOSED PROJECT AND ALTERNATIVES

This section begins with an overview of the proposed project, followed by a discussion of the development of alternatives to address sediment in Bolinas Lagoon and a discussion of the alternatives. At this time, the lead agencies do not have a preferred alternative. A summary of applicable state and federal laws is presented at the end of this section.

2.1 PROPOSED PROJECT OVERVIEW

The proposed project would address 150 years of sediment build up in Bolinas Lagoon by removing approximately 1.4 million cy of sediment from the lagoon and approximately 200,000 cy of dry soil from upland areas adjacent to the lagoon. This sediment-removal project would require the use of hydraulic suction dredges and other heavy equipment and would take approximately nine years to complete.

Sensitive species activity in the lagoon would limit dredging and upland excavation activities to a narrow window in late summer and early autumn of no more than three months per year. Sediment removed from the floor of the lagoon would be taken to a disposal site west of the Farallon Islands by barge, while upland soil and vegetation removed from Kent Island, Pine Gulch Creek Delta, Dipsea Road, and elsewhere would be taken to Redwood Landfill by barge and truck.

2.2 DEVELOPMENT OF ALTERNATIVES

An extensive discussion of the development of the project alternatives is available in the FS, sections 4, 5, and 6. In order to develop a list of alternatives that would satisfy the habitat restoration goals of the project, while avoiding adverse impacts to biological resources, the lead agencies convened a HEEP, consisting of biologists and other scientists familiar with Bolinas Lagoon. In consultation with MCOSD, BLTAC, the HEEP and the Corps have created a target structure for the lagoon, based on historic lagoon hydrology, in order to establish improved levels of tidal exchange and ecological health. The Corps has developed two dredging alternatives, has examined sediment issues in the watershed, and has conducted hydrologic modeling to ensure that maintenance dredging would not be necessary after the sediment removal project is completed.

Development of the project alternatives has been constrained by the following factors:

- The presence of sensitive species in the lagoon and surrounding watershed, including marine mammals, anadromous fish, and waterfowl, and the timing of critical events in their life cycles;
- The complex hydrology of the lagoon, including hydraulic relationships between tidal prism and inlet geometry, channel length and flushing time, and channel cross-sectional geometry and velocity;
- The limited long-term historical information on the lagoon's frequently changing hydrology and bathymetry;
- The need to monitor for adaptive management of the project as this long-term program is implemented;
- The complex variables influencing sedimentation in the lagoon, including slope and soil composition in the watershed, weather conditions, land use history, and other unpredictable factors, such as seismic events;
- The feasibility and cost of removing large quantities of sediment from the lagoon;
- The Corps' policy prohibiting enhancement of human environments;
- The availability and cost of appropriate disposal sites for material removed from the lagoon (as discussed extensively in Section 4.8 of the FS); and
- The existence of extensive residential development on the shore of the lagoon in the Seadrift area of Stinson Beach.

Project alternatives consist of removing sediment from the floor of the lagoon, opening channels within the lagoon to enhance tidal flow, removing soil from areas that have been previously filled by human activity (upland fills), and depositing the material in locations outside the Bolinas Lagoon watershed.

Scoping began on the Bolinas Lagoon Ecosystem Restoration Project in 1998. Since that time, regular meetings among the Corps, MCOSD, BLTAC, and the local communities have helped the lead agencies develop a series of alternatives to be considered for feasibility, environmental impact, and effectiveness. The Corps and MCOSD have sponsored several community meetings and public workshops in Stinson Beach and Bolinas to keep the general public informed of the progress of the restoration project. They also have sent out newsletters to keep the public apprised of key project milestones.

In order to develop scientifically sound proposals to address sedimentation in the lagoon, the Corps convened a series of HEEP meetings beginning in August 2000. In these meetings, which were open to the public, scientific experts on the biology, geology, and hydrology of Bolinas Lagoon and the surrounding watershed considered the Corps' proposals for the lagoon. On advice from the HEEP, the lead agencies established a short list of alternatives in March 2001. Members of the HEEP or BLTAC will continue to meet to advise on adaptive management techniques for implementing the project.

A screening analysis was conducted to determine the practical, environmental, and regulatory feasibility of the alternative restoration concepts. The purpose of the screening was to eliminate alternatives that either did not meet the project purpose and need or that clearly were not feasible from a cost, technical, or environmental standpoint. An alternative was eliminated from further analysis under any of the following:

- It did not meet the project purpose and need;
- It was not feasible from a technical perspective;
- It had clearly unacceptable environmental impacts; or
- It was determined to not be cost effective because it returned too little environmental benefit at only a slightly reduced cost.

Further discussion of cost effectiveness as an element of project feasibility is provided in sections 4 and 5 of the FS.

Based on this screening, as discussed in the FS, two sediment removal alternatives have been carried forward for detailed analysis. As required by NEPA and CEQA, the no project/no action alternative is also analyzed in detail. The two project alternatives each involve removing sediment from Bolinas Lagoon and disposing of the material at one of two locations; the San Francisco Deep Ocean Disposal Site (SFDODS) for ocean disposal and the Redwood Landfill for upland disposal. Other disposal sites were eliminated based on one or more of the screening criteria.

2.3 PROJECT ALTERNATIVES

The alternatives consist of two project alternatives, which would both remove over 1,400,000 cy of wet sediment and upland fill from selected areas throughout the lagoon, and the No Action Alternative. Aspects of the project alternatives that have yet to be fully developed include construction planning, scheduling sediment removal and identifying specific adaptive management techniques to evaluate and respond to changes in the lagoon ecosystem and hydrology as a result of project activity.

The two project alternatives vary only with regard to excavation in Pine Gulch Creek Delta (PGC Delta) and the total amount of sediment and vegetation to be removed from the project area. Schedules have yet to be finally determined, but uses of the lagoon by wildlife may limit construction to only a few months in the summer and fall. The two project alternatives are known as the Riparian Alternative and the Estuarine Alternative. The Riparian Alternative is identified as the locally preferred plan (LPP), and the Estuarine Alternative is identified in the Bolinas Feasibility Study (FS) as the National Ecosystem Restoration plan (NER).

2.3.1 Riparian Alternative (LPP)

This alternative would involve removing 1.4 million cy of wet sediment from the lagoon and dry soil and vegetation from the adjacent upland. Locations all over the lagoon would be dredged, and dry land adjacent to the lagoon also would be excavated. In some areas vegetation, including mature trees and shrubs, would be removed. Full construction is estimated to take three to four months per year for nine years; the short construction periods are designed to limit impacts on sensitive species in the lagoon. Construction schedules have not yet been developed, but, for the purposes of this EIS/EIR, construction is estimated to require approximately 60 working days per year, including 33 days of round-the-clock dredging.

Excavation and Disposal Overview

Wet Sediment Excavation

Wet sediment would be removed from the lagoon floor by a cutterhead suction dredge (Figure 2-1), which would remove sediment in a liquid slurry from the floor of the lagoon, while upland soils would be removed by land-based excavators. At this stage of the planning process, it is assumed that only one dredge would be used at a time in order to reduce short-term impacts on sensitive habitats.

Locations where dredging and upland excavation would take place are identified in Figure 2-2; specific dredging and excavation locations are discussed in more detail later in this section. Dredging activities would be staged from Winnebago Point, on the northeast side of the lagoon, and equipment would be stored there for the duration of the project.

The dredge being considered for use in this project is a floating dredge that can be transformed into an amphibious dredge by bolting on tires. This allows the dredge to traverse land and shallow areas normally not accessible to conventional dredges. In addition, this particular dredge has optional work implements, whereby vegetation harvesting, raking, and solid material grappling is possible, when required. When floating, the dredge would be moved by being poled forward on walking spuds, by winching along anchor wires, or by using a propulsion system, such as an outboard motor. The dredge head is on an articulated pipe extending from the front dredge and can be manipulated by the dredge operator. This articulated head gives the dredge a considerable range and reduces the need to relocate the dredge frequently. A disposal pipeline eight inches in diameter extends from the rear of the dredge.

2-1 Cutterhead Suction Dredge

2-2 Riparian Alternative Excavation Sites

The dredge head has sharp teeth designed to chew through packed sand and clay. As the dredge head spins, the dredge pump sucks in the dislodged sediment through the dredge head, along with a large amount of water, to form a slurry. Because the slurry would be pumped some distance prior to disposal, the sediment would be mixed with sufficient water to form a ratio of 25 percent sediment to 75 percent water. A suction dredge pulls disturbed water and soil into the pipe, so noticeable water quality impacts should not result from disturbing the sediment. The dredge being considered for use in this project has not been identified yet, but would probably have a dredgehead diameter of 8 inches, would have a maximum capacity of 200 cy per hour of sediment, and would be used 24 hours per day, seven days per week. The dredge would be powered by either electrical current from the shore of the lagoon or by a diesel engine muffled to reduce noise emissions. The size of the engine would vary, depending on the size of the dredge. Lights mounted on the dredge itself would provide illumination for night-time dredging.

The slurry would be pumped from the dredge through a flexible pipeline over the end of Stinson Beach sand spit to one of two transport barges, or scows, anchored in Bolinas Bay (Figure 2-3). The pipe would be eight inches in diameter, would be up to 16,300 feet long, would be made of steel or polyvinyl chloride (PVC), and would be kept afloat in the lagoon by buoys. Where it crosses the sandspit and the beach, the pipeline would be protected from interference by fences and flags. A walkway would be built to enable passersby to cross the pipeline, either by running the pipe underground at that point or by building a bridge over it. For most of the upland crossing, the pipeline would rest on top of the beach sands but may be covered by blowing sand as the season progresses. From the beach to the disposal scow the pipeline would run along the bottom of the bay. If steel, the pipeline would be green or rust-colored; if PVC, it would be black. The pipeline would be designed to keep up with the capacity of the dredge as it excavates, so there would be no backlog of dredged material waiting to be pumped out to the scow. The pipeline would be removed after the end of each dredging season and would be reinstalled the following summer.

Disposal of Wet Sediment

The scow would be anchored to a floating dock past the surf zone. The slurry would not be drained from the scow and would be transported as is to the disposal site. The disposal scows are presumed to operate 24 hours per day, seven days per week. Once filled with slurry, each scow would be towed by a tugboat to the SFDODS, which is roughly 55 miles away, west of the Farallon Islands. The scows are assumed to have a capacity of 3,000 cy and would be towed at seven knots to the disposal site (unloaded velocity is roughly eight knots).

Figure 2-4 provides the locations of the proposed disposal sites. Because the environmental impacts of the use of these sites for dredged material disposal have been addressed in previous NEPA or CEQA documents, this EIS/EIR addresses only the environmental impacts of the sediment removal in Bolinas Lagoon and the transport of

2-3 Pipeline From Dredge to Barge

2-4 Disposal Site Locations

the sediment to the disposal sites. Disposal at the SFDODS requires that dredged material be tested for metals, polynuclear aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), pesticides, and other contaminants before disposal is approved. This could affect cost or use of this disposal site for particular sediments if any contaminants were discovered.

Excavation and Disposal of Dry Upland Material

Upland sites would be excavated with land-based excavating machinery, such as bulldozers, loaders, and cranes. The removed materials would be dry and therefore would be transported by dump trucks rather than by barge. Each truck is assumed to have a capacity of 12 cubic yards. The disposal location for dry soil is the Redwood Landfill in Novato, California. Vegetation removed from some upland sites would also be disposed of at Redwood Landfill, unless the material could be sold or recycled.

Excavation Locations

Sediment removal in the lagoon under this alternative would reopen old channels or create new ones to increase hydraulic exchange within the lagoon. Earlier in this study, these channels were designed with a vertical rise of one foot for each three feet of horizontal distance (or 1V:3H) for the channel sides; however later analysis has determined that a ratio of 1V:4H would be a more stable slope. Hydrological effects are expected to change channel slopes rapidly to such an extent that the difference between 1V:3H and 1V:4H should be unnoticeable within a matter of months. As a result, the project designers have opted to retain the 1V:3H ratio for calculating results, while actual excavation would be done to a ratio of 1V:4H for channel sides.

Figure 2-2 shows the location of excavation activities under the Riparian Alternative, under which dredging would take place in the lagoon in the North Basin, Main Channel, Kent Island, Bolinas Channel, Pine Gulch Creek Delta (PGC Delta), and South Lagoon Channel. Additionally, dry land excavation would take place at Dipsea Road, the Highway 1 Fills, and Pine Gulch Creek Delta.

The primary staging area for the Riparian Alternative would be Winnebago Point, on Highway 1 in the northeast quarter of the lagoon. Excavation in PGC Delta would be staged from the MCOSD property adjacent to PGC Delta, off Olema-Bolinas Road.

Table 2-1 provides an overview of project elements, including excavation volumes and footprints, expected construction periods, and numbers of barge- or truck-loads necessary to dispose of excavated materials. Section 4 of the FS provides an extensive discussion regarding the development of these project elements.

North Basin and Main Channel

The North Basin and Main Channel elements were developed as a way to improve tidal prism in the lagoon quickly by dredging the basin that had historically existed at the north end of the lagoon and reconnecting it to the lagoon inlet. Figure 2-4 shows the

Table 2-1
Riparian Alternative Project Elements[1]

	Excavatio n Footprint (acres)	Excavation Volume (wet and dry) (cy)	Volume of Vegetative Debris (cy)	Deepest Level of Excavation (NGVD)[2]	Days of Dredging (at 200 cy/hour, 24 hours/day)	Barge Loads to SFDODS	Truckloads of Dry Soil to Redwood Landfill	Truckloads of Chips to Redwood Landfill
North Basin	136	458,550 (wet)	N/A	-4 ft	96	612	N/A	N/A
Main Channel	38	216,250 (wet)	N/A	- 4 ft	45	289	N/A	N/A
Bolinas Channel	16	130,800 (wet)	N/A	- 5 ft	28	175	N/A	N/A
Kent Island	124	376,750 (wet)	3,800	- 2 ft	79	503	N/A	320
Pine Gulch Creek Delta	86	149,100 (wet), 9,550 (dry)	850	- 1 ft	31	199	800	71
Highway 1 Fills	4	4,850 (dry)	N/A	0 ft	N/A	N/A	405	N/A
Dipsea Road	8	37,700 (dry)	N/A	0 ft	N/A	N/A	3150	N/A
South Lagoon Channel	18	89,250 (wet)	N/A	- 4 ft	19	119	N/A	N/A
Totals	**430**	**1,420,700 (wet), 52, 050 (dry)**	**3,800**	**N/A**	**296**	**1897**	**4,355**	**391**

Source: Romanoski 2002

[1] Volumes rounded off to nearest 50 cubic yards.
[2] NGVD is the land datum typically used on US Geological Survey topographic maps. NGVD is commonly referred to as mean sea level because it was based on the average of the mean tide levels at selected locations. However, because it is a national datum, 0 ft NGVD may not necessarily equate to mean sea level in Bolinas Lagoon.
NA - not applicable

North Basin at the far north corner of the lagoon, above Pine Gulch Creek Delta. Any use of this North Basin for increasing tidal prism requires increasing the volume and speed at which water and sediment may be carried from the basin to the lagoon inlet via the Main Channel; therefore, excavation in the North Basin would optimally be coupled with excavation in the Main Channel.

The proposed dredging in the North Basin would restore the historical basin between the -1 foot and -4 feet contours of the NGVD, which is the baseline elevation or land datum typically used on US Geological Survey topographic maps. NGVD is commonly referred to as mean sea level because it was based on the average of the mean tide levels at selected locations. However, because it is a national datum, 0 feet NGVD may not necessarily equate to mean sea level in Bolinas Lagoon. The sides of the North Basin will be cut to a slope of approximately 1V:8H, which is a vertical rise of 1 foot for each 8 feet of horizontal distance.

The Main Channel excavation would restore four sections of the Main Channel (shown on Figure 2-2) to recreate a better hydraulic connection between the North Basin and the rest of the lagoon. An island in the Main Channel would be removed entirely down to -4 feet NGVD. Three channels would be lowered to -3 feet NGVD, with side slopes of 1V:4H. One channel would be lowered to -4 feet NGVD, with side slopes of 1V:4H. Channel sections would vary between 1,280 and 4,070 feet long. One channel would be 140 feet wide at the bottom; the other three would be 120 feet wide at the bottom. These channel configurations are designed to result in more water moving through the lagoon at roughly the same velocity as at present. The excavation of the Main Channel would lead to optimal results if it were to follow the excavation of the North Basin rather than precede it.

Pine Gulch Creek Delta

Pine Gulch Creek feeds into Bolinas Lagoon on the west side of the lagoon, north of the town of Bolinas. Pine Gulch Creek is the largest single tributary of the lagoon, and its watershed constitutes nearly half of the greater Bolinas Lagoon watershed. Since the arrival of European settlers in the 1800s, Pine Gulch Creek has developed an upland area, known as a delta, at its entrance into the lagoon, as a result of both natural and human-influenced processes. (See the FS and the Bolinas Watershed Land Use History in Technical Appendix X, for further discussion.) Some of the delta includes upland habitat for sensitive species, and as a result of concerns regarding this habitat, the project sponsors have consulted with the HEEP to design this alternative to address the sediment buildup in PGC Delta while preserving the existing riparian habitat.

Excavation in PGC Delta would require removal of upland habitat in the delta, primarily shrubs and grasses. This would be followed by excavation: approximately 1 foot to 2 feet of material would be removed from the existing grade between the -1.5-foot and 4-foot NGVD contours. A total of 8.6 acres of upland habitat would be removed from the delta; however, this alternative would not remove any of the riparian habitat in the delta. It would be necessary to grade the land above the expected water level (3 feet to 4 feet NGVD) to maintain a natural gradual grade and to avoid a step or sharp break in grade. The soils removed would be a mix of sands and cobbles, with a high percentage of organic material.

Kent Island

Historical evidence and aerial photographs indicate that there was a system of channels running through Kent Island in the past (Figure 2-5). Excavating Kent Island would restore this historical channel system, create a series of flood shoal islands, and would temporarily remove some of the sediment-trapping salt marshes that have grown up on the island; these marshes are expected to reestablish themselves within a relatively short period. Kent Island overall would be excavated down to 1 to 4 feet NGVD, thus removing the sediment-trapping wetland area and creating lower intertidal and subtidal habitat. Following this, a channel would be excavated through the center of the island. The main part of the channel would be 200 feet wide, would have side slopes of 1V:4H, and would have a bottom elevation of -2.0 feet NGVD. In the northern part of Kent Island, the channel would split into three smaller channels, each with a width of 75 feet, side slopes of 1V:4H, and bottom elevations of -2.0 feet NGVD. The main channel would be 1,560 feet long; the other three would be 690 feet, 1,460 feet, and 2,800 feet long. The excavation of these channels would create a series of small flood shoal islands. The wet sediment taken from Kent Island would range from fine sands to beach sands.

All vegetation and upland material on Kent Island would be removed first by land-based machinery. Because of limited access to the island, the impracticality of transporting the upland material through the town of Bolinas, and various environmental constraints, a barge with a small crane and a small tug boat would be used to bring equipment to the island. The existing vegetation on the island would be removed by cutting, clearing, and mulching using conventional methods, e.g., chainsaw and mulcher. Vegetation that would be hard to remove by conventional methods would be cleared and stockpiled by the amphibious dredge for removal. The mulched vegetation would be taken in containers by barge to the marina at Bodega Bay. This would require approximately two barge trips. Once at Bodega Bay, the material would be offloaded by a hydraulic excavator bucket or a vacuum system into 12-cy trucks, and then trucked to the Redwood Landfill for disposal. The mulch would be disposed of, sold, or recycled.

Bolinas Channel

Excavating Bolinas Channel would consist of dredging the channel that originates near the main inlet of the lagoon, flows between Kent Island and the town of Bolinas, continues to the north, and terminates at PGC Delta (Figure 2-2). Near the north end, the channel would be split into two separate forks. Bolinas Channel would be dredged to a depth of -5.0 feet NGVD, with side slopes of 1V:4H, with the exception of the two forks, which would be dredged to a depth of -4.0 feet NGVD. The main section of Bolinas Channel would be approximately 4,600 feet long and 80 feet wide at the

2-5 Bolinas Lagoon 1942

bottom; the forks would be 800 to 900 feet long and 70 feet wide at the bottom. The material to be removed would be fine sand.

Excavation of Bolinas Channel and Kent Island would create a more direct hydraulic connection between the lagoon inlet and PGC Delta, which has historically been a significant source of sediment coming into the lagoon. Increasing the volume and velocity of the Bolinas Channel would allow a greater volume of sediment from the Pine Gulch Creek watershed to be flushed out of the lagoon instead of being deposited in the PGC Delta or the North Basin.

Highway 1 Fills

Highway 1 along the shore of Bolinas Lagoon has been identified by project sponsors as the location of a suggested upland removal element of the project. Excavation in this area would remove fill between Highway 1 and the edge of the lagoon from unofficial turnouts, illegal disposal sites, and excessive shoulder buildup. At each of the ten fill sites (see Figure 2-2), material would be removed between a minimum elevation of 0 feet and a maximum elevation of 7 feet NGVD. Construction access to these sites would be from Highway 1 and would most likely require temporary lane closures to accommodate the removal operation. Material coming from the Highway 1 sites would range from fine sands to gravel and cobbles.

South Lagoon Channel

The South Lagoon Channel would increase flow in the southern part of Bolinas Lagoon (Figure 2-2). The South Lagoon Channel would consist of a main section running parallel to Dipsea Road and two branches that would extend toward the Main Channel. The branches and main section would have a bottom elevation of -4 feet NGVD and side slopes of 1V:4H. The main section of the South Lagoon Channel would be 80 feet wide at the bottom and 2,710 feet long. The north fork would be 75 feet wide at the bottom and 2,211 feet long. The south fork would be 75 feet wide at the bottom and 3,310 feet long. The material excavated from the South Lagoon Channel would be composed of very fine sand to silt.

Dipsea Road

Excavation along Dipsea Road would remove fill material from between 0 feet and 7 feet NGVD between the eastern sections of Dipsea Road and Bolinas Lagoon, within the Seadrift subdivision on Stinson Beach sand spit (Figure 2-2). Because of regulations governing Bolinas Lagoon, septic systems cannot be closer than 100 feet to the edge of the water. Therefore, to maintain water quality standards in Bolinas Lagoon, fill would be removed only from areas in excess of 100 feet from the middle of Dipsea Road. Material from the Dipsea Road fill area most likely would consist of fine sands to beach sand.

Excavation Schedule

Based on the expected volume of material to be dredged and the dredge's average rate, 290-300 days of round-the-clock dredging would be needed in order to complete the dredging element of this alternative. Over nine years, this averages out to 33 days per year of dredging.

Table 2-2 provides dredging windows for the Riparian Alternative based on sensitive species activity in Bolinas Lagoon. An open window for PGC Delta exists between July and October; an open window for Kent Island exists between August and September. The Highway 1 Fills, Dipsea Road, and the South Lagoon Channel could be excavated any time between August and February. However there are no open windows for excavation in the Bolinas Channel, the Main Channel, or the North Basin. The lead agencies will consult with USFWS, NMFS, the California Department of Fish and Game (CDFG), and GFNMS to identify dredging windows for these areas that minimize impacts on sensitive species. Based on the sensitive species activity identified in Table 2-2, it is likely that most excavation in the lagoon would take place between July and October.

Disposal

Disposal at Redwood Landfill

Redwood Landfill is a Class III facility in northeastern Marin County, northeast of Novato. It is on Redwood Highway on the east side of US Highway 101, about three miles north of where San Marin Drive and Atherton Avenue cross the highway and about one mile north of Gnoss Field Airport. The landfill does not accept sand but has received dredged material from dredging projects in San Francisco Bay (Corps 2001).

Dry soil taken out by land-based excavation equipment would be loaded onto trucks at the excavation site and transported to Redwood Landfill along surface roads. To limit traffic impacts the trucks would use a route that follows Highway 1 north to Point Reyes-Petaluma Road, from there to Novato Boulevard and San Marin Drive, to Highway 101 at the north end of Novato. Other potential but less recommended routes could include traveling south on Highway 1 and then north on US 101, or north along Highway 1 and east to San Rafael and Novato by way of Sir Francis Drake Boulevard.

Mulched material from Kent Island would be loaded onto a shallow barge at Kent Island and transported to Bodega Bay. There it would be offloaded from barges at Bodega Bay and transferred to trucks for transport to Redwood Landfill. The exact route is yet to be determined but could include traveling south on Highway 1 to Valley Ford Road and then southeast on Bodega Avenue or Spring Hill Road to join US 101 in Petaluma, and then south on 101 to the landfill. Only two barge loads would be needed to transport the mulched material to Bodega Bay.

Disposal at San Francisco Deep Ocean Disposal Site

A barge would be required to transport the dredged sediment to the SFDODS, roughly 55 miles southwest of Bolinas Lagoon.

Table 2-2
Sensitive Species Activity in Bolinas Lagoon

Project Element	***JAN***	***FEB***	***MAR***	***APR***	***MAY***	***JUN***	***JUL***	***AUG***	***SEP***	***OCT***	***NOV***	***DEC***
North Basin	Wintering Shorebirds (foraging)						Wintering Shorebirds (foraging)					
	American Avocets							American Avocets				
	Egrets & Herons (staging)		(egg formation)		(feeding nestlings)			(juvenile foraging)				
						Leopard Sharks (breeding)						
	Steelhead (juveniles)										Steelhead adults	
Main Channel							Pelicans, Heermann's Gulls & Terns (& their prey)					
			Harbor Seals (pupping)									
	Diving Birds									Diving Birds		
	Steelhead (juveniles)										Steelhead adults	
Hwy 1 Fills			Harbor Seals (pupping)									
Kent Island			Harbor Seals (pupping)									
	Diving Birds									Diving Birds		
	Steelhead (juveniles)										Steelhead adults	
Bolinas Channel							Pelicans, Heermann's Gulls & Terns (& their prey)					
	Diving Birds									Diving Birds		
	Steelhead (juveniles)										Steelhead adults	
PGC Delta	Steelhead (juveniles)										Steelhead adults	
South Lagoon Channel			Harbor Seals (pupping)									
Dipsea Fills								-none-				

In 1994, the US EPA formally designated the SFDODS as an approved location for the "disposal of suitable dredged material removed from the San Francisco Bay region and other nearby harbors or dredging sites" (USEPA 1994). The SFDODS is an area of approximately 6.5 square nautical miles (nmi) approximately 49 nmi west of the Golden Gate, and six nmi west of the boundary of the GFNMS. The SFDODS is also 10 nmi south of the boundary of Cordell Banks National Marine Sanctuary. The disposal site is in waters ranging from 8,200 to 9,800 feet deep (USEPA 1998).

Prior to disposal at SFDODS, the dredged material would be tested for contaminants. Material from Bolinas Lagoon must fall within certain chemical and physical parameters in order to be approved for disposal at SFDODS. Assuming the material from Bolinas Lagoon passes inspection, it would be taken by barge to SFDODS for dumping.

The barge would be towed out of Bolinas Bay, through the GFNMS, past the Farallon Islands, and to the SFDODS. This would take approximately eight hours and perhaps less time to return unloaded. Disposal would entail opening the split hull of the barge and allowing the sediment to drain into the ocean (Joanou 2001).

The environmental impact of disposal at SFDODS is not discussed in this document, as the EIS for establishing the SFDODS as an approved disposal site, published in 1993, contains extensive description and analysis of the impacts of the use of that site for disposing of dredged spoils (USEPA 1993). The reader is also directed to the 1998 *Final EIS/EIR for the Long-Term Management Strategy for the Placement of Dredged Material in the San Francisco Bay Region* (USEPA 1998) for a discussion of disposal at SFDODS.

Disposal Schedule

A fully loaded barge is estimated to be able to make one round trip to SFDODS in approximately 16 hours. Additionally, a 3,000-cubic-yard barge could be loaded with slurry in approximately four hours, which would mean a total of 333 days to load barges with the 1.5 million cy of sediment from the lagoon. Based on this, assuming approximately 2,000 barge loads and a total excavation period of 333 days over nine years, an estimated five barges would be in constant operation 24 hours per day during the excavation period in order to convey all the wet sediment from Bolinas Lagoon to SFDODS under this alternative.

A summary of disposal destinations for material excavated from the lagoon under the Riparian Alternative is provided in Table 2-3.

Equipment and Machinery

Excavation and removal of vegetation, sediment, and dry soil require the use of heavy machinery. Diesel fuel is indispensable to operate machinery and heavy equipment, but refueling such equipment would be limited to designated areas (such as one of the staging areas) so as not to expose sensitive habitats to the possibility of a fuel spill.

Table 2-3
Riparian Alternative
Dredged Material Disposal Sites and Transportation Methods

Excavation Site	Type of Material	Disposal Location	Transportation Method
PGC Delta	Dry soil	Redwood	Truck
	Wet sediment	SFDODS	Barge
	Trees/Vegetation	Redwood	Truck
Bolinas Channel	Wet sediment	SFDODS	Barge
Kent Island	Wet sediment	SFDODS	Barge
	Trees/Vegetation	Redwood	Barge to Bodega Bay, then truck
Main Channel	Wet sediment	SFDODS	Barge
North Basin	Wet sediment	SFDODS	Barge
South Lagoon Channel	Wet sediment	SFDODS	Barge
Highway 1 Fills	Dry soil	Redwood	Truck
Dipsea Road Fills	Dry soil	Redwood	Truck
	Trees/Vegetation	Redwood	Truck

Additionally, best management practices, such as a spill contingency plan, would be incorporated during the construction period. Other best management practices could be used, such as environmentally friendly vegetable oil-based hydraulic fluids, which are considered an industry standard for operating construction equipment near environmentally sensitive areas.

The following is a list of the equipment planned for the project:

- 8-inch hydraulic suction pipeline dredge (amphibious);
- Excavators or large backhoes (number undetermined);
- Dump trucks (number undetermined);
- 2 or more tugboats (3,000-horsepower diesel engine);
- Scows (at least 3) to transport dredge material to SF DODS;
- 2 motorboats capable of transporting up to 10 people;
- Hydraulic excavators;
- Chain saws (2);
- Grinder for wood and vegetation;
- Vacuum apparatus to remove vegetative material from scow used to transport material from Kent Island;
- Pickup trucks used by contractors;
- Portable generators (2);
- Loaders; and

- Cranes.

2.3.2 Estuarine Alternative (NER)

This alternative is identical to the Riparian Alternative except for the excavation in PGC Delta. Excavation under the Estuarine Alternative would take out greater amounts of vegetation, upland soils, and wet sediment than under the Riparian Alternative (Figure 2-6). Implementation of the Estuarine Alternative is estimated to last approximately nine years, and a somewhat larger amount of wet sediment would be taken out of the lagoon. The same types of machinery and disposal locations would be used, and the same schedule limitations would apply.

Pine Gulch Creek Delta

Under this alternative, a large portion of the upland area in PGC Delta would be removed. Approximately 1 to 1.5 vertical feet of material would be removed from the existing grade between the -1 foot and 4 feet NGVD contours. This would require removing 11 acres of upland habitat in the delta, including 7 of the 17 acres of riparian habitat in the delta. It would be necessary to grade the land above the expected water level (3 feet to 4 feet NGVD) to maintain a natural gradual grade and to avoid a step or sharp break in grade. The material removed would be a mix of sands and cobbles with a high percentage of organic material. In addition, a large amount of vegetation, including trees and shrubs, would be removed.

Table 2-4 provides a summary of volumes and acreages for the Estuarine Alternative.

2.3.3 No Action/No Project Alternative

NEPA requires that every EIS consider a No Action Alternative, while CEQA requires that every EIR consider a No Project Alternative. Under some circumstances these may result in different analyses, but here these alternatives are much the same, compared to the project alternatives.

The No Action/No Project (referred to as No Action) Alternative would entail taking no further action to address sedimentation in the lagoon but would leave in place existing management plans and policies. This would include the Bolinas Lagoon Management Plan, existing management plans and policies administered by other authorities, such as GFNMS, Golden Gate National Recreation Area (GGNRA), and Point Reyes National Seashore (PRNS), as well as applicable state and federal resources management laws and regulations. Evaluating this alternative includes determining the future impact of these plans and policies in the absence of any dredging or other sediment removal activities in the lagoon. The No Action Alternative is based on the existing conditions of Bolinas Lagoon and the adjacent properties, described in Section 3 of this EIS/EIR, as projected forward by the Corps' modeling of hydraulic processes and other conditions in the lagoon over the next 60 years.

2-6 Estuarine Alternative Excavation Sites

Table 2-4
Estuarine Alternative Project Elements

	Excavation Footprint (acres)	Excavation Volume (wet and dry) (cy)[1]	Volume of Vegetative Debris (cy)	Deepest Level of Excavation (NGVD)[2]	Days of Dredging (at 200 cy/hour, 24 hours/day)	Barge Loads to SFDODS	Truckloads of Dry Soil to Redwood Landfill	Truckloads of Chips to Redwood Landfill
North Basin	136	458,550 (wet)	N/A	-4 ft	96	612	N/A	N/A
Main Channel	38	216,250 (wet)	N/A	- 4 ft	45	289	N/A	N/A
Bolinas Channel	16	130,800 (wet)	N/A	- 5 ft	28	175	N/A	N/A
Kent Island	124	376,750 (wet)	3,800	- 2 ft	79	503		320
Pine Gulch Creek Delta	103	155,950 (wet), 34,750 (dry)	11,300	- 1 ft	31	208	2,900	950
Highway 1 Fills	4	4,850 (dry)	N/A	0 ft	N/A	N/A	405	N/A
Dipsea Road	8	37,700 (dry)	N/A	0 ft	N/A	N/A	3,150	N/A
South Lagoon Channel	18	89,250 (wet)	N/A	- 4 ft	19	119	N/A	N/A
Totals	**445**	**1,427,550 (wet) 77,250 (dry)**	**15,100**		**298**	**1906**	**17,455**	**1,270**

Source: Romanoski 2002

[1] Total volumes rounded off to nearest 50 cubic yard.
[2] NGVD is the land datum typically used on US Geological Survey topographic maps. NGVD is commonly referred to as mean sea level because it was based on the average of the mean tide levels at selected locations. However, because it is a national datum, 0 ft NGVD may not necessarily equate to mean sea level in Bolinas Lagoon.
NA – not applicable

One possibility under the No Action alternative would be that all agencies would cease management activities in the lagoon and the surrounding watershed. All erosion control and lagoon management activities would cease. While it is not reasonable to expect this, it is mentioned here as an example to the public of the highest level of environmental damage possible under the No Action Alternative.

2.4 OTHER PROJECT COMPONENTS

2.4.1 Watershed-Level Actions

In 2000 and 2001, the Corps conducted a study of sediment movement and erosion in the Bolinas Lagoon watershed (see Technical Appendix A). This study identified sediment sources, developed a sediment budget for the watershed, and constructed a model to determine future sediment inputs into the lagoon from the watershed. This study concluded that the watershed was no longer a significant source of sediment for the lagoon and that efforts to reduce erosion in the watershed would have minimal impact on sedimentation in the lagoon. Based on this finding, the Corps has not proposed watershed-level actions as part of this study; however, the Corps could pursue sediment control projects that focus on aquatic or habitat restoration under the Continuing Authorities Program if a local group or agency willing to share costs asked the Corps to participate.

2.4.2 Timing and Adaptive Management

Implementing either of the project alternatives would require a multi-year process, during which project scheduling would be constrained by weather, traffic, disposal site capacity, availability and capacity of dredges and disposal barges, fishing boat traffic in the lagoon and Bolinas Bay, and the seasonal activity of sensitive species in the lagoon. In coordination with the HEEP, the lead agencies would develop an implementation schedule during the project design phase, which would take into account all of these factors. Table 2-2 provides an overview of sensitive species activities in the lagoon, which illustrates the difficulty of scheduling excavation work.

Adaptive Management Planning

To facilitate long-term planning and implementation of solutions for the Bolinas Lagoon Ecosystem Restoration Project, a comprehensive Bolinas Lagoon Comprehensive AMP is being developed that would provide a roadmap for the long-term stabilization, enhancement, and management of the lagoon. The plan would be comprehensive in nature, covering all the important issues facing the lagoon, but also would be easily adaptable, in order to reflect the changing conditions and needs of the lagoon. The Bolinas Lagoon Comprehensive AMP is not intended to be a capital improvement plan, focusing just on implementing engineering solutions. Instead, this document would serve as the basis for consideration of implementation of the actions recommended by the HEEP and as a guidance instrument from which to develop a long-term management plan with full stakeholder involvement.

Adaptive management provides for studies and management programs that can be adapted to uncertain or unforeseen circumstances. A well-designed adaptive management plan anticipates as many circumstances as possible before designing monitoring and data assessment approaches. The AMP would identify circumstances or issues that may include potential limiting factors, such as stream flow, erosion and sedimentation rates, or problems with restoration activities or operation. However, not all of these factors may be anticipated. Some of the unanticipated factors could include institutional changes (e.g., changes to the ESA or other laws), new natural resource management directives (e.g., maximizing tidal exchange, increasing seal haul-out areas), newly understood ecological phenomena (e.g., global climate change), or land and water use changes (e.g., upstream development). Some unanticipated factors, such as toxic spills, may fall outside of the scope of the plan and would be addressed through other programs or directives, while others might be shown to be related shortcomings in the project that could arguably be included under these adaptive management objectives, such as possible beach erosion.

If a trigger event occurs (indicating an objective has not been met), then an adaptive response would be required. This could involve further diagnostic studies, modification of the restoration activities or operations, or changes to natural features of the project area, designed to bring the system closer to achieving the objective. All responses must be feasible, practical, reasonable, prudent, and acceptable to the local community, though this does not preclude potentially major modifications to project facilities or operations. Each response would have response limits that describe the absolute scope of actions that can be taken in response to a trigger event.

In general, response limits under the AMP would be determined by consensus, guided by principles of feasibility, practicality, reasonability, prudence, and local community acceptance, and would conform to limits identified by the Corps. Possible adaptive responses that fall outside of the project's scope, such as major upstream modifications, would require further decisions through the established Corps processes. In addition, nothing in the AMP is intended to bind Marin County or the Corps or otherwise limit their respective authorities in the performance of their responsibilities under applicable state and federal laws.

All adaptive responses would be evaluated, and outcomes of those adaptive responses would be compared to the objective. If the objective has been met, then the original monitoring and data assessment approach would be resumed. If the objective is still not met, the monitoring and data assessment approach may be modified to diagnose the problem.

An important component of the adaptive management process would be reporting, which includes emergency reporting procedures, regular periodic reporting, and final long-term reporting. An annual adaptive management report would summarize all data collected under these monitoring and data assessment approaches and would present analyses required within each objective. Certified raw data and reports generated under these objectives would be updated to appropriate agency and publicly accessible/locally endorsed and maintained information systems using database standards.

The AMP is under development and would be finalized as part of the Project Engineering Design (PED) phase of the project, following completion of the FS and certification of the EIS/EIR. Finally, the AMP would identify the funding source for each adaptive management objective, specifying who would fund studies, responses, and reporting.

2.5 Alternatives Considered but Removed from Consideration

This section incorporates by reference the discussion of plan formulation and plan evaluation in sections 4 and 5 of the FS.

2.5.1 Jetties in Bolinas Bay

During the project planning phase, the Corps discussed the construction of two 1,000-foot jetties into Bolinas Bay, outside the lagoon inlet, designed to prevent sand from washing into the lagoon at the inlet. This would not restore habitat in the lagoon but would help prevent the lagoon from closing by keeping the inlet open for a more extended period. This option was discussed but was removed from further consideration for a variety of reasons, including the following:

- It would violate GFNMS regulations;
- It meets only one of the project objectives, that of keeping the inlet open, and does not add tidal prism or restore lost habitat;
- It would need to be maintained with regular dredging, which would be cost-prohibitive and would not be permitted under GFNMS regulations;
- It would not have public support; and
- It would be an eyesore in the natural setting.

2.5.2 Dredging Alternatives

As discussed extensively in sections 4, 5, and 6 of the FS, the lead agencies considered a wide variety of dredging alternatives during the project planning phase of the FS. Several of these other alternatives included excavation in Seadrift Lagoon, opening Seadrift Lagoon to full tidal flushing, and excavating only some of the project elements identified under the riparian and estuarine alternatives.

These alternatives were removed from further consideration for a variety of reasons, among them:

- Excavation in Seadrift Lagoon would violate Corps policy not to enhance human environments;

- Opening up Seadrift Lagoon would require the Corps to exercise eminent domain over private property in order to construct channels to open the lagoon to full tidal flushing;
- Seadrift Lagoon is not considered to be valuable habitat;
- The additional cost of work in Seadrift Lagoon would not result in proportional increases in intertidal and subtidal habitat; and
- As discussed in sections 4 and 5 of the FS, limited excavation alternatives were determined to return too little environmental benefit at only a slightly reduced cost.

Extensive discussion of the merits and flaws of earlier project proposals can be found in sections 4, 5, and 6 of the FS.

2.5.3 Disposal Alternatives

The Corps estimates that roughly 1.4 million cy of material would have to be removed from the lagoon to achieve project goals. Although disposing of this material locally would be preferable, there is no appropriate disposal location within the watershed. Disposing dredged sediment within the watershed, which is topographically varied and subject to erosion, could result in the same material being redeposited into the lagoon within a relatively short time. The decision was made, therefore, not to pursue the possibility of disposal within the watershed.

One possibility for local disposal was the use of five abandoned quarries within PRNS; however, these quarries would provide only 50,000 to 75,000 cubic yards of disposal volume and could accept only dry (upland) materials. Because of concerns regarding seed dispersal from invasive exotic plants, soil erosion, and water quality issues in the PRNS, any materials deposited there would have to be carefully screened before disposal. Additionally, the lead agencies would be required to pay for designing, constructing, maintaining, restoring, and revegetating the quarries. These requirements are both substantial and financial and make the quarries less desirable as disposal sites.

Using the sediment excavated from the lagoon for beach fill also was considered; however, on further analysis, the Corps found that the grain size was too small and the color was inappropriate for beach use. In addition, the GFNMS , which has jurisdiction over such activities in the project area, would not permit this use.

Potential disposal sites farther from the project site included Bel Marin Keys in Marin County, Altamont Landfill in Livermore, and Montezuma Wetlands in Suisun Bay. All of these sites were determined to be far enough away that their use would result in unacceptable traffic and air quality impacts, as well as high project costs.

As discussed in the FS, Hamilton Army Airfield (HAAF) in Novato was seriously considered as a disposal site for the material removed from Bolinas Lagoon. HAAF is the site of a project to restore seasonal and tidal wetlands on close to 1,000 acres of subsided diked baylands, adjacent Navy ballfields, and the decommissioned antenna field. The restoration site is bounded on the east by San Pablo Bay, on the west by US Highway 101 and the former air base facilities, on the north by Bel Marin Keys, and on the south by property belonging to St. Vincent's Catholic Youth Organization. HAAF was chosen as a disposal site because the clean state of the dredged material from Bolinas Lagoon made it appropriate for reuse in the HAAF wetland restoration project. The material would have been used to raise low elevation areas, now protected by levees and pumps, to recreate tidal wetlands at higher elevations. Material from Bolinas would have been transported to HAAF by barge through the Golden Gate and north into San Pablo Bay. There it would have been discharged to an off-loader anchored in San Pablo Bay off shore of the HAAF. Accurate cost estimates of using the Hamilton disposal site for the Bolinas Lagoon project cannot be calculated due to uncertainties in piping, site management, and operations and maintenance costs of the disposal site.

2.6 Comparison of Alternatives, Including Impacts and Mitigation

NEPA requires that the EIS present the alternatives in comparative form to define the issues and to provide decision-makers and the public with a clear basis for choice among options. Tables 2-5 and 2-6 provide a summary of the effects on habitat and hydrology that are predicted as a result of the alternatives. Table 2-7 provides a summary of the environmental impacts of each alternative.

The final EIS/EIR will include a mitigation monitoring plan (MMP) for approval and certification by the lead agencies. The MMP would identify specific measures to be taken in order to track the mitigation measures identified under this EIS/EIR. As required by CEQA, Marin County must certify that the EIS/EIR was prepared in compliance with CEQA and was presented to the County's decision-making body for review and consideration. In order to support its decision on the project, the County must prepare and adopt written findings of fact for each significant environmental impact identified in the EIS/EIR. Specifically, the County must find that, for each significant impact identified, the project has been changed (including adoption of mitigation measures) to avoid or substantially reduce the magnitude of the impacts identified in the EIS/EIR. If no feasible mitigation measures can be identified to reduce a significant impact to less than significant level, the County must issue a Statement of Overriding Considerations discussing those impacts and justifying its approval of the project.

2.7 Environmentally Preferable/Environmentally Superior Alternative

NEPA requires that an environmentally preferable alternative be identified, and CEQA requires that an environmentally superior alternative be identified. To achieve this, environmental impacts were compared among the project alternatives for the resource areas analyzed in Section 4. This comparison determined which alternative(s) would result in the fewest overall adverse environmental impacts for each resource area.

A summary of significant impacts and applicable mitigation from each of the alternatives is provided in Table 2-7. CEQA guidelines require that if the environmentally superior alternative is the 'no project' alternative, the EIS/EIR shall also identify an environmentally superior alternative among the other alternatives.

The No Action Alternative would be environmentally superior to the Riparian or Estuarine Alternatives because it would result in three identified unmitigable significant impacts, compared with seven unmitigable significant impacts from the Riparian Alternative and eight unmitigable significant impacts from the Estuarine Alternative. However the No Action Alternative would not meet the project objectives of increasing the volume of tidal prism and restoring intertidal and subtidal habitats in Bolinas Lagoon; therefore designation of another environmentally superior alternative is appropriate under CEQA.

The Riparian Alternative would be the environmentally superior alternative, because this alternative would create fewer impacts as compared to the Estuarine Alternative. The Riparian Alternative would result in seven significant and unmitigated impacts and 11 significant but mitigated impacts, compared to the Estuarine Alternative, which would result in eight significant and unmitigated impacts and 14 significant and mitigated impacts. As discussed in Section 4, the Riparian Alternative would present fewer environmental impacts than the Estuarine Alternative, because it would not remove the riparian vegetation in PGC Delta. The Riparian Alternative would meet the project goal of increasing tidal volume in Bolinas Lagoon, would in the long term produce the same acreages of subtidal and intertidal habitat as the Estuarine Alternative (see Table 2-6), would result in fewer significant impacts, would result in the loss of less jurisdictional wetland, and would not conflict with the Marin County Local Coastal Plan (LCP), as discussed in Section 4.7.

Compared to the Estuarine Alternative, the Riparian Alternative would avoid impacts relating to the conflict with the LCP, recreation access to PGC Delta, potential impacts to the federally endangered California Red-Legged Frog, and water quality from excavating organic soils in PGC Delta.

2.8 CONSISTENCY WITH FEDERAL AND STATE LAWS

Table 2-8 provides a brief overview of major federal and state laws with which the lead agencies must comply during project planning or before project construction.

Table 2-5
Dredging Alternative Results

Alternative	Volume of Excavated Material (cy)	Dredged Footprint (acres)	Lagoon Tidal Prism (cy)	Tidal Prism Compared to 1998 (cy)	Closure Index[1]
No Project (1998)	N/A	N/A	5,126,588	N/A	10.5
Estuarine Alternative (2008)	1,504,800	447	6,567,513	+1,440,925	8.1
Riparian Alternative (2008)	1,472,750	430	6,559,185	+1,432,597	8.1
No Action/No Project (2008)	0	0	4,883,508	-243,0800	11.2
No Action/No Project (2058)	0	0	3,841,791	-1,284,797	16.1

Source: Romanoski 2002

Notes:

[1]Inlet closure is possible at an index of 15.
NA – not applicable

Table 2-6
Lagoon Habitat Totals after Construction

Alternative	Subtidal Habitat Acreage	Subtidal Habitat Volume (cy)	Intertidal Habitat Acreage	Intertidal Habitat Volume (cy)	Upland Habitat Acreage
No Project (1998 conditions)	146.39	523,318	848.53	3,584,714	238.10
Estuarine Alternative					
2008	284.47	890,366	832.87	5,460,468	117.47
2018	205.82	627,984	873.01	5,355,085	165.11
2038	184.78	590,921	864.34	4,728,183	190.96
2058	166.01	557,866	856.61	4,169,080	214.01
Riparian Alternative					
2008	285.39	894,995	827.31	5,448,416	121.97
2018	205.41	627,264	872.84	5,342,896	165.61
2038	184.37	590,201	864.17	4,715,994	191.46
2058	165.6	557,146	856.44	4,156,891	214.51
No Action/No Project					
2008	134.45	502,281	843.61	3,228,889	252.77
2018	123.07	482,246	838.92	2,890,014	266.74
2038	102.03	445,183	830.25	2,263,112	292.59
2058	83.26	412,128	822.52	1,704,008	315.64

Source: Romanoski 2002

Table 2-7
Summary of Potential Significant Impacts

Resource Category	No Action/No Project	Riparian Alternative	Estuarine Alternative
Air Quality and Odor	No significant impacts are expected.	No significant impacts are expected.	No significant impacts are expected.
Biological Resources	*Impact 4.3.5: Loss of Habitats (SU)* Increasing sedimentation and eventual closure of the lagoon would result in loss of open water, salt marsh, riparian, and transitional habitats and associated plant and animal species. *Mitigation:* No mitigation has been identified for this impact.	*Impact 4.3.1: Impact on Benthic Invertebrates (SU)* Dredging activities would directly disrupt benthic communities in the lagoon bottom and would indirectly affect animal life, such as birds and fish that feed on benthic invertebrates. *Mitigation:* No mitigation has been identified for this impact. *Impact 4.3.2: Loss of Jurisdictional Wetland (SU)* More than 5 acres of jurisdictional wetland would be destroyed and converted to mudflat or open water under this alternatives. *Mitigation:* No mitigation has been identified for this impact. *Impact 4.3.3 Loss of Black Rail Habitat: (SU)* Excavation of salt marsh habitat would cause significant impacts to the state-listed as threatened California black rail. *Mitigation:* no mitigation has been identified for this impact.	*Impact 4.3.1: Impact on Benthic Invertebrates (SU)* Dredging activities would directly disrupt benthic communities in the lagoon bottom and would indirectly affect animal life, such as birds and fish that feed on benthic invertebrates. *Mitigation:* No mitigation has been identified for this impact. *Impact 4.3.2: Loss of Jurisdictional Wetland (SU)* More than 5 acres of jurisdictional wetland would be destroyed and converted to mudflat or open water under this alternatives. *Mitigation:* No mitigation has been identified for this impact. *Impact 4.3.3 Loss of Black Rail Habitat: (SU)* Excavation of salt marsh habitat would cause significant impacts to the state-listed as threatened California black rail. *Mitigation:* no mitigation has been identified for this impact. *Impact 4.3.4: Impact to the California Red-Legged Frog (SM)* Removal of riparian habitat in PGC Delta would affect possible red-legged frog habitat. *Mitigation 4.3.4:* surveys and compliance with USFWS protocols.

Table 2-7
Summary of Potential Significant Impacts *(continued)*

Resource Category	No Action/No Project	Riparian Alternative	Estuarine Alternative
Cultural Resources	No significant impacts are expected.	*Impact 4.5.1: Damage to Undiscovered Cultural Resources (SM)* Under this alternative, impacts could include the possible destruction of both previously recorded and undiscovered archaeological sites or sensitive Native American sites. Dredging operations that disturb strata below the 50-year-old silt deposition level and land-based excavation of upland sites could encounter archaeological sites. *Mitigation 4.5.1:* Any removed dredge material should be monitored by a qualified archaeologist, who would have the authority to stop work, record the material, and determine potential significance. Native Americans should be consulted before any ground-disturbing activities begin to determine if sensitive resources could be affected. Areas within Bolinas Bay that could be affected either by barge anchoring or disposal pipeline dragging should be surveyed for cultural resources.	*Impact 4.5.1: Damage to Undiscovered Cultural Resources (SM)* Under this alternative, impacts could include the possible destruction of both previously recorded and undiscovered archaeological sites or sensitive Native American sites. Dredging operations that disturb strata below the 50-year-old silt deposition level and land-based excavation of upland sites could encounter archaeological sites. *Mitigation 4.5.1:* Any removed dredge material should be monitored by a qualified archaeologist, who would have the authority to stop work, record the material, and determine potential significance. Native Americans should be consulted before any ground-disturbing activities begin to determine if sensitive resources could be affected. Areas within Bolinas Bay that could be affected either by barge anchoring or disposal pipeline dragging should be surveyed for cultural resources.
Geology, Soils, & Seismicity	*Impact 4.4.2: Inlet Channel Narrowing or Closure (SM)* A reduction in the tidal prism of the lagoon would eventually reduce the power of tidal flows and would result in closure of the lagoon entrance channel. Narrowing or closing the lagoon would accelerate sediment deposition. Freshwater inflows to the lagoon would continue, and some of the freshwater would seep through the permeable sand spit. *Mitigation 4.4.2:* A number of engineering options are available for releasing the water from the lagoon, and it can be assumed that some workable engineering solution could be found. An example of the type of measure that might be used to keep the inlet channel open, in spite of a reduced tidal prism, is construction of groins seaward of the mouth of the lagoon.	*Impact 4.4.1: Erosion of the Tidal Inlet Channel and Banks (SM)* Increased tidal flow velocities at the inlet may increase erosion of the beach at the base of the cliffs on the west side of the channel inlet and could increase erosion of the cliffs themselves. Similarly, enhanced bank erosion or channel scouring could affect the embankment supporting Wharf Road. Undermining the coastal bluff and Wharf Road would be significant impacts, if they were to occur. *Mitigation 4.4.1:* Enhanced erosion of the bluffs on the west bank of the inlet channel could be partially mitigated by placing protection structures at the base of the bluff, including riprap, cement walls, or bluff armoring. The rate of erosion would be monitored to determine if mitigation is warranted.	*Impact 4.4.1: Erosion of the Tidal Inlet Channel and Banks (SM)* Increased tidal flow velocities at the inlet may increase erosion of the beach at the base of the cliffs on the west side of the channel inlet and could increase erosion of the cliffs themselves. Similarly, enhanced bank erosion or channel scouring could affect the embankment supporting Wharf Road. Undermining the coastal bluff and Wharf Road would be significant impacts, if they were to occur. *Mitigation 4.4.1:* Enhanced erosion of the bluffs on the west bank of the inlet channel could be partially mitigated by placing protection structures at the base of the bluff, including riprap, cement walls, or bluff armoring. The rate of erosion would be monitored to determine if mitigation is warranted.

Table 2-7
Summary of Potential Significant Impacts *(continued)*

Resource Category	No Action/No Project	Riparian Alternative	Estuarine Alternative
Hydrology & Water Resources	*Impact 4.2.5: Lagoon Closure (SU)* Under the No Action Alternative, the PGC Delta is projected to continue to aggrade and expand, and the tidal prism of the lagoon would continue to decrease. Temporary or intermittent closure of the inlet channel is predicted as soon as 2058. However, the changes in water quality and loss of a significant water resource (the lagoon) would be of a magnitude that would be considered significant if they were caused by human action. These impacts are not mitigable, except by increasing the tidal prism. *Mitigation*: No mitigation has been identified for this impact. *Impact 4.2.6: Flooding Impacts (SM)* The closure of the lagoon inlet could result in a significant increase in the risk of flooding of developed areas. *Mitigation 4.2.6:* The hazard of flooding might be mitigable through engineering action to create a permanent outflow structure, but the feasibility of this has not been evaluated. Alternatively, the sand spit could be artificially breached, as needed, to prevent flooding. It is also possible that groins might prevent sand from accumulating in the inlet channel and might enable the channel to remain open despite a decreasing tidal prism.	*Impact 4.2.1: Subsidence impacts from Earthquake Activity (SU)* A strong earthquake would cause liquefaction of the sand spit and probably a general leveling of the lagoon bottom, as well as widespread destruction of structures underlain by sandy sediments. While not an impact of the project, these conditions would form the backdrop for additional hydraulic effects related to the project. *Mitigation:* No mitigation has been identified for this impact. *Impact 4.2.2: Water Quality Impacts from Construction (SM)* During construction, dredging would increase suspended sediment in the vicinity of the dredging activity. Exposing these sediments by dredging and excavating could result in a significant but mitigable impact on water quality. *Mitigation 4.2.2:* Sediment samples could be collected and tested during the PED phase. The use of small cutterhead dredges would reduce the impacts of turbidity. Sediment curtains or other barriers would be used to isolate areas being dredged from ambient conditions. Water quality monitoring would allow adjustments to reduce adverse effects. *Impact 4.2.3: Long-Term Water Circulation Impacts (SM)* Changes in the shape of the bottom of the lagoon may substantially change circulation patterns within the lagoon, resulting in uncertain impacts. An example of an undesirable result would be the creation of a large pool that would not fill or drain adequately and therefore would experience radical variations in water quality. *Mitigation 4.2.3:* Sediment transport modeling would be performed during PED. Potential adverse effects on lagoon circulation patterns would be identified by monitoring water quality and flow patterns, monitoring bathymetric	*Impact 4.2.1: Subsidence impacts from Earthquake Activity (SU)* A strong earthquake would cause liquefaction of the sand spit and probably a general leveling of the lagoon bottom, as well as widespread destruction of structures underlain by sandy sediments. While not an impact of the project, these conditions would form the backdrop for additional hydraulic effects related to the project. *Mitigation:* No mitigation has been identified for this impact. *Impact 4.2.2: Water Quality Impacts from Construction (SM)* During construction, dredging would increase suspended sediment in the vicinity of the dredging activity. Exposing these sediments by dredging and excavating could result in a significant but mitigable impact on water quality. *Mitigation 4.2.2:* Sediment samples could be collected and tested during the PED phase. The use of small cutterhead dredges would reduce the impacts of turbidity. Sediment curtains or other barriers would be used to isolate areas being dredged from ambient conditions. Water quality monitoring would allow adjustments to reduce adverse effects. *Impact 4.2.3: Long-Term Water Circulation Impacts (SM)* Changes in the shape of the bottom of the lagoon may substantially change circulation patterns within the lagoon, resulting in uncertain impacts. An example of an undesirable result would be the creation of a large pool that would not fill or drain adequately and therefore would experience radical variations in water quality. *Mitigation 4.2.3:* Sediment transport modeling would be performed during PED. Potential adverse effects on lagoon circulation patterns would be identified by monitoring water quality and flow patterns, monitoring bathymetric

Table 2-7
Summary of Potential Significant Impacts *(continued)*

Resource Category	No Action/No Project	Riparian Alternative	Estuarine Alternative
		changes, and observing the circulation patterns.	changes, and observing the circulation patterns. *Impact 4.2.4: Water Quality Impacts from Excavation Materials (SM)* During delta dredging, spillage would contribute to turbidity. Spilled sediment may enrich nutrient levels in the lagoon water, enhancing algae growth. Deltaic sediments are probably chemically reduced, so that when exposed to air, the sediments would liberate swampy odors and possibly some toxic forms of natural compounds. *Mitigation 4.2.4:* Dredging impacts would be monitored to ensure that water quality is not significantly affected, and dredging would be performed slowly and during periods that are not critical for migrating fish. The rate of dredging may be reduced or the dredged area may be kept isolated from the lagoon to maintain effects below a significant level.

Table 2-7
Summary of Potential Significant Impacts *(continued)*

Resource Category	No Action/No Project	Riparian Alternative	Estuarine Alternative
Land Use	No significant impacts are expected.	*Impact 4.7.1: Compatibility with Uses at the Project Site (SM)* Project measures include installing a slurry pipeline in the lagoon; during high tide the pipeline would float, and during low tide it would likely rest on the mudflats. Therefore, current uses of the lagoon for recreation would be interrupted at certain times of the year. *Mitigation 4.7.1:* This impact on kayakers and Seadrift recreational boaters would be mitigated by submerging the pipeline at one or two places along its length within the lagoon.	*Impact 4.7.1: Compatibility with Uses at the Project Site (SM)* Project measures include installing a slurry pipeline in the lagoon; during high tide the pipeline would float, and during low tide it would likely rest on the mudflats. Therefore, current uses of the lagoon for recreation would be interrupted at certain times of the year. *Mitigation 4.7.1:* This impact on kayakers and Seadrift recreational boaters would be mitigated by submerging the pipeline at one or two places along its length within the lagoon. *Impact 4.7.2: Consistency with Countywide Plan and LCP. (SU)* Because the Estuarine Alternative requires vegetation removal in the riparian protection area of Pine Gulch Creek, there would be a significant impact. No mitigation is suggested. *Mitigation 4.7.2:* Apply best management practices to control erosion and runoff and restore disturbed areas by replanting them with plant species naturally found on the site. While this would lessen the long-term biological impacts, such a mitigation measure would not remove the conflict with Stream Protection Policy II-4 and would not mitigate the impact below the level of significance.
Marine Transportation	No significant impacts are expected.	No significant impacts are expected.	No significant impacts are expected.

Table 2-7
Summary of Potential Significant Impacts *(continued)*

Resource Category	No Action / No Project	Riparian Alternative	Estuarine Alternative
Noise	No significant impacts are expected.	*Impact 4.11.1: Noise from Dredging (SM)* Because noise levels from dredging in the southern part of Bolinas Lagoon might produce CNEL levels above 60 dBA in the Seadrift development and in portions of Bolinas, this impact is considered potentially significant. *Mitigation 4.11.1:* Noise mitigation opportunities should be reasonably available by selecting quieter running equipment and by providing supplemental noise shielding around engines and pumps. Noise level reductions of 10 dBA or more (compared to noise levels illustrated in Figure 4-1) should be possible by selecting dredging equipment that produces noise levels below 80 dBA at 50 feet or by installing acoustical shielding panels around the sides of engine and pump equipment on the dredge. *Impact 4.11.2: Noise from Vegetation Clearing Activity (SM)* Because noise levels from vegetation clearing on Kent Island might exceed 70 dBA in Bolinas and portions of Seadrift, this impact is considered potentially significant. *Mitigation 4.11.2:* Noise can be mitigated by limiting mulching and clearing to daytime hours, locating the equipment on the side of Kent Island farthest from residences, and screening the machinery on three sides.	*Impact 4.11.1: Noise from Dredging (SM)* Because noise levels from dredging in the southern part of Bolinas Lagoon might produce CNEL levels above 60 dBA in the Seadrift development and in portions of Bolinas, this impact is considered potentially significant. *Mitigation 4.11.1:* Noise mitigation opportunities should be reasonably available by selecting quieter running equipment and by providing supplemental noise shielding around engines and pumps. Noise level reductions of 10 dBA or more (compared to noise levels illustrated in Figure 4-1) should be possible by selecting dredging equipment that produces noise levels below 80 dBA at 50 feet or by installing acoustical shielding panels around the sides of engine and pump equipment on the dredge. *Impact 4.11.2: Noise from Vegetation Clearing Activity (SM)* Because noise levels from vegetation clearing on Kent Island might exceed 70 dBA in Bolinas and portions of Seadrift, this impact is considered potentially significant. *Mitigation 4.11.2*: Noise can be mitigated by limiting mulching and clearing to daytime hours, locating the equipment on the side of Kent Island farthest from residences, and screening the machinery on three sides.

Table 2-7
Summary of Potential Significant Impacts *(continued)*

Resource Category	No Action/No Project	Riparian Alternative	Estuarine Alternative
Recreational Resources	*Impact 4.6.3: Long-Term Impacts: Lagoon Recreation Access (SU)* Failure to address sedimentation in Bolinas Lagoon is likely to have significant impacts on a variety of recreational uses in the lagoon, including fishing, kayaking, and wildlife viewing. *Mitigation*: No mitigation has been identified for this impact.	*Impact 4.6.1: Lagoon Recreation Access (SM)* The presence of the pipeline in the lagoon would have an additional impact on recreational use of the lagoon. Because the dredge would at least sometimes be at the north end of the lagoon, the pipeline would necessarily interfere with kayakers attempting to cross the lagoon. Motorboats would be similarly affected by the presence of the pipeline; the residents of Seadrift put in their motorboats from the boat launch on the northwest of the Seadrift development. *Mitigation 4.6.1:* This impact on kayakers and Seadrift recreational boaters would be mitigated by submerging the pipeline at one or two places along its length within the lagoon. This mitigation would provide for some recreational access for motorboats and kayaks during the construction period.	*Impact 4.6.1: Lagoon Recreation Access (SM)* The presence of the pipeline in the lagoon would have an additional impact on recreational use of the lagoon. Because the dredge would at least sometimes be at the north end of the lagoon, the pipeline would necessarily interfere with kayakers attempting to cross the lagoon. Motorboats would be similarly affected by the presence of the pipeline; the residents of Seadrift put in their motorboats from the boat launch on the northwest of the Seadrift development. *Mitigation 4.6.1:* This impact on kayakers and Seadrift recreational boaters would be mitigated by submerging the pipeline at one or two places along its length within the lagoon. This mitigation would provide for some recreational access for motorboats and kayaks during the construction period.. *Impact 4.6.2: Lagoon Recreation Access (SM)* Removing seventeen additional acres of delta and upland habitat along Pine Gulch Creek under this alternative would substantially prevent year-round use of that area for hiking, walking, or wildlife viewing. *Mitigation 4.6.2:* While seventeen acres of the delta and upland habitat would be removed, much of the reserve would be left in place, and MCOSD could build new trails or provide educational materials to explain the project and its projected benefits.
Public Services and Utilities	No significant impacts are expected.	No significant impacts are expected.	No significant impacts are expected.
Socioeconomics and Population	No significant impacts are expected.	No significant impacts are expected.	No significant impacts are expected.
Transportation	No significant impacts are expected.	No significant impacts are expected.	No significant impacts are expected.

Table 2-7
Summary of Potential Significant Impacts *(continued)*

Resource Category	No Action / No Project	Riparian Alternative	Estuarine Alternative
Visual Resources	No significant impacts are expected.	*Impact 4.12.1: Alteration of Terrain and Water (SU)* During and after project construction, immediate impacts would include significantly altering the terrain of the lagoon by changing the lagoon shoreline at Pine Gulch Creek Delta and Dipsea Road and along Highway 1; immediate impacts would also include changes in water flow, volume, location, and possibly color all through the lagoon. *Mitigation*: No mitigation has been identified for this impact. *Impact 4.12.2: Short-Term Changes in Vegetation (SU)* The Riparian Alternative would remove over 100 acres of upland habitat, including all the vegetation on Kent Island, but would retain the mature trees in the PGC Delta. This would significantly change the view from the eastern and northern shores of the lagoon, as well as from viewing locations along Highway 1 and along the hiking trails on Bolinas Ridge. While the impact would be less than that under the Estuarine Alternative because the mature trees in the PGC Delta would be left in place, this would be a significant impact under Marin County guidelines. *Mitigation*: No mitigation has been identified for this impact. *Impact 4.12.3: Long-Term Changes in Vegetation (SU)* Compared to the No Action Alternative in 2058, the Riparian Alternative in 2058 would result in there being 100 fewer acres of upland, 34 acres more of intertidal habitat, and 82 acres more of subtidal habitat. The long-term effects of the changes in vegetation under the Riparian Alternative would be slightly less than from the Estuarine Alternative because the riparian vegetation in the PGC Delta would be left in place and would continue to mature. *Mitigation*: No mitigation has been identified for	*Impact 4.12.1: Alteration of Terrain and Water (SU)* During and after project construction, immediate impacts would include significantly altering the terrain of the lagoon by changing the lagoon shoreline at Pine Gulch Creek Delta and Dipsea Road and along Highway 1; immediate impacts would also include changes in water flow, volume, location, and possibly color all through the lagoon. *Mitigation*: No mitigation has been identified for this impact. *Impact 4.12.2: Short-Term Changes in Vegetation (SU)* This impact is roughly identical to the impact described for the Riparian Alternative. The Estuarine Alternative would remove over 100 acres of upland habitat, including all the vegetation on Kent Island, but would remove the mature trees in the PGC Delta. This would significantly change the view from the eastern and northern shores of the lagoon, as well as from viewing locations along Highway 1 and along the hiking trails on Bolinas Ridge. The impact would be slightly greater than that under the Riparian Alternative because the mature trees in the PGC Delta would be removed. *Mitigation*: No mitigation has been identified for this impact. *Impact 4.12.3: Long-Term Changes in Vegetation (SU)* Compared to the No Action Alternative in 2058, the Estuarine Alternative in 2058 would result in there being 100 fewer acres of upland, 34 acres more of intertidal habitat, and 82 acres more of subtidal habitat. The long-term effects of the changes in vegetation under the Estuarine Alternative would be slightly greater than from the Riparian Alternative because the riparian vegetation in the PGC Delta would be left in place and would continue to mature. *Mitigation*: No mitigation has been identified for

Table 2-7
Summary of Potential Significant Impacts *(continued)*

Resource Category	No Action/No Project	Riparian Alternative	Estuarine Alternative
		this impact.	this impact.
		<u>*Impact 4.12.4: Light and Glare (SM)*</u> Because lagoon sediment is scheduled to be excavated around the clock, the dredge would require night-time lighting. The project area has very little artificial light, and thus the light or glare may constitute a significant impact. *Mitigation 4.12.4:* This impact would be mitigated by the use of shielding, which would direct the light downward to the work area. Implementing this measure should reduce light and glare impacts to a less than significant level.	<u>*Impact 4.12.4: Light and Glare (SM)*</u> Because lagoon sediment is scheduled to be excavated around the clock, the dredge would require night-time lighting. The project area has very little artificial light, and thus the light or glare may constitute a significant impact. *Mitigation 4.12.4:* This impact would be mitigated by the use of shielding, which would direct the light downward to the work area. Implementing this measure should reduce light and glare impacts to a less than significant level.
		<u>*Impact 4.12.5: Changes to Existing Visual Quality of Water (SM)*</u> The excavation in the lagoon would be likely to produce turbid water in the area of excavation and around the disposal scow in Bolinas Bay. *Mitigation 4.12.5:* This impact would be mitigated by the use of a hydraulic suction dredge and siltation screens at the dredging site and dredge scow. Implementing this measure would reduce visual quality impacts to a less than significant level.	<u>*Impact 4.12.5: Changes to Existing Visual Quality of Water (SM)*</u> The excavation in the lagoon would be likely to produce turbid water in the area of excavation and around the disposal scow in Bolinas Bay. *Mitigation 4.12.5:* This impact would be mitigated by the use of a hydraulic suction dredge and siltation screens at the dredging site and dredge scow. Implementing this measure would reduce visual quality impacts to a less than significant level.
		<u>*Impact 4.12.6: Changes in Terrain (SM)*</u> As discussed in Section 4.4, potential significant impacts on the lagoon include erosion of the bluffs on the west bank of the inlet channel as a result of increased tidal prism and increased water velocity through the inlet. Additionally, increased velocity of water through the lagoon inlet could have a detrimental effect on Bolinas Beach and Stinson Beach on either side of the inlet. Such changes would constitute a substantial and permanent change to existing terrain. *Mitigation 4.12.6:* As discussed in Section 4.4, the impact on the bluffs would be mitigated by placing protection structures at the base of the bluff. The rate of erosion would be monitored to determine whether mitigation is warranted.	<u>*Impact 4.12.6: Changes in Terrain (SM)*</u> As discussed in Section 4.4, potential significant impacts on the lagoon include erosion of the bluffs on the west bank of the inlet channel as a result of increased tidal prism and increased water velocity through the inlet. Additionally, increased velocity of water through the lagoon inlet could have a detrimental effect on Bolinas Beach and Stinson Beach on either side of the inlet. Such changes would constitute a substantial and permanent change to existing terrain. *Mitigation 4.12.6:* As discussed in Section 4.4, the impact on the bluffs would be mitigated by placing protection structures at the base of the bluff. The rate of erosion would be monitored to determine whether mitigation is warranted.

Table 2-7
Summary of Potential Significant Impacts *(continued)*

Resource Category	No Action/No Project	Riparian Alternative	Estuarine Alternative
		Impacts to the beaches could be mitigated by replacing any lost sand.	Impacts to the beaches could be mitigated by replacing any lost sand.

Key: SU = Significant and unmitigable
SM = Significant but mitigated to less than significant

Table 2-8
Consistency with Federal and State Laws

Law	Summary	Consistency
Archaeological and Historic Preservation Act of 1974. 16 U.S.C. § 469	This act requires federal agencies to preserve archeological and historical data and artifacts threatened by dam construction or other federally-licensed projects.	If archaeological materials are discovered during construction appropriate actions would be taken in compliance with the AHPA and NHPA.
Archaeological Resources Protection Act of 1979, 16 U.S.C §§ 470aa – 470mm.	Among other things, requires all excavations on federal land to be undertaken pursuant to permit issued by the federal land manager. Imposes criminal penalties for unauthorized excavations.	This act is not applicable at this time as no archaeological excavations are expected to be undertaken.
Clean Air Act, 42 U.S.C. § 7401 – 7671q, and implementing regulations (40 CFR 51.850)	Among other provisions, the Clean Air Act (CAA) requires federal agencies to ensure that their actions conform to EPA- approved State Implementation Plans (SIP) governing air quality.	Technical Appendix D provides draft conformity statements based on the air quality analysis conducted for the project.
Clean Water Act, 33 U.S.C. § 1251 et seq., and implementing regulations (33 CFR 320-330, 335-338, 40 CFR 104-140, 230-233, 401-471)	The Clean Water Act prohibits the discharge of pollutants into the navigable waters of the United States without prior approval by the EPA or authorized state agency. Section 404 of the Clean Water Act grants the U.S. Army Corps of Engineers (the Corps) the authority to approve the placement of dredged or fill material into the navigable waters of the U.S.	During feasibility planning, the Corps shall conduct - to the fullest extent practicable - the investigation and analysis required by the CWA guidelines. The 404(b)(1) analysis shall be included in the Feasibility Study.
Coastal Zone Management Act, 16 U.S.C. §§ 1451 – 1465, and implementing regulations (15 CFR 921-933)	Federal actions that impact the coastal zone must be as consistent as reasonably possible with state coastal zone management policies and programs.	A Coastal Consistency Determination will be prepared by the lead agencies following certification of the EIS/EIR.
Endangered Species Act, 16 U.S.C. §§ 1531 – 1544, and implementing regulations (50 CFR 17, 401-424, 450-453	The Endangered Species Act (ESA) protects plants and animals listed as endangered or threatened. Federal agencies are prohibited from taking action that might adversely effect listed species or critical habitat, and requires federal agencies to consult with the Fish and Wildlife Service to determine whether proposed actions might endanger such species or habitat.	The lead agencies have initiated consultation with the Fish and Wildlife Service and National Marine Fisheries Service to determine possible impacts on sensitive species and identify appropriate mitigation for such impacts.
Estuary Protection Act and implementing regulations, 16 U.S.C. §§ 1221 – 1226	Requires federal agencies to consider the impacts of their actions on estuaries and their natural resources, as well as commercial and industrial uses of the estuaries.	This EIS/EIR is designed to analyze the impact of the project on the Bolinas Lagoon, an estuarine lagoon.
Fish and Wildlife Coordination Act and implementing regulations, 16 U.S.C. §§ 661 – 666c	Any federal agency that proposes to control or modify any body of water must first consult with the USFWS or NMFS, as appropriate, and with the head of the appropriate state agency exercising administration over the wildlife resources of the affected state.	The lead agencies have initiated consultation with USFWS, NMFS, and CDFG regarding project impacts.

Table 2-8
Consistency with Federal and State Laws *(continued)*

Law	Summary	Consistency
Marine Mammal Protection Act, 16 U.S.C. §§ 1361 – 1421h, and implementing regulations	Prohibits the taking, harm, or harassment of marine mammals.	The lead agencies have designed the project to minimize impacts on marine mammals in Bolinas Lagoon.
Marine Protection, Research and Sanctuaries Act, 33 U.S.C. § 1401 et seq., 16 U.S.C. § 1431 et seq., as amended, and implementing regulations	Establishes the National Marine Sanctuaries. NOAA establishes regulations controlling sanctuaries.	The project is designed to be in compliance with the Sanctuary regulations and the GFNMS management plan.
Migratory Bird Treaty Act, 16 U.S.C. §§ 703 - 712, and implementing regulations	Prohibits injury or taking of birds covered by act without permission.	The project is designed to limit impact on birds.
National Environmental Policy Act, 42 USC § 4321 et seq., and implementing regulations (40 CFR 1500 et seq.)	The National Environmental Policy Act (NEPA) requires any agency undertaking a major federal action to ensure that the decision-making process considers the environmental impacts of the proposed action.	This EIS/EIR is designed to comply with NEPA and its implementing regulations.
National Historic Preservation Act, 16 USC §§ 470a et seq., and implementing regulations (36 CFR 800)	Section 106 of the NHPA requires federal agencies to take into account the effect their actions might have on historic properties, and offer the public, the State Historic Preservation Officer (SHPO), and the Advisory Council on Historic Preservation (ACHP) an opportunity to comment.	The lead agencies have initiated consultation with the SHPO and the ACHP to document compliance with the NHPA and its implementing regulations.
Rivers and Harbors Act, 33 U.S.C. § 403, and implementing regulations	This section grants the Corps of Engineers authority to regulate construction, excavation, or filling within the navigable waters of the United States.	The EIS/EIR documents the impact of the project on wetlands in Bolinas Lagoon, and sets forth proposed mitigation to limit the damage to wetlands.
Submerged Lands Act, 43 U.S.C. § 1301 et seq., as amended, and implementing regulations	This act affirms the states' ownership of the lands beneath the navigable waters of the United States, while retaining in the United States authority over navigation, flood control, and power production.	The lead agencies will consult with the California State Lands Commission to confirm compliance with state regulations.
NOAA Master Plan, Point Reyes-Farallon Islands National Marine Sanctuary, 15 CFR Part 922	Identifies the Sanctuary boundaries and prohibited actions within the Sanctuary, and establishes permit procedures.	The EIS/EIR documents the consistency of the project with the GFNMS regulations.
E.O. 11990 – Protection of Wetlands (42 Fed. Reg., May 25, 1977)	Requires agencies to minimize destruction of wetlands when managing lands, administering federal programs, or undertaking construction. Agencies are also required to consider effects of federal actions on the health and quality of wetlands.	The EIS/EIR documents the impact of the project on wetlands in Bolinas Lagoon, and sets forth proposed mitigation to limit the damage to wetlands.
E.O. 12898 – Environmental Justice (59 Fed. Reg. 7629, February 16, 1994)	This Order requires federal agencies to identify and avoid disproportionate impacts on minority or low-income communities.	Section 6 of the EIS/EIR documents the lead agencies' compliance with this order.
E.O. 13045 – Protection of Children from Environmental Health Risks and Safety Risks (62 Fed. Reg. 19885, April 23, 1997)	This Order requires federal agencies to identify, assess, and address disproportionate environmental health and safety risks to children from federal actions.	Section 6 of the EIS/EIR documents the lead agencies' compliance with this order.
California Coastal Act of 1976, Cal. Pub. Res. Code §§ 30000 et seq.	Requires coastal consistency determination from California Coastal Commission.	A Coastal Consistency Determination will be prepared by the lead agencies following certification of the EIS/EIR.
California Endangered Species Act, Cal. Fish and Game Code §§ 2090 et seq.	Requires consultation with CDFG regarding impacts to species identified as sensitive under the California ESA.	The lead agencies have initiated consultation with CDFG to determine possible impacts on sensitive species and identify appropriate mitigation for such impacts.
Magnuson-Stevens Fishery Management Act, 16 U.S.C. § 1801 et seq.	Federal agencies must consult with NMFS on proposed actions that may adversely affect Essential Fish Habitat as defined under the Act.	The lead agencies have initiated consultation with USFWS, NMFS, and CDFG regarding project impacts.

CHAPTER 3
AFFECTED ENVIRONMENT

3.1 INTRODUCTION

Bolinas Lagoon is an estuarine lagoon approximately one by three miles in size, located 12 miles northwest of the Golden Gate, south of Point Reyes (MCOSD 1996). The lagoon's watershed covers close to 17 square miles and contains a number of tributaries draining into the lagoon. On the east side of the watershed is the Bolinas Ridge, which runs northwest to southeast at about 2,000 feet above mean sea level (MSL). On the west side of the watershed is the Point Reyes Peninsula. The San Andreas Fault runs directly through the lagoon itself along its northwest-southeast axis (MCOSD 1996).

One major tributary and a number of minor tributaries feed into the lagoon. Pine Gulch Creek drains the west side of the watershed and feeds into the lagoon at a point north of the unincorporated town of Bolinas. At the mouth of Pine Gulch Creek is an extensive delta, which supports a wide assortment of bird life. Several smaller creeks drain into the east side of the lagoon from Bolinas Ridge.

3.2 HYDROLOGY AND GROUNDWATER

3.2.1 Introduction / Region of Influence

The Bolinas watershed is located in western Marin County, on the southern side of the Point Reyes peninsula. The region of influence (ROI) for water resources includes all areas that could be modified or affected by the Bolinas Ecosystem Restoration project. This would encompass all of Bolinas Lagoon, adjacent areas of the lagoon watershed, and Bolinas Bay.

3.2.2 Surface Water Drainage

The watershed of Bolinas Lagoon (Figure 3-1) covers 16.7 square miles. Average annual rainfall in the watershed ranges from about 22 to 50 inches, depending on elevation. Most of the precipitation occurs from November through April.

Pine Gulch Creek, the principal drainage to the lagoon, is a perennial (year-round) stream. Most of the drainage area of Pine Gulch Creek lies on the west side of the San Andreas Graben Fault and is underlain by Monterey Formation. The drainage area of Pine Gulch Creek is approximately 8 square miles (5,120 acres), representing about 50 percent of the watershed of Bolinas Lagoon. Instead of following the most direct route to the head of Bolinas Lagoon, Pine Gulch Creek follows a more circuitous route. Pine Gulch Creek and the drainage of Copper Mine Gulch originally followed the trace of the older western boundary of San Andreas Fault, and they continue to follow this course even after lateral movement on the younger 1906 trace shifted their channels northward. Pine Gulch Creek joins McCormick Creek, flows through Paradise Valley west of Horseshoe Hill, and enters Bolinas Lagoon about midway between the head of the lagoon and Kent Island. Pine Gulch Creek discharges on the west side of the lagoon and represents a major source of sediment inflow to the lagoon in wet years.

Easkoot Creek, by contrast, drains an area roughly 1.7 square miles (1,062 acres) on the south end of the lagoon. This is roughly 10 percent of the total calculated watershed (Fong 2000b).

The drainage areas of the next two largest (intermittent) streams on the east side of the San Andreas Fault, Morses Creek and Audubon Creek, are 0.70 square miles, and 0.46 square miles, respectively. The remainder of the watershed drains the east side of the San Andreas Graben Fault, which is underlain by Franciscan rocks. The streams are steeper on the east side than on the west side of the fault and flow intermittently. Numerous steep, straight, perennial and intermittent streams drain the approximately 1.5-mile long slope from the ridge top to Bolinas Lagoon. Three of the east side drainages discharge to Pine Gulch Creek north of the lagoon, but about a dozen others discharge directly to the east side of the lagoon.

Figure 3-2 shows historical flows measured at a USGS monitoring station at Pine Gulch Creek, operated between June 1967 and September 1970. Although the data shown in

3-1 Watershed Boundaries and Surface Features

3-2 Daily Average Flows in Pine Gulch Creek (1967-1970) the figure represent only a brief period of time, it can be seen that flows varied in magnitude over a wide range during the period. The total annual discharge from Pine Gulch Creek from October 1, 1967 to the end of September 1968 (the 1968 water year) was 3,670 acre-feet. During the following water year, the total discharge was 12,110 acre-feet. The total inflow during the 1970 water year was 14,080 acre-feet. The total annual discharge from Morse Creek in 1968 and 1969 was just 159 acre-feet and 813 acre-feet, respectively (Ritter 1973). Since November 1998, the US Geological Survey has collected water quality data at a point about 0.4 miles upstream from the mouth of Pine Gulch Creek. Samples are collected about every two months and analyzed for a range of inorganic parameters, including suspended sediment, as part of a study of water quality in coastal streams. However, only the instantaneous stream discharge (at the time of sampling) is measured, and there is no recording discharge gage.

Although the stream discharge record for Pine Gulch Creek is extremely brief, the pattern of runoff from other nearby coastal watersheds that have been gaged for longer periods of time can provide insights into the pattern of runoff that has occurred in Pine Gulch Creek over a longer period of time. For example, Figure 3-3 shows the average daily discharge in Walker Creek, near Tomales, from 1959 to 1984, and for Lagunitas Creek, near Point Reyes, from 1974 to 1997. Although the magnitude of the discharge differs due to the different sizes of the watersheds, the general patterns of stream discharge shown in each of these hydrographs are similar to each other, and similar to the discharge in Pine Gulch Creek for corresponding time periods.

3.2.3 Circulation and Tidal Flows

Elevation Datums

Historical changes in water depth and land elevation figure prominently in the discussion of sedimentation and hydraulics in Bolinas Lagoon. It is important to keep in mind that a number of different elevation datums (or bases for measurement) have been used in studies of the lagoon. The most commonly used land elevation datum in the US is the National Geodetic Vertical Datum (NGVD) of 1929. This is the land datum typically used on US Geological Survey topographic maps, and is the datum used to calculate habitats in the lagoon. It is commonly referred to as mean sea level, because it was based on the average of the mean tide levels at selected locations. It has been replaced, for some applications, by the more precise North American Vertical Datum (NAVD) of 1988. Navigational charts, however, typically reference mean lower low water, or MLLW, which is the average of the lowest daily tidal stands. The shoreline on USGS topographic maps and on navigational charts typically represents MLLW, and underwater depths are typically reported as depths below MLLW. The relationship between tidal averages and land elevation datums varies locally, and tidal averages reported in different historical documents may vary widely from each other. Since bathymetric data, or soundings, are typically reported relative to tidal averages, such as MLLW, this variability makes it difficult to accurately interpret historical water depth information.

3-3 Daily Average Flows in Other Watersheds Near Bolinas Lagoon (1959-1997)

Table 3-1 presents the relation between the NGVD and NAVD land elevation datums and the respective tidal averages at gages in the Presidio in San Francisco Bay and at Point Reyes. In this report, if not otherwise noted, elevations above and below water are referenced to the 1929 NGVD, and the term mean sea level or MSL is assumed to be equivalent to NGVD. A detailed discussion of elevation and tidal references that have historically been used as the basis for depths and elevations reported for Bolinas Lagoon is presented in Bergquist's (1978) study of the depositional history of Bolinas Lagoon.

Table 3-1
Comparison of Tidal Averages and Land Elevation Datums (1929 NGVD and 1988 NAVD)

Description	SF Presidio Elevation relative to NGVD (ft)	Bolinas Bay NGVD (estimated)	Pt. Reyes, Drakes Bay relative to NGVD (ft)
Highest Observed Water Level	5.74		5.82
Mean Higher High Water (MHHW)	2.70		2.92
Mean High Water (MHW)	2.10		2.26
Mean Tide Level (MTL)	0.05		0.30
Mean Sea Level (MSL)	0.00	0.3877	0.00
National Geodetic Vertical Datum (NGVD)	0.00	0.3877	0.00
Mean Low Water (MLW)	-2.00		-1.67
North American Vertical Datum-1988 (NAVD)	-2.99		-2.61
Mean Lower Low Water (MLLW)	-3.13		-2.85
Lowest Observed Water Level	-5.80		-5.33

Source: Bergquist 1978

Lagoon Configuration and Bathymetry

Bolinas Lagoon covers an area of about 1,100 acres at mean high water (MHW). There are two main channels within the lagoon: Bolinas Channel and the Main Channel. Bolinas Channel extends between Francisco Mesa in Bolinas and Kent Island. The Main Channel follows a course eastward between the channel inlet and Kent Island and then turns north and generally hugs the east shore of the lagoon toward the Upper Basin. The Upper Basin, previously connected to the Lagoon, lies north of the delta of Pine Gulch Creek. Sediment deposition on the delta prevents the Upper Basin from draining via the Bolinas Channel.

Figure 3-4 shows the evolution of Bolinas Lagoon between 1854 and 1969, and Figure 3-5 shows the current configuration of the lagoon. The lagoon morphology, or functional configuration, has been influenced by a number of geologic and hydrologic factors, but probably the most important factors are changes in sea level, uplift and subsidence related to movement on the San Andreas Fault, erosion and sediment transport in the watershed, and wave and tidal action. Superimposed on these natural

3-4 Historic Change in Configuration of Bolinas Lagoon (1854-1969)

3-5 Current Configuration of Bolinas Lagoon processes are human actions that influence the shape of the lagoon, including dredging and filling, upland land practices and shoreline erosion protection. These processes occur at different rates, with different cycles of periodicity, and with different degrees of predictability. The ways in which these processes overlap determines the shape and depth of the lagoon. During the past 5,000 years, sea level has been rising at an average rate of about one-half foot per century. Rising sea levels invaded the rift valley of the San Andreas Fault, forming a deep tidal inlet. As it did so, counter-clockwise longshore currents in Bolinas Bay created a sand spit in the shallow waters across the mouth of the inlet. The rift valley is a zone in which the land tends to subside due to movement along the San Andreas Fault. The subsidence occurs episodically. The 1906 earthquake, for example, caused the lagoon east of the active trace of the fault to subside about one foot. Based on evidence from sediment cores, the combination of subsidence and sea level rise was approximately equal to the rate at which sediment accumulated in the lagoon until about 1849.

In addition to natural processes that played a role in the configuration of the lagoon, human activities are also suspected to have helped shape the lagoon (Ritter 1973). Munro-Fraser estimated that about 15,000,000 board feet of lumber was cut in the immediate vicinity of Bolinas beginning in the year 1849. Munro-Fraser also noted that the same ships that could pass into Bolinas port in the mid-1800s were unable to by 1880 due to a decreasing water depth. In addition, decreasing water depth caused by siltation forced shipbuilders in the lagoon to move their operations three times before being discontinued entirely in the late 1870s (Munro-Fraser 1880). Quantitative data indicates that the lagoon, which had a high volume of 210 million cubic feet before 1849, decreased to a low volume of 90 million cubic feet by 1906 (Bergquist and Wahrhaftig 1993). More information about the effects on Bolinas Lagoon of historic human activities in the watershed are presented in the Bolinas Lagoon Watershed Study, provided in the technical appendix to this report.

Sediment Deposition and Change in Tidal Prism

The volume of water that flows in and out of the lagoon between tides is called the tidal prism. The size of the tidal prism is an important factor in maintaining sufficient tidal exchange to support many of the existing functions of the lagoon, including removing sediment, keeping the inlet channel open, and maintaining water quality.

Figure 3-6 shows the change in the tidal prism since the early 1800s. Prior to 1849, when European settlement of the watershed began in earnest, the tidal prism is believed to have been relatively stable, at about 210 million cubic feet (7.8 million cy). After 1849 it decreased at a rate of about 2 million cubic feet (74,000 cy) per year and reached a low point of about 90 million cubic feet in 1906. Subsidence from the 1906 earthquake abruptly increased the tidal prism to about 175 million cubic feet (6.5 million cy). Sedimentation continued, however. From the 1930s to the 1960s sedimentation resulted in the loss of tidal prism at a rate of about 0.7 million cubic feet (26,000 cy) per year. Since the 1960s, the rate of loss is believed to have doubled to about 1.4 million

3-6 Estimated Change in Tidal Prism of Bolinas Lagoon cubic feet (52,000 cy) per year. The tidal prism was estimated to be about 100 million cubic feet (3.7 million cy) in 1990 (Bergquist and Wahrhaftig 1993). (Throughout this document, units of volume are provided in both cubic feet and in acre-feet. Units of acre-feet are used preferentially when discussing larger volumes. One million cubic feet is approximately 23 acre-feet.)

In 1993, a causeway and dump in the southern end of the lagoon were removed. This directly increased the tidal prism by 248,000 cubic feet (9,200 cy) and led to an estimated increase in tidal prism of 435,000 cubic feet (16,000 cy) because of increased tidal circulation (MCOSD 1996).

A USGS study conducted between 1967 and 1970 (Ritter 1973) found that more sediment was carried out of the lagoon on outgoing tidal currents (ebb currents) than was carried in by incoming tidal currents (flood currents). However, the variability in the daily observations was high, suggesting that even if the measured values are highly accurate, the long-term sediment balance in the lagoon is unpredictable. The net rate of discharge of sediment from the lagoon was estimated at approximately 10,000 tons. This discharge rate has been calculated to have a volume of approximately 5.8 acre-feet per year (133 million cubic feet or 4.9 million cy) Ritter 1973).

Other sources of sediment inflow to the lagoon estimated in the USGS study included sediment inflows from streams (primarily Pine Gulch Creek), wind-blown sand, and shore erosion. The total inflow of sediment from all streams was estimated to average about 4,900 tons (218 acre-feet) per year. Nearly all of this sediment comes from Pine Gulch Creek. For example, the sediment load from Morses Creek averages about 34 tons per year (Ritter 1973). Average rates may be misleading, however. The USGS study showed that the rate of sediment inflow varies considerably with the rate of discharge. For the 1968 water year, when stream discharge was relatively low, the total annual suspended sediment inflow from Pine Gulch Creek was estimated to be about 383 tons. In 1969, the suspended sediment load was 7,580 tons. Nearly half of the sediment inflow in 1969 (about 3,430 tons) was carried by runoff from one storm occurring on December 28, 1969, when the daily discharge was 320 cubic feet per second (cfs). A glance at Figures 3-7A and 3-7B suggests that sediment loading from stream inflow is very unevenly distributed over time and that Pine Gulch Creek may become a significant source of sediment loading in some wet years.

Figure 3-7A shows a graph of daily suspended sediment loads plotted against Pine Gulch Creek discharges based on data reported by the USGS (Ritter 1973). Daily sediment loads to Bolinas Lagoon can be estimated from the discharge measured at the Pine Gulch Creek gage. Using this procedure, the daily sediment loads were estimated for the period from June 1967 through September 1969 (Figure 3-7B). Unfortunately, the relationship between stream flow and sediment loading at higher stream flows is not known. If the equation developed for the relationship between discharge and sediment

3-7A and B Estimated Suspended Sediment Loading to Bolinas Lagoon From Pine Gulch Creek (1968-1969) loading is applied to the stream flows recorded in 1970 (Figure 3-2), the total sediment load for 1970 is calculated to be about 175,000 tons, or about 25 times more than the loading estimated by the USGS for 1969.

What happens to the sediment when it enters Bolinas Lagoon from Pine Gulch Creek depends mainly on the tidal elevation and the rate of stream discharge. The tidal elevation determines the location of the mouth of Pine Gulch Creek. At lower tidal stands, the creek discharges further along its delta, and more of the sediment load will be deposited further toward the east side of the lagoon. When the tide is high, the sediment enters the lagoon further to the west and disperses over a wider area of the delta. Higher stream flows not only carry more sediment but also larger sized sediment particles. The larger sediment particles are more likely to remain in the lagoon, while fine-grained particles remain suspended and can be carried out of the lagoon on ebb currents.

Other sources of sediment loading to the lagoon are probably not as significant as tidal inflow and stream inflow. The USGS study concluded that erosion from the lagoon side of the Stinson Beach sand spit contributes an average of about 1,500 tons (0.9 acre-feet) of sediment per year, and wind-blown sand accounts for about 40,000 tons of sediment (23.2 acre-feet) per year. The estimated quantity of wind-blown sand entering the lagoon is nearly 10 times the average rate of sediment estimated to enter the lagoon from streams. According to the USGS, however:

> That value probably is high because houses and fences may interrupt sand movements. Also, the general absence of drifting sand on access roads suggests that sand movement may not be great. However, local residents affirm that quantities of sand are moved across the spit by winds (Ritter 1973).

Based on these observations and estimates by other methods, it was concluded that the rate of sediment accumulation during the period from about 1939 to 1969 was about 11 to 21 acre-feet per year, representing an average rate of filling of about 0.5 to 1.0 feet per year. Extrapolating these results to the future, it was concluded that the lagoon would fill to the elevation of mean sea level within 90 to 160 years (Ritter 1973). However, as noted above, this prediction is sensitive to errors in measurement and assumptions about the rates at which sediment enters the lagoon.

The Corps evaluated annual sediment infilling rates and changes in lagoon volume based on bathymetric surveys conducted in 1968, 1978, 1988, and 1998 (Corps 1999a). The results of this analysis are shown on Figure 3-8, which shows the change in volume of the lagoon over time. Figure 3-8A shows the change in volume with elevation, and Figure 3-8B shows the average annual rate of loss of volume plotted at the midpoint between each survey date (1973, 1983, and 1993) for elevations corresponding to the typical spring and neap high tide elevations. (“Spring” tide is the tide cycle with the greatest difference between high and low tides during a lunar month; the “neap” tide is

3-8A and B Change in Tidal Prism based on Bathymetric Data 1968 to 1998 the tide cycle with the least difference between high and low tides. The typical spring and neap tides were defined as the 1998 average spring and neap high tides and were calculated to be 3.15 feet NGVD and 2.25 feet NGVD, respectively). The figure indicates that the infilling rate declined dramatically between 1968 and 1998. The lagoon filled at an average rate of about 0.71 million cubic feet per year between 1988 and 1998, which represents a rate of about 0.26 million cubic feet above the long-term average filling rate for the period before 1850 of about 0.45 million cubic feet per year.

The infilling rates described above are based on the assumption that infilling occurs at a constant rate during any 10-year period. However, this may not be accurate for short periods of observation if sedimentation rates are significantly influenced by high-runoff events in Pine Gulch Creek. If this is so, then it may be seen that the bathymetric surveys of 1968 and 1998 each followed a series of years in which there were high runoff events, while the 1978 and 1988 bathymetric surveys each followed a series of low runoff years. If sediment inflow and deposition is episodic and related to stream discharge, then surveys in 1968 and 1998 may have overestimated the average rate of infilling, while surveys in 1978 and 1988 may have underestimated the average rate. Since the surveys in 1978 and 1988 both were done at times of low runoff, the effect on the calculation of volume loss over time might be to underestimate the average loss represented by the points plotted on Figure 3-8B at 1983. If these points were plotted higher on the graph of average volume loss rate, the trend of the projected infill rate might be much steeper, possibly intersecting the estimated pre-development infill rate. Also, if the rate of sediment infilling in 1998 were much lower than in 1968, despite comparable runoff events occurring just prior to both the 1968 and 1998 surveys, this suggests that conditions in the watershed or the channel of Pine Gulch Creek may have changed, resulting in a reduction in erosion from the watershed.

Tidal Exchange and Channel Inlet Size

The entrance channel to the lagoon is an opening in the sand spit that is formed when water rushes in and out with flood and ebb currents, respectively, as the water elevation in the sea and inside the lagoon move toward equilibrium. The size of the entrance channel is related to the size of the tidal prism and the rate at which the sand spit beach is built up. The rate at which the sand spit beach is built up is a function of wave power and the availability of sediment. If there is no shortage of sediment, then it is simply a function of wave power. As the tide changes, the elevation inside the lagoon always lags somewhat behind the water elevation of the sea outside the lagoon. It is this difference in elevations that creates tidal inflow and outflow.

The smaller the channel opening, the faster the water must move through the entrance channel to equilibrate the elevations. The greater the velocity of the water through the entrance channel, the more sediment scouring can occur. The smaller the tidal prism, the less water needs to be moved through the entrance channel during a tidal cycle, and the lower the velocity will be through a channel of a given size. There is a dynamic relationship between all of these factors which results in a particular channel entrance configuration. At some point, if the tidal prism decreases enough, the sand spit will build up enough to close the inlet channel (Williams and Cuffe 1994). Historically, however, the ratio of tidal prism to wave power has been large enough to keep the inlet open.

Tidal exchange is much more important, overall, in keeping the inlet channel open than is freshwater flow out of the lagoon, although at times freshwater outflow may be significant. Maximum daily tidal flows through the inlet channel range from about 700 cfs to about 4,000 cfs. By contrast, the combined maximum daily freshwater inflow to the lagoon from streams, measured between 1967 and 1969, was about 500 cfs (Ritter 1973).

Hydrodynamics

The highest tidal current velocities occur in the tidal channels. Velocities tend to decrease further from the inlet channel. Ritter (1973) concluded that except in the North Basin and the extreme southeastern portion of the lagoon, nearly every part of the lagoon is subjected to tidal currents strong enough to transport sediment particles of the size most prevalent in the lagoon (silt size particles). However, more energy is required to erode particles once they have been deposited than is needed to transport particles once they are suspended. Most of the erosion in the lagoon takes place in the tidal channels, which remain inundated longest and where the velocities are highest. Only very fine-grained sediments tend to be deposited in the North Basin and southeastern area, where current velocities are lowest.

The pattern of distribution of current velocities and the magnitudes of the velocities vary depending on the height of the tides and on the tidal difference. At higher stands, the flow that passes through the inlet channel is distributed over a wider area of lagoon, so that velocities tend to be lower at higher stands. However, as the tide rises, the inlet channel widens, allowing more water to enter. Flood current inflows initially follow the courses of tidal channels and then become less constrained by the channels as the tide rises. During ebb currents initially move as sheet flow over the tidal flats and gradually become channelized as the tide turns. Wind-generated wave action can resuspend sediments in shallow areas, and the ebb currents then move the resuspended sediment toward the channels, where it is transported out of the lagoon.

3.2.4 Regulatory Considerations

The federal legislation governing the water quality aspects of the project is the Clean Water Act (CWA) as amended by the Water Quality Act of 1987. The objective of the CWA is “to restore and maintain the chemical, physical, and biological integrity of the Nation’s waters.” California’s Porter-Cologne Water Quality Control Act (Division 7 of the California Water Code) provides the basis for water quality regulation within the state. The lead agencies will coordinate with Corps regulatory staff to comply with the CWA and Corps policies.

As part of its responsibility to protect water quality, the Corps of Engineers' Section 404 (CWA) permit program regulates alteration of channels concerning "waters of the United States." The purpose of the Section 404 program is to insure that the physical, biological, and chemical quality of our nation's water is protected from irresponsible and unregulated discharges of dredged or fill material that could permanently alter or destroy these valuable resources. While the Corps does not require permits for its own activities, Corps policy is to comply with the provisions of the CWA in as much as they are applicable to the project. Section 404 of the CWA regulates the following activities:

- Depositing fill or dredged material in waters of the US or adjacent wetlands;
- Placing site fill for residential, commercial, or recreational developments;
- Constructing revetments, groins, breakwaters, levees, dams, dikes, and weirs; and
- Placing riprap and road fills.

Waters of the United States include essentially all surface waters, such as all navigable waters and their tributaries, all interstate waters and their tributaries, all wetlands adjacent to these waters, and all impoundments of these waters.

The State Water Resources Control Board (SWRCB) administers water rights, water pollution control, and water quality functions throughout the state, while the regional water quality control boards (RWQCBs) conduct planning, permitting, and enforcement activities; the project would be subject to review under RWQCB regulations. The project must comply with sections 401 and 402 of the CWA, which are under the jurisdiction of RWQCB Region 3 for this project.

Section 401 of the CWA, Water Quality Certification, gives the state and its RWQCBs broad authority to review proposed federal activities in or affecting a region's waters. The RWQCB can recommend to the state board that it grant, deny, or approve conditionally federal permits or licenses that may result in a discharge to waters of the United States.

The RWQCB also administers the National Pollution Discharge Elimination System (NPDES) stormwater permitting program for compliance with Section 402 of the CWA and Section 13370 of the Porter-Cologne Water Quality Control Act. Construction activities of five acres or more are subject to the permitting requirements of the NPDES General Permit for Discharges of Stormwater Runoff Associated with Construction Activity (General Construction Permit). The general construction permit requires a stormwater pollution prevention plan (SWPPP) to be implemented. The plan includes specifications for BMPs that would be implemented during project construction to control contamination of surface flows through measures to prevent the potential discharge of pollutants from the construction area. Additionally, the plan describes measures to prevent or control pollutants in runoff after construction is complete and identifies a plan to inspect and maintain these facilities or project elements.

3.3 Biological Resources

3.3.1 Introduction / Region of Influence

A comprehensive study of the ecosystem of Bolinas Lagoon has not been conducted since 1968 (Gustafson 1968). However, numerous focused studies and surveys have been conducted since that time. This section attempts to compile these focused studies and surveys into a broad ecosystem overview of the lagoon. Given the variety of techniques, focuses, and time periods with which these studies were conducted, it is important to note that some data gaps and discrepancies are inevitable.

Biological resource data were collected from various sources, including a search of available literature, the CDFG Natural Diversity Database (CNDDB), and conversations with local biologists. For the purpose of this report, biological resources are defined as all habitat communities and plant and animal species, including special status species, that inhabit Bolinas Lagoon and the surrounding watershed. Special status species are defined as those plant and animal species that are listed as threatened or endangered by the USFWS, NMFS, or CDFG.

Bolinas Lagoon was designated a Wetland of International Importance in 1998 by the USFWS under the Convention on Wetlands (Ramsar 2000; USFWS 1998). The lagoon attracts more than 35,000 birds annually (Shuford et al. 1989) and is a critical feeding ground and stopover for migratory birds on the Pacific Flyway. The tidal flats of Bolinas Lagoon serve as primary foraging habitat of many of the region's most abundant shorebirds (Page and Shuford 1999), primarily feeding on invertebrates, crustaceans, and small fish (Audubon Canyon Ranch 1996; Stenzel et al. 1983).

The ROI for biological resources includes Bolinas Lagoon, adjacent upland, and Bolinas Bay.

This section includes a general description of the habitat types and associated wildlife potentially occurring in and around Bolinas Lagoon. The following description is divided into Vegetation / Habitat, Wildlife, and Sensitive Species sections. These have been further divided into Estuarine (marine influenced) and Upland (including freshwater) areas.

3.3.2 Vegetation / Habitats

Much of the Bolinas watershed is composed of overlapping habitats (Figure 3-9), which are defined differently by the Corps than they are by MCOSD. This section breaks down the habitats into two general types, estuarine and upland. Estuarine habitat contains two further subdivisions, subtidal and intertidal. When exact measurements of habitat types are presented, habitat types are defined according to the Corps' definitions (Corps 1999c); however habitat types and associated plant and wildlife species are categorized according to their descriptions in the Bolinas Lagoon Management Plan (BLMP) (MCOSD 1996).

3-9 Habitat Types

For the purposes of this EIS/EIR, habitats are defined by the Corps as follows: Upland habitat is the area between 2.54 and 7.00 ft NGVD, intertidal habitat is from -1.36 to 2.54 feet NGVD, and subtidal habitat is anything below -1.36 ft NGVD.

Estuarine Habitats

Estuarine habitat, according to the Corps, can be further subdivided into two types of habitat: subtidal and intertidal. Subtidal habitat is the "area that remains submerged during a typical spring and neap tide." Intertidal habitat is defined as "the area that experiences wetting and drying during a one-month period with typical spring and neap tides" (Corps 1999c). (Spring and neap tides are fully defined in the discussion of hydrology in Section 3.2.)

Due to sedimentation, the amount of estuarine habitat in Bolinas Lagoon decreased substantially between 1968 and 1998. The subtidal acreage decreased by 28.8 percent, while the tidal acreage decreased by 4.8 percent. At the same time, the amount of upland habitat increased by 67.1 percent (Table 3-2) (Corps 1999c).

Table 3-2
Changes in Bolinas Lagoon Habitat Acreages Over Time

Year		Upland	Intertidal	Subtidal
1968 (Acres Measured)		156	876	213
1998 (Acres Measured)		238	849	146
2058 (Acres Predicted)		316	823	83
1968-1998	**Total Measured Change (acres)**	82	-27	-67
	% Measured Change	+53%	-3%	-31%
1968-2058	**Total Predicted Change (acres)**	160	-53	-130
	% Predicted Change	+103%	-6%	-61%

Source: Romanoski 2002b.

Based on modeling by the Corps, this trend is expected to continue. By the year 2058, the amount of subtidal habitat is expected to decrease by 63 percent compared to 1968, the amount of intertidal habitat is expected to decrease by 7 percent, and the amount of upland habitat is expected to increase by 99 percent.

Given that estuarine habitats have decreased and are expected to continue to decrease, and that subtidal and intertidal habitats are the major sources of primary production, loss of biodiversity is a concern for Bolinas Lagoon. Existing species present in both the estuarine and upland habitats of Bolinas Watershed are described below.

Subtidal Channels

The bottom substrate of subtidal habitat is characterized by soft mud and sand with a general lack of vascular plants; however, some of the deeper channels may contain plants such as eelgrass *(Zostera marina)* and maiden's hair *(Gracilaria* spp.*)* (Gustafson 1968). Eelgrass beds provide important habitat for a variety of invertebrate and vertebrate species. Currently, only one eelgrass bed is known to exist in Bolinas

Lagoon. This eelgrass bed is approximately 1200 square feet in area and is located in the Kent Island Channel (Moore 2000).

The water depth, salinity, and biological composition are strongly influenced by the tidal action of the Pacific Ocean. The most significant primary producers of oxygen in subtidal habitats are phytoplankton and benthic diatoms (microflora) that become suspended in the water column during daily tidal cycles. In addition to suspending organisms already present in the area, daily tidal actions introduce a substantial volume of ocean water that carries both passively suspended and actively swimming organisms (MCOSD 1996). As described earlier, the amount of subtidal habitat in Bolinas Lagoon is decreasing (Table 3-2).

Intertidal Mudflats

The intertidal mudflat is defined as habitat between mean low lower water (MLLW) and mean high water (MHW). The habitat varies with the tide from relatively lifeless shallow water to a large exposed mudflat (MCOSD 1996). The intertidal mudflat makes up the majority of the "tidal flat" area, defined earlier as "the area that experiences wetting and drying during a one-month period with typical spring and neap tides" (Corps 1999c). The remainder of the "tidal flat" consists of emergent saltmarsh, described in the next subsection.

Intertidal mudflats have a low abundance of vascular plants. Eelgrass historically occurred in this zone of Bolinas Lagoon (MCOSD 1996). The primary producers of the intertidal and subtidal areas are the macroalgae. Filamentous algae, including *Rhizoclonium* and *Enteromorpha*, have been found on vast areas of the tidal flat. In addition, *Ulva* is commonly found on the tidal flats and forms beds in the low tide zones (Stenzel et al. 1983). Detritus and benthic diatoms are also relatively abundant.

The total amount of intertidal mudflat acreage increased from 510 to 700 acres between 1968 and 1988. This habitat, however, is expected to decrease to 480 acres by 2008 (MCOSD 1996).

Emergent Salt Marsh

Emergent salt marsh is defined as the relatively narrow elevation band between MHW and extreme high water (EHW) (MCOSD 1996). According to this definition, emergent salt marsh includes the upper portion of "tidal flat" habitat, and the lower portion of "upland habitat" as defined by the Corps (Corps 1999c). Due to the overlap between tidal and upland habitats, acreage estimates cannot be made using the Corps' 1999 survey data (Corps 1999c).

As intertidal and subtidal habitat decreases, however, the total acreage of emergent salt marsh is expected to increase. According to the Bolinas Lagoon Management Plan:

> Emergent salt marsh occurs on the margins of Pine Gulch Creek delta, Kent Island, and in a narrow band along the fringes of the lagoon. . . Benthic algae

are an important element of the primary production of tidal marshes (Zedler 1982). Algal mats in tidal marshes consist of green algae, such as *Enteromorpha*, and bluegreen algae, such as *Microcoleus* and *Schizothrix*, and numerous species of diatoms.

Two dominant plant species are Pacific cordgrass (*Spartina foliosa*) and pickleweed (*Salicornia virginica*). Pickleweed occurs at higher elevations, approximately MHW to above tidal action where salt is still present in the soil. The lower areas are dominated by pickleweed interspersed with fleshy jaumea *(Jaumea carnosa)*, arrow grass *(Triglochin concinna)*, and sea lavender *(Limonium californicum).* Salt marsh dodder *(Cuscuta salina)* is a parasitic plant found in association with pickleweed and other salt marsh species at various elevations. Alkali heath *(Frankenia grandifolia)* can be found in the midrange elevation. Salt grass *(Distichlis spicata)* and saltbush *(Atriplex watsonii)* interspersed with rush *(Juncus* spp.*)* are dominant in the higher areas. Where freshwater flows into the lagoon, brackish marsh forms with species such as cattails *(Typha latifolia)* and bulrush *(Scirpus* spp.*)* (MCOSD 1996).

Freshwater and Upland Habitats

As the estuarine habitats transition from subtidal to tidal flats and tidal flats transition to emergent salt marsh due to the sedimentation process, the upland habitat is increasing at the margins of Bolinas Lagoon (Table 3-2).

In several areas within the lagoon and along its border, exposed sand substrate has created sandbars and beaches. Proceeding inland from the margins of the lagoon, the watershed consists of freshwater streams draining steep canyons. The streams are bordered by coniferous and mixed evergreen forest. Proceeding up the canyons toward the ridges, the vegetation cover transitions from forest to coastal scrub, chaparral, and annual prairie/grassland.

Sand Bars and Beaches

Stinson Beach sand spit and Kent Island are the major sandy areas of Bolinas Lagoon. Stinson Beach sand spit, which is located at the southern perimeter of the lagoon between the towns of Bolinas and Stinson Beach, provides a buffer from storm waves. Kent Island is located just north of the entrance of the lagoon.

Freshwater Marsh and Riparian Habitat

Many freshwater creeks drain the 16.7-square mile watershed of Bolinas Lagoon. Pine Gulch Creek is a perennial stream that drains half the watershed basin and enters the lagoon from the west. Eucalyptus trees are present in the riparian areas surrounding Pine Gulch Creek. Easkoot Creek, also a tributary to the lagoon, enters the lagoon at the south end. The eastern creeks, which drain steep canyons, are intermittent/ephemeral at lower elevations but are often perennial at higher elevations (i.e., are dry for part of the year only in the lower elevations) (Fong 2000a). Where the streams enter the lagoon, the mix of fresh and salt water supports brackish marsh.

Species such as cattails and bulrush are found in the brackish marsh areas of the lagoon (MCOSD 1996).

Riparian habitat is increasing along the margins of the lagoon. The creek deltas are expanding into the lagoon due to large annual sediment loads carried out of the channelized eastern tributaries. The expanding marshlands are creating suitable substrate for riparian vegetation to establish on the landward margins (MCOSD 1996). The montane riparian vegetation typically includes red alder *(Alnus rubra)* and willow *(Salix* spp.*)* (MCOSD 1996; Mayer and Laudenslayer 1988).

Upland Habitat - Forest, Scrub, and Grassland

Mixed evergreen forests extend up the canyons, gulches, and ridges of the lagoon watershed, grading into coastal scrub and annual/perennial grasslands on more exposed slopes. Some chaparral is present, although it occurs more commonly inland. In the shady canyon areas, coast redwood forests have reestablished themselves by sprouting from the stumps left from logging operations (Gustafson 1968). Coast live oak, Douglas fir, and bay make up the mixed evergreen woods on the ridges and canyon slopes (Rowntree 1973). The main species found in the coastal scrub include *Baccharis* sp. and California sagebrush *(Artemesia californica)* (Szychowski 1999).

3.3.3 Wildlife Communities

Numerous wildlife species occupy the estuarine and upland habitats found in the lagoon. While some species are residents, others are migrant visitors. Many of the species use multiple habitats. The descriptions below are intended to illustrate representative wildlife communities within the lagoon.

Estuarine Communities

Subtidal Wildlife

Phytoplankton and benthic diatoms support a highly productive and diverse wildlife community in the subtidal regions of the lagoon. These organisms provide the base of the subtidal food chain.

Marine zooplankton, such as copepods, cladocerans, ostracods, and arrow worms, are the primary grazers of phytoplankton. During certain times of year, zooplankton may be dominated by planktonic stages of benthic invertebrates, such as bryozoans, echinoderms, polychaetes, bivalves, and gastropods. The predominant deposit feeders in subtidal habitat are polychaetes (segmented worms) (MCOSD 1996).

The primary consumers of phytoplankton and zooplankton are filter feeders and fish. The filter feeding community consists mainly of clams and worms. Prime shellfish habitat once covered a large portion of the southern half of the lagoon but now is restricted to a narrow band of sandy substrate near the lagoon mouth. Little recent information is available on the distribution and abundance of clams or other macroinvertebrates in the lagoon. Primary consumer fish species include topsmelt

(Atherinops affinis), Pacific herring *(Clupea harengus pallasi)*, and Northern anchovy *(Engraulis mordax)*. Bird species, such as the northern shoveler *(Anas clypeata)*, also feed on phytoplankton and zooplankton (MCOSD 1996).

Ghost shrimp *(Callianasa californiensis)* are commonly found in the sandy substrata within the Lagoon. In addition to filter feeding on diatoms living on the lagoon floor by pumping water from the surface through its burrows, ghost shrimp feed on subsurface organic material. It is this ability to remove organic material from mud and sand that causes ghost shrimp to be an important member of the subtidal community. Without this activity, organic debris would quickly accumulate, depleting surface oxygen, and causing anaerobic sulfur bacteria to eventually bloom (MCOSD 1996).

Fish and bird species dominate the secondary consumer community. The most common fish include the leopard shark *(Triakis semifasciata)*, bat ray *(Myliobates californica)*, several species of flatfish, and surfperch. Bird species, including herons and egrets, commonly forage in the shallow subtidal regions. For instance, herring, smelt, and surfperch are important prey for birds, such as grebes, cormorants *(Phalacrocorax* spp.*)*, ospreys *(Pandion haliaetus)*, herons, egrets, and terns *(Sterna* spp.*)* that are found in the lagoon (MCOSD 1996). Brown pelicans *(Pelecanus occidentalis)* feed in the lagoon for pelagic fish species, such as northern anchovy, and topsmelt. Terns generally feed on the smaller fish found near the surface, such as topsmelt and northern anchovy (MCOSD 1996).

Numerous other species use the subtidal areas. Other common fish species found in the subtidal open water habitat at Bolinas Lagoon are surf smelt *(Hypomesus pretiosus)*, arrow goby *(Clevlandia ios)*, shiner surfperch *(Cymatogaster aggregata)*, and English sole *(Parophyrus vetulis)*. The CDFG has sampled fish and invertebrate species in Bolinas Lagoon on several occasions between 1994 and 1998. Sampling gear used during these surveys includes beach seine, otter trawl nets, and crab traps (CDFG 2000c).

One important result of the CDFG sampling surveys has been the capture of larval Pacific herring and juvenile California halibut *(Paralichthys californicus)*. This indicates that Bolinas Lagoon provides breeding habitat for herring and juvenile rearing habitat for halibut. California halibut is an important sport fishing species, and both species are considered important commercially (CDFG 2000b).

Harbor seals *(Phoca vitulina richardsi)* use the main channel to enter and exit the lagoon and access favored haul-out and pupping sites, but it is not known to what extent they forage within the lagoon (see special status species section).

Intertidal Wildlife

The soft substrate of the intertidal mudflat makes respiration, acquisition of food, and location of attachment sites challenging for invertebrates. Consequently, a rather specialized invertebrate community has evolved in the intertidal areas (Ricketts and Calvin 1968).

The most recent biological surveys of the intertidal regions in the lagoon were presented in the BLMP (MCOSD 1996). Benthic meiofauna play a significant role in the grazing and processing of primary production by benthic diatoms. Crabs, particularly the green shore crab *(Hemigrapsus oregonensis)*, are important grazers on the mudflat. The green shore crab feeds mainly on diatoms and green algae. On the higher intertidal mudflats, the California horn snail *(Cerethidia californica)* is a dominant grazer, feeding on fine organic detritus and microorganisms occurring at the mud surface.

Fish that inhabit intertidal flats include gobies and sculpin, and species such as sharks and rays move from the subtidal areas into flooded tidal flats to forage on the abundant benthic invertebrates. Some small, channel-dwelling fish species (e.g., sculpin) are prey for shorebirds (egrets, herons, and kingfishers) (Stenzel et al. 1983). Topsmelt and jacksmelt *(Atherinopsis californiensis)* enter on rising tides and are taken by osprey.

A distinctive feature of the intertidal mudflat is the abundance of shorebirds. The most numerous are the dunlin *(Calidris alpina)*, least and western sandpiper *(C. minutilla* and *C. mauri)*, marbled godwit *(Limosa fedoa)*, willet *(Catoptrophorus semipalmatus)*, and American avocet *(Recurvirostra americana)*. Dowitchers *(Limnodromus* sp.*)*, like other "surface" feeding shorebirds, are primarily confined to tidally exposed portions of mudflat and feed on small invertebrates on and just below the surface of the mud. The western sandpiper is a common migrant occurring in flocks of up to 30,000. American Avocets have strongly upcurved bills that allow them to forage in shallow water channels, low marsh, and on mudflats. Polychaetes and amphipods are the most important prey species for Bolinas Lagoon shorebirds (Stenzel et al 1983). They are found in the diet of nearly all lagoon species except long-billed curlew *(Numenius americanus)*, which tend to feed on large burrow-dwelling prey such as mud shrimp, ghost shrimp, and mud crab (Stenzel et al. 1976). Other important prey species include small crustaceans, such as ostracods, cumaceans, and copepods (Stenzel et al. 1983).

Some nonnative invertebrate species inhabit the intertidal flats and serve as prey for shorebirds. The impacts of invasive species, including the european green crab *(Carcinus maenas)*, on the Bolinas lagoon ecosystem may be important, as introduced species are thought to directly affect native populations (UCCE 2000).

Herons and egrets take fish and invertebrates in the intertidal flats but may also forage extensively in salt marsh and upland areas. The American peregrine falcon *(Falco peregrinus)* is listed as endangered by the CDFG. Peregrines take shorebirds and waterfowl in open water and intertidal mudflat habitats. Due to propagation measures, peregrine falcons have become year long residents, with migrating falcons greatly increasing the local population in the winter and spring (Stallcup 2001). The peregrines are known to forage on a variety of bird species and rodents along the shoreline and exposed mudflats (MCOSD 1996).

Emergent Saltmarsh Wildlife

Emergent saltmarsh provides less important invertebrate habitat than the adjacent subtidal and intertidal areas (MCOSD 1996). The invertebrate community consists of mainly benthic and epibenthic fauna. Molluscan communities are usually dominated by epifaunal surface feeders, such as the horn snail, which are important grazers on marsh algal mats (MCOSD 1996).

As presented in the 1996 BLMP,

> fish species likely to inhabit tidal marsh and channels include topsmelt, shiner surfperch, staghorn sculpin *(Leptocottus armatus)*, and longjaw mudsucker *(Gillichthys mirabilis)*. Fish using tidal marsh and channel employ two general strategies. Relatively efficient swimmers such as topsmelt and shiner surfperch move into intertidal habitats on incoming tides to feed, and move out on outgoing tides to avoid becoming stranded. Benthic species such as staghorn sculpin and longjaw mudsucker remain in tidal channels in the salt marsh habitat and retreat into burrows and depressions when the tide goes out (MCOSD 1996).

Tidal channels provide a significant foraging area for piscivorous (fish eating) wading birds, such as herons and egrets. The snowy egret *(Egretta thula)* and great egret *(Casmerodius albus)* are resident species that rely on upland riparian habitats for nesting.

Raptors use the emergent saltmarsh as foraging habitat. Birds and mammals such as voles could occupy densely vegetated areas in the marsh (MCOSD 1996).

Freshwater and Upland Wildlife Communities

Sandbars and Beaches

Shorebirds, terns, gulls, and brown pelicans feed and rest on the offshore bars, and in the past western snowy plover *(Charadrius alexandrinus)* nested on the beach at the tip of the spit. This habitat serves as an important haul-out and pupping area for harbor seals (Allen 2000) (see discussion in special status species section).

Freshwater, Marsh, and Riparian

Riparian vegetation along Pine Gulch Creek provides habitat for invertebrates, reptiles, amphibians, birds, and mammals.

The freshwater streams and associated riparian areas support anadromous and freshwater fish and a diversity of bird species. Since the eastern creeks are dry in the summer and drain steep canyons, they provide accessible habitat in a limited range, although striped bass (an invasive alien species) and remnant steelhead populations have been observed (MCOSD 1996). There is a growing Steelhead trout *(Oncorhynchus mykiss)* population inhabiting Easkoot Creek. Juvenile steelhead have also been observed in the creeks of Audubon Canyon (Szychowski 1999). Historically, coho salmon *(O. kisutch)* spawned and reared in Pine Gulch and Easkoot creeks. This range has been diminished, and now only Pine Gulch Creek is known to contain coho (Ketchum 2001).

Pine Gulch Creek supports three freshwater species: threespine stickleback *(Gasterosteus aculeatus)*, prickly sculpin *(Cottus asper)*, and California roach *(Hesperoleucus symmetricus)* (MCOSD 1996). Since the late 1960s, use of Pine Gulch Creek by these more estuarine species has likely declined or been restricted downstream to the mouth of the creek (MCOSD 1996). Two anadromous species, steelhead and lamprey *(Lampetra* spp.*)*, were observed in Pine Gulch Creek during surveys conducted between 1994 and 1996 (CDFG 2000b).

A dense tangle of riparian vegetation dominated by red alder and willow has been used by migrant land birds. Bird use of this area includes species never before recorded in California. These include sulphur-bellied flycatcher *(Myiodynastes luteiventris)*, sedge wren *(Cistothorus platensis)*, yellow warbler *(Dendroica petechia)*, and yellow-breasted chat *(Icteria virens)*, as well as rare transient species, such as long-eared owl *(Asio otus)*, mourning warbler *(Oporornis philadelphia)*, and dusky-capped flycatcher *(Myiarchus tuberculifer)* (MCOSD 1996). The riparian habitat in the PGC Delta, which developed during the second half of the twentieth century, is used primarily as a migrant stop from August to October, while deciduous trees still have leaves. It also is used as spring breeding habitat and migrant roost cover for several rare species, including green heron *(Butorides virescens)*, red-shouldered hawk *(Buteo lineatus)*, long-eared owl, yellow warbler, and yellow-breasted chat (MCOSD 1996). The state threatened California black rail *(Laterallus jamaicensis)* has been identified frequently at PGC Delta and is thought to be a year-round resident (Shuford 1989).

Upland Forest, Scrub, and Grasslands

Large wading birds depend upon the redwood habitat adjacent to the lagoon. As many as 150 pairs of herons and egrets have nested in the redwood canyon at Audubon Canyon Ranch (Pratt 1983), and 10 pairs of herons nest in trees near Francisco Mesa in Bolinas (MCOSD 1996). Numbers of nesting herons and egrets have fallen in recent years, down to approximately 85 nests. Some of this decrease is likely the result of predation by ravens (Shinske 1996). In the past 15 years, black-crowned night herons *(Nycticorax nycticorax)* have been sighted in the lagoon area, although reliable counts of the species have not been obtained (Stenzel 2000). More recently, black-crowned night herons have also been sighted in the cypress trees along the edge of Francisco Mesa (MCOSD 1996), while small numbers have been found nesting in McKennan Gulch (Stenzel 2000). Wintering monarch butterflies *(Danus plexippus)* roost in trees and shrubs in the vicinity of the lagoon (MCOSD 1996).

3.3.4 Special Status Species

Special status species are defined as those plant and animal species that are listed as threatened, endangered, or of special concern by the USFWS, NMFS, or CDFG, including those species proposed for federal or state listing. Plants listed by the CNPS also are included (Table 3-3, Figure 3-10).

Table 3-3
Special Status Species Potentially Occurring in Bolinas Lagoon

Scientific Name	Common Name	Federal/ State/CNPS Listing	Habitat	Likelihood of Occurrence Confirmed (C) / Potential (P)
Plants				
Alopecurus aequalis var. *sonomensis*	Sonoma alopecurus	E/-/-	Freshwater marsh, riparian scrub	P
Arctostaphylos hookeri ssp. *Montana*	Mt. Tamalpais manzanita	SC/-/1B	Serpentine slopes in chaparral and grassland	P
Arctostaphylos virgata	Marin manzanita	-/-/1B	Douglas fir forest	C
Boschniakia hookeri	Small groundcone	-/-/2	Open woods, shrubby places	P
Calamagrostis crassiglumis	Thurber's reed grass	SC/-/2	Coastal scrub, freshwater marsh	P
Castilleja affinis ssp. *neglecta*	Tiburon paintbrush	E/T/1B	Valley and foothill sites, rocky serpentine sites	P
Ceanothus masonii	Mason's ceanothus	SC/-/1B	Chaparral	P
Chorizanthe cuspidata var. *cuspidata*	San Francisco Bay spineflower	SC/-/1B	Coastal bluff, scrub, dunes, prairie	P
Cirsium hydrophilum var. *vaseyi*	Mt. Tamalpais thistle	SC/-/1B	Serpentine seeps in upland forest or chaparral	P
Cordylanthus maritimus ssp. *palustris*	Point Reyes bird's beak	-/-/1B	Salt marsh	C
Dirca occidentalis	Western leatherwood	-/-/1B	Broadleaf upland forest, chaparral, closed-cone coniferous forest	P
Fritillaria affinis var. *tristulis*	Marin checker lily	-/-/1B	Coastal scrub	P
Grindelia hirsutula var. *maritima*	San Francisco gumplant	SC/-/-	Coastal bluff, sandy or serpentine slopes	P
Helianthella castanea	Diablo helianthella (rock rose)	SC*/-/-	Chaparral, coastal scrub, riparian woodland, valley and foothill grassland	P
Hesperolinon congestum	Marin western flax	T/T/1B	Serpentine chaparral, serpentine grassland	P
Horkelia marinensis	Point Reyes horkelia	SC/-/1B	Sandy flats and dunes near coast	P
H. tenuiloba	Thin-lobed horkelia	-/-/1B	Chaparral, coastal scrub	P
Lessingia micradenia var. *micradenia*	Tamalpais lessingia	SC/-/1B	Serpentine grassland, serpentine chaparral	P
Microcina tiburona	Tiburon micro-blind harvestman	SC/-/-	Open hilly grassland in areas of serpentine bedrock, near permanent springs	P
Microseris decipiens	Santa Cruz microseris	SC/-/1B	Coastal prairie, coastal scrub, forest, chaparral	P
Navarretia rosulata	Marin County navarretia	-/-/1B	Closed-cone coniferous, chaparral, serpentine	P
Pentachaeta bellidiflora	White-rayed pentachaeta	E*/E/1B	Valley and foothill grassland, Open dry rocky slopes and grassy areas	P
Pleuropogon hooverianus	North coast semaphore grass	SC/R/1B	Wet, grassy, shady areas, freshwater marsh, forests	P
Polygonum marinense	Marin knotweed	SC/-/3	Coastal marshes and brackish swamps	P
Sidalcea calycosa ssp. *Rhizomata*	Point Reyes checkerbloom	-/-/1B	Freshwater marsh	P

Scientific Name	Common Name	Federal/ State/CNPS Listing	Habitat	Likelihood of Occurrence Confirmed (C) / Potential (P)
S. hickmanii ssp. *Viridis*	Marin checkerbloom	SC/-/1B	Serpentine chaparral	C
Streptanthus batrachopus	Tamalpais jewel-flower	SC/-/1B	Coniferous forest, chaparral	P

Table 3-3
Special Status Species Potentially Occurring in Bolinas Lagoon *(continued)*

Scientific Name	Common Name	Federal/ State/CNPS Listing	Habitat	Likelihood of Occurrence Confirmed (C) / Potential (P)
S. glandulosus ssp. *pulchellus*	Mt. Tamalpais jewel-flower	SC/-/1B	Serpentine slopes in chaparral and grassland	P
Streptanthus niger	Tiburon jewel-flower	E/E/1B	Valley and foothill grassland	P
Trifolium amoenum	Showy Indian clover	E*/-/1B	Grassland, coastal bluff scrub, serpentine	C
Triphysaria floribunda	San Francisco owl's-clover	SC/-/1B	Coastal prairie, serpentine and non-serpentine substrate	P
Invertebrates				
Adela oplerella	Opler's longhorn moth	SC/-/-	Inner coast ranges in Marin to Oakland	P
Caecidotea tomalensis	Tomales isopod	SC/-/-	Freshwater ponds, streams	C
Cicindela hiricollis gravida	Sandy beach tiger beetle	SC/-/-	Along nonbrackish areas of coast	P
Danus plexippus	Monarch butterfly	-/-/-	Wind-protected tree groves (eucalyptus, Monterey pine, cypress) with nectar and water sources nearby	C
Hydrochara rickseckeri	Ricksecker's water scavenger beetle	SC/-/-	Aquatic	C
Incisalia mossii	Marin elfin butterfly	SC/-/-	Rocky outcrops, woody canyons, cliffs	P
Speyeria zerene myrtleae	Myrtle's silverspot butterfly	E/-/-	Coastal dunes, coastal scrub, coastal grassland	P
Fish				
Eucyclogobius newberryi	Tidewater goby	E/-/-	Shallow lagoons and lower stream reaches	P
Lampetra tridentata	Pacific (river) lamprey	SC/-/-	Young: Cool, flowing, freshwater and backwater; Adults: bay and ocean water	P
Oncorhynchus kisutch	Coho salmon	T/E/-	Covered, cool streams, gravel beds	P
O. s kisutch	Critical habitat, coho salmon, central California coast	T/-/-	Covered, cool streams, gravel beds	P
O. mykiss	Steelhead trout	T/-/-	Anadromous, covered cool streams, gravel beds	C
Amphibians/Reptiles				
Clemmys marmorata marmorata	Northwestern pond turtle	SC/-/-	Near permanent water in a variety of habitats	P
Phrynosoma coronatum frontale	California horned lizard	SC/-/-	Lowlands along sandy washes with scattered low bushes	P
Rana aurora aurora	Northern red-legged frog	SC/-/-	Humid forests, woodlands, grasslands, and streamsides	P

Table 3-3
Special Status Species Potentially Occurring in Bolinas Lagoon *(continued)*

Scientific Name	Common Name	Federal/ State/CNPS Listing	Habitat	Likelihood of Occurrence Confirmed (C) / Potential (P)
R. aurora draytonii	California red-legged frog	T/-/-	Foothills/lowlands near permanent source of deep water with dense, shrubby, riparian vegetation	C
R. boylii	Foothill yellow-legged frog	SC/-/-	Partly shaded shallow streams and riffles with rocky substrate	P
Birds				
Agelius tricolor	Tricolored blackbird	SC/-/-	Freshwater marsh, tules	P
Amphispiza belli belli	Bell's sage sparrow	SC/-/-	Chaparral and scrub habitats	P
Botarus lentiginosus	American bittern	SC/-/-	Fresh and salt emergent wetlands	C
Brachyramphus marmoratus	Marbled murrelet	T/-/-	Near-shore feeder, nests along coastline	P
B. marmoratus	Marbled murrelet, critical habitat	T/-/-	Coastal waters, tide rip, bays, mountains; nests exclusively in old growth forest	P
Branta canadensis leucopareaia	Aleutian Canada goose	T/-/-	Winters on lakes and inland prairies, forages on natural/cultivated grain pastures	C
Buteo regalis	Ferruginous hawk	SC/-/-	Open grasslands, sparse shrub; nests on elevated structures	P
Charadrius alexandrinus nivosus	Western snowy plover	T/-/-	Sand spits/beaches	C
Chlidonias niger	Black tern	SC/-/-	Coastal lagoons and estuaries during migration	C
Circus cyaneus	Northern harrier	-/-/-	Emergent marsh	C
Cypseloides niger	Black swift	SC/-/-	Canyon cliffs, sea bluffs	C
Falco peregrinus anatum	American peregrine falcon	D/-/-	Breeds near wetlands or bodies of water on high cliffs, dunes, etc.	C
Gavia immer	Common loon	SC/-/-	Shallow, marshy areas	C
Geothlypis trichas sinuosa	Saltmarsh common yellowthroat	SC/-/-	Fresh and salt marsh	C
Haliaetus leucocephalus	Bald eagle	T/-/-	Ocean shorelines, roosts in old growth trees	P
Histrionicus histrionicus	Harlequin duck	SC/-/-	Breeds on western slope of Sierra Nevada, nests on shores of swift, shallow rivers	C
Laterallus jamaicensis coturniculus	California black rail	-/T/-	Tidal marsh with pickleweed,, freshwater and brackish marsh	C
Numenius americanus	Long-billed curlew	SC/-/-	Coastal estuaries, open grasslands, croplands; nests in wet meadows	C
Nycticorax nycticorax	Black-crowned night heron	MB/-/-	Marshy spots	C
Oceanodroma homochroa	Ashy storm-petrel	SC/-/-	Colonial nester in offshore coastal islands	C
Pandion haliaetus	Osprey	-/-/-	Subtidal	C
Pelecanus occidentalis californicus	California brown pelican	E/-/-	Colonial nester on coastal islands, just beyond surf line	C
Rallus longirostris obsoletus	California clapper rail	E/E/-	Tidal salt marsh and brackish marsh	C
Strix occidentalis caurina	Northern Spotted Owl	T/-/-	Old growth forest	C
Mammals				

Table 3-3
Special Status Species Potentially Occurring in Bolinas Lagoon *(continued)*

Scientific Name	Common Name	Federal/ State/CNPS Listing	Habitat	Likelihood of Occurrence Confirmed (C) / Potential (P)
Aplodontia rufa phaea	Point Reyes Mountain beaver	SC/-/-	Springs, seepages, north facing slopes with sword ferns and thimbleberries	P
Corynorhinus townsendii townsendii	Townsend's (Pacific) western big-eared bat	SC/-/-	Buildings	P
Myotis evotis	Greater western mastiff-bat (long-eared myotis)	SC/-/-	All brush, woodland, and forest habitats, from sea level to 9,000 feet	P
M. yumanensis	Yuma myotis bat	SC/-/-	Forest and woodland with water over which to feed, buildings	P
Zapus trinotatus orarius	Point Reyes jumping mouse	SC/-/-	Riparian areas, grasslands, wet meadows	P

Sources: CDFG 1996, 1998, CDFG; MCOSD 1996; Pitelka 1979; Shuford 1989; Stenzel 2000; Szychowski 1999; USFWS 2000.

Notes:

Federal Status (USFWS)

E = Endangered
T = Threatened
C = Candidate (formerly C1)
MB = Migratory Bird
PE = Proposed endangered
PT = Proposed threatened
PX= Proposed Critical Habitat
SC = Species of Concern (formerly C2)
SCR = Species of Concern—recommended listing
(*) = Possibly extirpated from area
(**) = Possibly Extinct
D= Delisted

State Status (CDFG)

E = Endangered
T = Threatened
R = Rare
SC = California species of special concern
S* = Protected under CEQA

CNPS (California Native Plant Society) Status

List 1A = Presumed extinct in California
List 1B = Rare and endangered in California and elsewhere
List 3 = Need more information - a review list
List 4 = Limited distribution - a watch list

Anadromous Fishes

Anadromous salmonids pass through the lagoon en route to many of the creeks in the watershed. While steelhead trout are found in all the creeks that feed the lagoon (MCOSD 1996), they may not be able to grow to full size. This is because the majority of the streams in the watershed are dry during the summer, while a few are also affected by water diversions at Easkoot and Pine Gulch Creeks (Fong 2000b). Steelhead typically rear in freshwater for a full year before smolting (relocating to salt water). A recent 2-year study conducted on three streams in Audubon Canyon found only juvenile (young-of-the-year) steelhead trout (Szychowski 1999). Juvenile striped bass and coho salmon have not been seen in recent surveys; however, coho salmon were once common in Pine Gulch and Easkoot creeks (MCOSD 1996).

Since steelhead trout and coho salmon are listed as threatened under the federal Endangered Species Act, management decisions will have to consider impacts on these species.

Reptiles and Amphibians

California red-legged frogs *(Rana aurora draytonii)* have been observed in the vicinity of Bolinas Lagoon (Fong 2000a). Red-legged frogs require deep permanent sources of fresh water for breeding. As a result, they may occur in some of the tributaries and wetlands surrounding the lagoon.

3-10 Sensitive Species in Bolinas Lagoon and Watershed

Birds

Many special status bird species have been observed in the region (Table 3-3). A few of these species, such as the northern harrier *(Circus cyaneus)*, osprey, saltmarsh common yellowthroat *(Geothlypis trichas sinuosa)* and the western snowy plover, are likely to use the lagoon for breeding, roosting, and foraging. The western snowy plover, which depends on sandy areas for breeding, historically nested on the beach at the tip of the Stinson Beach sand spit (MCOSD 1996) and on the sand beach of Kent Island (Stenzel 2000). A greater sandplover *(Charadrius leschenaultii)*, the first of its kind to have been observed in the Western Hemisphere, has been sighted at the lagoon (Morlan 2001).

Sensitive Plant Communities

A majority of the special status plant species observed in the region exists in upland habitats. Many of these species grow in serpentine chaparral and serpentine grassland communities. These communities live in soils derived from serpentine rock, which is a metamorphic, magnesium silicate rock, often green in color. Since serpentine soils are often low in essential nutrients, high in toxic elements, and acidic or basic, they typically support specially adapted plants. Other special status plant species located in the uplands exist in coniferous forest and coastal scrub.

A few special status plants rely on estuarine and freshwater habitats like those found in the lagoon. Point Reyes bird's beak *(Cordylanthus maritimus* ssp. *palustris)* is a federal species of concern that exists in salt marsh habitat. Point Reyes checkerbloom *(Sidalcea calycosa* ssp. *rhizomata)*, which is listed by the California Native Plant Society as having 1B status, exists in freshwater marsh. Sonoma alopecurus *(Alopecurus aequalis var. sonomensis)*, a federal endangered species, depends on freshwater marsh and riparian scrub.

Harbor Seals

Harbor seals are present throughout the year in the Gulf of the Farallones, which includes the Bolinas Lagoon, and are estimated to comprise 20 percent of the California population (MCOSD 1996). Bolinas Lagoon and adjacent waters are important to GFNMS's harbor seal population. The population peaks in the lagoon during molt (May-June) after the pupping season, which corresponds with the seasonal declines at Double Point and Tomales Bay (MCOSD 1996).

Since 1970, the total population and the number of pups at Bolinas Lagoon has increased. Surveys by Point Reyes Bird Observatory between 1971 and 1976 found a maximum of 66 seals hauled-out in the lagoon, whereas 288 seals were observed in the lagoon in July 1996, and 322 were observed between March and July 1999 (MCOSD 1996; Allen 1999). The number of pups has increased from 12 pups in 1978-89; 40 in 1992; 28 in 1993; to 50 in 1999 (MCOSD 1996, Allen 1999).

The 1996 Bolinas Land Management Plan provides the following documentation of harbor seal activity in the lagoon:

Haul-out sites secure from disturbance are critical for harbor seal populations (Allen et al. 1984, 1989). Haul-out sites provide seals with resting, breeding, and nursery areas. These sites are used daily throughout the year and successively from year to year. The haul-out sites on Bolinas Lagoon have been Kent Island and Pickleweed Island with exposed sand bars along the main channel providing secondary sites. At Bolinas, harbor seals use haul-out sites primarily during daylight hours with peak numbers in early afternoon (Allen et al. 1984, 1989). During the breeding months, no relationship occurs between tide and number of animals hauled out (Allen et al. 1984), whereas during the non-breeding season more animals hauled out at low tide.

Harbor seals are opportunistic feeders and forage on shallow water estuarine and marine species of fish, cephalopods, and crustaceans. Many of their preferred prey species (e.g., jacksmelt, topsmelt, starry flounder *(Platichthys stellatus)*, and shiner surfperch) occur in Bolinas Lagoon, but no feeding studies have been conducted in the lagoon (MCOSD 1996).

The critical period for the harbor seal population at Bolinas Lagoon is during the spring and summer. This is because the seals pup between the months of March and June and molt during the month of July. The seals typically pup at haul-out sites between the mouth of the lagoon and Highway 1, and also along a 300 yard stretch where the Main Channel parallels Highway 1 (Allen 2000).

3.3.5 Regulatory Considerations

Endangered Species Act, 16 USC §§ 1531 – 1534

The ESA protects plant and animal species (and their habitats) that are listed as endangered and threatened. Species are listed as endangered if found to be in danger of extinction throughout all or a significant portion of their ranges; species are listed as threatened if they are likely to become endangered within the foreseeable future. The ESA also protects designated critical habitat for listed species, which are areas of physical or biological features essential to the conservation of the species and which may require special management considerations. The ESA requires federal agencies to consult with USFWS or NMFS, as applicable, before initiating any action that may affect a listed species.

California Endangered Species Act, Cal. Fish and Game Code 2070

The California Endangered Species Act (CESA) places the responsibility for maintaining a list of threatened and endangered species on the CDFG (Cal. Fish and Game Code 2070). The CDFG also maintains a list of candidate species that are under review for addition to either the list of endangered species or the list of threatened species. The CDFG also maintains lists of species of special concern, which serve as watch lists. Pursuant to the requirements of CESA, an agency reviewing a proposed project within its jurisdiction must determine whether any California-listed endangered or threatened species may be present in the project area and determine whether the proposed project will have a potentially significant impact on such species. In addition, CDFG encourages informal consultation on any proposed project that may affect a candidate species.

Magnuson-Stevens Fishery Conservation and Management Act (MSA), 16 USC § 1801 **et seq.**

The MSA applies to fisheries resources and fishing activities in federal waters that extend to 200 miles offshore. Under the MSA, there are eight Regional Fishery Management Councils, which prepare fishery management plans (FMP) for those fisheries that they determine require active federal management. After public hearings, revised FMPs are submitted to the Secretary of Commerce for approval. One of the major components of this act is the protection of areas deemed essential fish habitat (EFH) for species identified in FMPs. EFH is defined as those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. Federal agencies must consult with NMFS on proposed actions authorized, funded, or undertaken by the agency that may adversely affect EFH.

Fish and Wildlife Coordination Act and Implementing Regulations, 16 USC §§ 661 – 666c

Any federal agency that proposes to control or modify any body of water must first consult with the USFWS or NMFS, as appropriate, and with the head of the appropriate state agency exercising administration over the wildlife resources of the affected state.

Migratory Bird Treaty Act (MBTA), 16 USC § 703 **et seq.**

The MBTA is a federal statute that implements US treaties with several countries concerning the conservation and protection of migratory birds. The number of bird species covered by the MBTA is extensive and is listed at 50 CFR § 10.13. Further, the regulatory definition of migratory bird is broad and includes any mutation or hybrid of a listed species, as well as any part, egg, or nest of such bird (50 CFR § 10.12). Migratory birds are not necessarily federally listed endangered or threatened under the ESA. The MBTA, which is enforced by the USFWS, makes it unlawful "by any means or manner, to pursue, hunt, take, capture [or] kill" any migratory bird except as permitted by regulation. The applicable regulations prohibit the take, possession, import, export, transport, sale purchase, barter, or the offering of these activities, except as permitted by the implementing regulations.

Marin Countywide Plan

Relevant policies of the Marin Countywide Plan include:

> **Program EQ-2.43a**: Wetland Impact Mitigation. Development should be sited to avoid wetland areas so that the existing wetlands are preserved. The next priority would be to restore or enhance the wetland environment on-site, porvided that no net loss of wetlands occurs. Restoration of wetlands off-site should only be allowed when it has been demonstrated that on-site restoration

is not possible and there is no net loss of wetlands. For each acre of wetland lost, two acres shall be restored and should be of the same type of wetland habitat as the wetland which was lost.

Program EQ-2.43c: Criteria for Evaluating Projects. The following criteria shall be considered, when evaluating development projects which may impact wetland areas and should be incorporated into mitigation measures:

(a) No net losses shall occur in wetland acreage, functions and values...

3.4 GEOLOGY, SOILS, AND SEISMICITY

3.4.1 Introduction/Region of Influence

Bolinas Lagoon is in the California Coast Range physiographic province, which is characterized by northwest-trending mountain ranges that generally parallel the coast. The study area includes the watershed of Bolinas Lagoon and adjacent portions of Bolinas Bay. The watershed includes the portion of the Bolinas Peninsula that drains to Pine Gulch Creek on the west and a set of parallel drainages from Bolinas Ridge on the east. The watershed covers an area of approximately 16.7 square miles (Ritter 1973). The lagoon itself covers approximately 1.7 square miles (1,100 acres) (Bergquist 1978).

The ROI for the project includes the project site and surrounding land that would directly interact with or be influenced by project components.

3.4.2 Geology and Geomorphology

Physiographic Setting

The southern end of the peninsula, on which the town of Bolinas is situated, is a broad gently sloping marine terrace that ranges in elevation from 48 to 67 meters (157 to 220 feet) MSL. The terrace, called the Mesa, is an ancient wave-cut platform that has been uplifted. Around the outer edge of the peninsula is a shallow shelf of wave-cut shale rock called Duxbury Reef which extends 5000 feet in a southwestern direction into ocean tidal zone. The Bolinas Peninsula is divided by a northwest-trending ridge, called Stewart Point, which extends into the Point Reyes National Seashore, where it rises to elevations of more than 1,000 feet MSL. East of this ridge is the San Andreas Rift Zone, which contains the main drainage of Pine Gulch Creek.

The eastern boundary of the study area is Bolinas Ridge, an approximately 14-kilometer (8.75 mile) long northwest-trending feature that slopes from about 1,950 feet near the south end of Bolinas Lagoon to about 488 feet north of Tomales Bay.

Geology

Figure 3-11 is a regional geologic map showing the study area in relation to larger-scale geologic features. One of the most important geologic features affecting the formation of the lagoon is the San Andreas Fault, which runs from near the Gulf of California to Cape Mendocino. The San Andreas Fault represents the boundary between two plates of the earth's crust that have been moving in opposite directions at an average rate of several inches per year for approximately the past 15 million years or so. In the study area, several traces of the fault comprise a zone in which faulting has historically occurred. The fault zone is about 1.25 miles wide at the mouth of the lagoon and narrows to about 1,500 feet wide along the Rift Zone between Bolinas Lagoon and Tomales Bay.

3-11 Geology of the Bolinas Lagoon Area

The crust on the west side of the fault is moving north relative to the North American continent. The basement rocks that underlie the Bolinas Peninsula are similar to granitic rocks found in southern California. The granitic rocks are not exposed in the immediate vicinity of Bolinas Lagoon, but they are exposed further north on the Point Reyes Peninsula. At Bolinas the granitic rocks are overlain by younger sedimentary rocks. The basement rocks on the east side of the San Andreas Fault consist of an assemblage of oceanic crustal rocks similar to those that underlie most of Marin County and the San Francisco Bay Area. Together, these basement rocks are known as the Franciscan Complex. The Franciscan rocks are exposed in the study area, but in some places they are also overlain by younger sedimentary deposits.

The lagoon itself occupies a graben, a geological structure resulting from subsidence of the land that lies between traces of the San Andreas Fault. The most westerly trace, which marks the western edge of the San Andreas Fault Zone, is also the oldest. The San Andreas Graben Fault forms the eastern edge of the Fault Zone. The 1906 Trace of San Andreas Fault, that ruptured in the 1906 earthquake lies about midway between these two (Figure 3-12) (Wagner 1977; Bergquist 1979).

The oldest exposed rocks on the Bolinas Peninsula belong to the Upper Miocene age (7-9 million years old) Santa Cruz Mudstone. The Santa Cruz Mudstone is exposed on a large portion of the southern part of the Point Reyes National Seashore west of the San Andreas Fault (Clark and Brabb 1997). The Santa Cruz Mudstone is an olive-gray to pale yellow-brown silica-rich mudstone with thin to thick bedding, which contains thin concretions of carbonate. Locally, it contains thin sandstone beds with tar residues that have been chemically correlated with similar deposits exposed in the cliffs near Davenport in Santa Cruz County. The implication is that the Point Reyes Peninsula has moved northward along the San Andreas Fault about 70 miles relative to the North American continent during the past 10 million years (Stanley and Lillis 2000). The Santa Cruz Mudstone unconformably overlies the Upper Miocene Monterey Formation, which is exposed north of the Bolinas Peninsula in the upper portion of the watershed of Pine Gulch Creek, and elsewhere on the Point Reyes Peninsula.

The Santa Cruz Mudstone is highly fractured and crumbles easily. The bedding in these rocks is tilted down to the west at an angle of about 40 to 60 degrees. As a result, steep unstable slopes tend to form on the eastern uptilted side of the peninsula, such as along the west bank of Pine Gulch Creek.. Unstable cliffs tend to form where wave action attacks the foot of slopes in the Santa Cruz mudstone, such as along the cliffs facing Bolinas Bay south of the Peninsula. The south-facing cliffs of Bolinas Peninsula are estimated to be retreating at an average rate of about 0.3 to 0.6 meters (1 to 2 feet) per year (Wagner 1977).

Overlying the Santa Cruz Mudstone, on the east side of the older trace of the San Andreas Fault are massive blue siltstones, clays, buff-colored sandstone, and gravels of the Merced Formation. The Merced Formation is more than 90 meters (292 feet) thick

3-12 Principal Regional Active Faults

in the study area and forms cliffs along the west side of Bolinas Lagoon. The bedding in the Merced Formation slopes down to the east at an angle of between 5 and 35 degrees. The deposits are not very well consolidated and erode easily, making them susceptible to debris-flow landslides (Wagner 1977). The cliffs between Brighton Road and Wharf Road, on the Bolinas Peninsula opposite the Stinson Beach sand spit, are estimated to be retreating at a rate of about 0.5 meters (1.6 feet) per year (Wagner 1977).

Filling depressions in the Santa Cruz Mudstone on the Bolinas Mesa are relatively thin unconsolidated deposits of silt, sand, and gravel derived mainly from erosion of the Santa Cruz Mudstone. In some areas, these terrace deposits contain boulders of Franciscan rocks that must have originated from the slopes east of the San Andreas Fault. The terrace deposits were formed during the last Ice Age, less than about 2 million years ago, when the Mesa was partially submerged below sea level.

At about the same time the terrace deposits were formed, stream gravels derived mainly from Franciscan rocks, but also containing Monterey and Merced formation material, were being deposited. These older stream gravels, in a sandy matrix, have been named the "Older alluvium" and are common in former streambeds within, or immediately adjacent to, the San Andreas Fault Zone. These deposits are easily eroded.

The east side of the San Andreas Fault Zone is underlain by rocks that are quite distinct from those on the west side. While the rocks on the east side of the fault share some general characteristics, they represent a variety of materials that were scraped onto the North American continental plate as it slid beneath the Pacific plate near the end of the age of dinosaurs, more than 65 million years ago. In the study area, the Franciscan rocks consist of melange, a chaotic mixture of sandstone, greenstone, chert, and other rocks in a sheared clayey matrix (Clark et al. 1991; Wagner 1977). The matrix is weak subject to erosion and slope failure. Because the slopes east of the San Andreas Fault Zone tend to be steep, erosion is slow but they are prone to landsliding.

Recent unconsolidated deposits in the study area consist of landslide deposits, alluvium, beach sand, and Bay mud. The Stinson Beach sand spit, which is about 3 kilometers (1.9 miles) long and nearly connects the Bolinas Peninsula to the mainland, is composed of beach sand deposits. In the mid-1960s, the lagoon side of the spit was dredged in order to extend the land upon which houses were later constructed. Between this extension and the original spit, Seadrift Lagoon, an artificial lagoon, was created (Bergquist 1978). A narrow opening in the sand spit at the foot of the Bolinas Peninsula, about 50 meters (163 feet) wide, allows water to flow in and out of the lagoon with changing tides. Kent Island, located just inside the lagoon from the mouth, is a tidal delta composed of beach sand deposits and formed from changing tides that move sand in and out of the inlet.

Wagner (1977) described the deposits within Bolinas Lagoon as Bay Mud. Bay Mud is a mixture of silt, clay, sand, shells, and organic material of recent age. It is watersaturated and poorly-consolidated, with the consistency of jelly. Ritter found that the median grain size of lagoon sediment and the sediment on beaches along the Stinson Beach sand spit is in the fine sand range. A larger proportion of silts and clays were found in the extremities of the lagoon than in the center of the lagoon, while the coarsest sediment was found near the mouths of some of the east shore streams on the east shore. Based on circulation studies using a dye tracer, Ritter concluded that the southeast extremity of the lagoon, the upper basin (north of the Pine Gulch Creek delta), and the tidal flat north of Kent Island are areas of net sediment deposition in the lagoon. Elsewhere, he concluded that current velocities are sufficient to transport and to resuspend sediment.

Seismicity

The US Geological Survey (USGS) estimates that there is a 70 percent probability of at least one magnitude 6.7 or greater earthquake, capable of causing widespread damage, striking the San Francisco Bay region before 2030. For the North Coast South segment of the San Andreas Fault (the segment that crosses Bolinas Lagoon), the probability of a magnitude 6.7 quake is estimated to be 12 percent in the next 30 years (Working Group 1999). Figure 3-12 shows active faults in the greater San Francisco Bay area. Refer also to Figure 3-11.

The USGS estimates that there is a 30 percent probability that within the next 30 years an earthquake similar in magnitude to the 1906 earthquake will occur on the northern segment of the San Andreas Fault. The 1906 earthquake is likely to have been associated with both vertical and horizontal displacement. Vertical displacement along the 1906 trace of the fault was estimated to be about 30 to 35 centimeters (12 to 14 inches) (Bergquist 1978). Horizontal displacements in the area, measured after the earthquake, ranged from about 3.7 meters (12 feet) near Bolinas Lagoon to about 6.1 meters (19.8 feet) near Point Reyes Station (Wagner 1977). Under the Alquist-Priolo Earthquake Fault Zones Act of 1972, the California Division of Mines and Geology is charged with delineating zones along active faults in which construction of structures for human habitation should be discouraged. Such a fault-rupture hazard zone has been designated within the project area along the trace of the San Andreas Fault.

Slope Stability, Bearing Capacity, and Liquefaction Potential

The Franciscan melange east of the San Andreas Fault is locally variable in stability. Depending on soil structure, landsliding can be common on steep slopes, but where large blocks of rock occur within the melange, its stability can be increased locally.

On the Bolinas Peninsula the principal stability problem is undercutting and collapse of cliffs underlain by Monterey shale. The slopes adjacent to the floodplain of Pine Gulch Creek are classified in the two least stable slope categories. This includes areas in which the slopes are near the stability limits of the underlying materials, or areas in which active downslope movement (landslides or slope creep) is occurring.

Level areas classified as stable slopes may be underlain by unstable deposits as well. Areas on the floodplain and delta of Pine Gulch Creek, which are underlain by loose, sandy materials with a high water table, may be vulnerable to liquefaction in an earthquake.

3.4.3 Soils and Erosion

Soils on Bolinas Ridge are generally thin, derived from the Franciscan melange, and easily eroded when disturbed or exposed to rainfall. Soils derived from the Monterey Formation, on the west side of the San Andreas Fault, are much less stable and much more easily eroded (Ritter 1973). Appendix C contains a comprehensive list of soils found in the Bolinas watershed and their properties.

Soils on land adjacent to the Bolinas Lagoon, including most of the Bolinas Peninsula and most of the watershed on the eastern side of Bolinas Lagoon belong to the Cronkhite-Dipsea-Centissima group. These include deep to moderately deep soils on steep slopes. The soils are generally described as moderately well drained (Kashiwagi 1985). Soils on the central ridge of the Bolinas Peninsula, west of Pine Gulch Creek, belong to the Palomarin-Wittenber group. These are shallow, well drained soils on moderately steep upland slopes. Soils on upland portions of the watersheds of most of the creeks that drain the east side of the San Andreas Fault (north of Morses Creek) belong to the Maymen-Maymen group, which are described as shallow to moderately deep, excessively-drained soils on steep slopes. Many of the soils in upland areas are characterized by a high degree of susceptibility to erosion. Erosion increases when the vegetation cover is reduced, such as from grazing or logging. Soil erosion also increases where slopes fail or are cut and filled.

3.4.4 Regulatory Considerations

The proposed project is within unincorporated Marin County and is subject to policies and programs of the Marin Countywide Plan, the Local Coastal Plan, and the GFNMS. A detailed discussion of regulations and policies related to the project is presented in Section 3.7, Land Use, and is therefore not repeated here.

3.5 CULTURAL RESOURCES

3.5.1 Introduction/Region of Influence

This section includes a definition of cultural resources and a summary of the cultural background of the project area. Also included are discussions of known resources and previous investigations and brief descriptions of federal and state regulations that pertain to cultural resources.

Cultural resources include prehistoric resources, Native American resources, and historic resources. Prehistoric resources are physical properties resulting from human activities that predate written records and are generally identified as isolated finds or sites. Prehistoric resources can include village sites, temporary camps, lithic scatters, roasting pits/hearths, milling features, petroglyphs, rock features, and burials.

Native American resources are sites, areas, and materials important to Native Americans for religious, spiritual, or traditional reasons. These resources may include villages, burials, petroglyphs, rock features, or spring locations. Fundamental to Native American religions is the belief in the sacred character of physical places, such as mountain peaks, springs, or burials. Traditional rituals often prescribe the use of particular native plants, animals, or minerals. Therefore, activities that may affect sacred areas, their accessibility, or the availability of materials used in traditional practices are of primary concern.

Historic resources consist of physical properties, structures, or built items resulting from human activities that post-date written records. Historic resources can include archaeological remains and architectural structures. Historic archaeological site types include townsites, homesteads, agricultural or ranching features, mining-related features, refuse concentrations, and features or artifacts associated with early military use of the land. Historic architectural resources can include houses; cabins; barns; lighthouses; local structures, such as churches, post offices, and meeting halls; and early military structures, such as hangars, administration buildings, barracks, officers' quarters, warehouses, and guardhouses.

The ROI for cultural resources is the Bolinas Lagoon and adjacent upland, and Bolinas Bay.

3.5.2 Cultural Background

The cultural background for the project area can be separated into three broad categories. Precontact history describes events prior to European exploration and influence in the Americas. Ethnohistory represents information gleaned from ethnographic sources (including oral histories and anthropological and sociological studies) and historical accounts of Native American groups within the project area. History is generally post-contact information gathered from written documents from the time of early European exploration until today.

Precontact History

California

It is generally believed that human occupation of the West Coast dates back to at least 10,000 years before present (BP). Several sites around California are thought to have been occupied between 40,000 to 200,000 years BP; however, the reliability of the dating techniques used and the validity of the artifacts found in those sites remains highly controversial (Moratto 1984).

Archaeological evidence for occupation of California during the Holocene Epoch (10,000 years BP to present) is stronger. Early Holocene Period (12,000 to 8,000 years BP) sites are common throughout California, including several located around the Bay Area from Monterey to Bodega Bay. Hunter/gatherers during this period appear to have been attracted to lacustrine, marshland, and estuarine settings for the varied and abundant resources found there. Milling-related artifacts are lacking during this period, but the atlatl (spear-thrower) and dart are common. Heat-treating of lithic materials for tool manufacture is also evident. Fishing and hunting of large and small game appears to have occurred. Limited permanent settlements may have been established near large water sources, but a nomadic lifestyle appears to have been more common (Moratto 1984).

Milling of plant materials appears to have commenced during periods of occupation later in the Holocene Epoch. Milling-related artifacts first appear in sites dating to the Early Horizon Period (8,000 to 4,000 years BP). Hunting and gathering continued during this period but with greater reliance on vegetal foods. Mussels and oysters appear to also have been a staple. This gave way to greater consumption of shellfish in the Middle Horizon Period (4,000 to 2,000 years BP). Use of bone artifacts appears to have increased during this period, and baked-earth steaming ovens were developed. Occupation of permanent or semi-permanent villages occurred in this period, as did reoccupation of seasonal sites. During the Late Horizon Period (2,000 years BP to European Contact), settlement of villages increased, as did trade between different groups (Moratto 1984). During this period, regional subcultures are thought to have developed, each with their own geographical territory and language or dialect.

Marin County

Relatively few archaeological investigations have been undertaken in Marin County. The earliest occupations currently recognized are shell middens that date to approximately 3,000 years BP (Gerike et al. 1996). Other excavations have focused primarily on the protohistoric or historically recognized villages of Coast Miwok (Dietz 1976). Although little archaeological research has been undertaken in the area, existing archaeological sites could nonetheless become significant sources of cultural data.

Ethnohistory

The Coast Miwok territory centered in present day Marin County and extended north to Sonoma County and Bodega Bay. Shelters were conical-shaped and covered with grass. Villages included sweathouses and ceremonial chambers. Seines, rafts, and weirs were constructed from tule balsa for fishing, and intricate baskets were woven for household uses. Subsistence was based on hunting, fishing, and gathering. A variety of large and small mammals were hunted, and fish, eels, and shellfish were taken from the ocean, lakes, and rivers. Vegetal staples included acorns, seeds, and kelp. Groups were generally organized without political leaders, yet large villages had a non-hereditary chief (Kelly 1978). Although some reports indicate that upon death, the Miwok cremated the deceased by binding them to three long poles, then burning litter and all possessions together, recent archaeological evidence may suggest otherwise. One such example is the large number of human remains discovered in one location, indicating specific burial grounds, at the D Street site in the city of San Rafael.

While Coast Miwok populations were believed small even in the Precontact period, few Coast Miwok individuals survived the events of the 18th and 19th centuries in California. By the 1930s, only a handful of individuals with predominantly Coast Miwok ancestry were alive (Kelly 1978). The Coast Miwok tribe affiliated with the project area is the Federated Indians of Graton Rancheria. Listing over three hundred registered descendants, the tribe has recently gained federal recognition. Ethnohistorical records indicate that a Coast Miwok village called “Bauli-an” existed on the eastern shoreline of Bolinas Lagoon (Kelly 1978, Kroeber 1925).

History of Bolinas Lagoon

The Bolinas Land Use History, found in the Technical Appendices to this report, provides an extensive discussion of the history of the Bolinas Lagoon watershed since European settlement.

The Bolinas Lagoon was formed as a result of tectonic movements along the San Andreas Rift Valley before 7,700 years ago (Atwater 1978). A sand spit developed, isolating the lagoon waters from the larger Bolinas Bay. Bergquist (1978) determined that the depth and configuration of the lagoon remained in dynamic equilibrium until the early 1800s. Beginning in 1849, the slopes of the Bolinas watershed became a source for timber, particularly redwood. According to one historical account, these trees could measure up to 50 feet in circumference, or roughly 16 feet in diameter. The lumber was then milled at nearby Dogtown, and was used to build the rapidly expanding city of San Francisco. Mills were reported to generate nearly 15 million board-feet of lumber each year (Munro-Fraser 1880). The depth of the entry bar of the lagoon was measured as only 1 foot at low tide in 1854, and allowed for the use of only shallow draft vessels in the lagoon (Rowntree 1973). To transport lumber, embarcaderos or wharves were built in the lagoon, and lumber was transferred from shallow draft schooners to waiting heavier ships in Bolinas Bay. Lumber was also towed as rafts to San Francisco, presumably only during good weather (MCOSD 1996). Small, shallow-draft schooners were built near McKennan Gulch until 1870, but boat building and embarcadero activities were eventually rendered unfeasible due to siltation of the lagoon (Ritter 1973).

Lands harvested of timber along the steep slopes on the Bolinas Ridge were then converted to cattle grazing or agricultural uses. Butter, milk, and other commodities were produced near Bolinas Lagoon and transported to customers in San Francisco (Munro-Fraser 1880). Several mining operations were also active in the area by 1863 (Compas 1997). From the late 19th century until World War I, 22,500 pounds of copper ore were transported from Bolinas Lagoon to Pittsburg, California (Mason 1973).

New land-use practices of the late 19th century, including logging, mining, and ranching, increased the rate of erosion and sedimentation, and caused Bolinas Lagoon to fill at five times the pre-development rate (Winkelman n.d.). The 1906 earthquake on the San Andreas fault caused the lagoon floor to drop by approximately one foot and restored a reported 50 million cubic feet of tidal prism (Bergquist 1993). The tidal prism is currently less than half of that estimated from bathymetric data in 1850, and sediment continues to accumulate in the lagoon at a higher rate than the estimated long-term sedimentation rate prior to development, despite improvements in land use patterns in the last century (Winkelman n.d.). The effects of past practices may be long-lasting. Some of the sediment currently entering the lagoon probably derives from the continued erosion and downcutting by Pine Gulch Creek into flood plain deposits that resulted from past periods of abnormally high erosion induced by intensive logging, grazing, and other destructive management practices in the watershed.

Prehistoric and Historic Archaeological Resources

It is estimated that less than 5 percent of the land area of the Bolinas Lagoon Watershed has been examined by archaeological surveys. The largest archaeological surveys completed in this area were two surveys covering approximately 50 acres, both east of Mesa Road in Bolinas. Archaeological surveys of 46 smaller areas have largely focused on the developed areas near Stinson Beach and along the Highway 1 corridor. Highway 1 largely follows the coast south of Stinson Beach and from Stinson Beach northward follows the eastern shore of the Bolinas Lagoon, and then into the San Andreas Rift Zone valley.

Additional surveys were conducted for the purposes of this project along the shore of the lagoon above the high water line where the shoreline was accessible. The survey area also included the sand spit at the terminus of Stinson beach, and Kent Island. The majority of the lagoon shoreline is covered in mud or sand, making identification of cultural sites difficult. An attempt was made to relocate recorded sites, although surficial evidence was not present in the areas surveyed. The fact that silt continues to be deposited in the lagoon, and that the majority of previously recorded sites were located in shoreline areas, indicates the possibility that if sites exist below the mud they will be well preserved.

A record search conducted at the Northwest Information Center identified eleven archaeological sites recorded within the Bolinas watershed. Nine of these sites have been identified as prehistoric shell middens (trash dumps), one site is a midden of undetermined age, and one site is a historic mining site. One of these sites appears to be close to the area of excavation for the Main Channel, and another is within the area of excavation for the Highway 1 Fills, although they have not been precisely mapped. Additionally, no eligibility determination has been made for any of these sites, and it is possible that one or more of them may have been destroyed since they were recorded.

The prehistoric midden sites consist of shell, ash, fire-cracked rock, and other debris accumulated during the utilization or collection of shellfish resources. Artifacts collected from these sites include both flaked and non-flaked lithic tools, including small amounts of obsidian. These sites range in size from 1,000 square meters of dense midden deposits to 25 square meters of sporadic deposits of shell and artifacts. The other midden site, consisting of compacted ash, is of undetermined age or association and may also have been the site of a historic 19th century structure near the town of Bolinas.

The majority of known prehistoric shell midden sites in the Bolinas watershed are clustered along the shoreline of the Bolinas Lagoon. This "clustering", however, may be due to the fact that few surveys have been conducted or may mean that the shoreline has experienced a high degree of prehistoric and ethnographic use. Concentrations of archaeological sites are also expected on alluvial fans of freshwater creeks that drain into the lagoon. Shell middens represent the most visible and most widely encountered site type in this region.

Other than the remains of a possible 19th century structure related to the compacted ash midden described above, only one historic archaeological site has been recorded to date within the Bolinas watershed. This site consists of a 19th century copper mine, including a cabin, boiler, adits, a large tailing pile, and other associated footings, debris, and artifact scatters. On GGNRA property, in a canyon northeast of the lagoon, and therefore outside the area of potential effect for project excavation activities, this site is estimated to have been an active copper mine from 1848 to the World War I era. The NPS has not made an eligibility determination for this site.

Native American Resources

Other than archaeological resources of Native American origin, as described in the preceding section, no cultural resources of special concern to Native Americans, including sacred sites, burial sites, or traditional cultural properties, have been identified in the project area.

The Corps has initiated formal consultation with the Federated Indians of Graton Rancheria, the federally recognized Native American Tribe associated with Bolinas Lagoon.. Although it is common for tribes to wish not to disclose the exact location or specific information regarding traditional cultural properties, tribal concerns will be addressed as required by legislation and in consideration of the customs of the tribe.

Architectural Resources

The Lighter Wharf is located north of the town of Bolinas along Highway 1 and is listed in the California Inventory of Historical Resources as an important demonstration of the economic/industrial theme of California history. The Lighter Wharf is not listed in the National Register of Historic Places (NRHP). This wharf played an important role in the shipping industry that once flourished in Bolinas Lagoon. Four buildings along Highway 1 constructed between 1850 and 1900 may become eligible for the NRHP as contributing properties of a potential historical district, according to the California Office of Historic Preservation. Slightly outside the eastern boundary of the watershed, the Hill 640 Military Reservation has been determined eligible for listing on the NRHP.

Within the lagoon itself, the remains of an abandoned dredging barge are visible at both high and low tide. The barge was reported to have been abandoned following the dredging of the Seadrift Lagoon, and although not historic, it has become a local landmark.

Submerged Cultural Resources and Bolinas Bay

There is no record of any survey for submerged cultural resources within the lagoon itself or in Bolinas Bay. Within the lagoon, there may be the remains of watercraft dating to both the prehistoric and historic period, in addition to the possible remains of early habitation sites that at one time were on land. If the proposed dredging removes sediments that were deposited over 50 years ago, there is a possibility that cultural sites may be affected.

There are 18 reported shipwrecks in the vicinity of Bolinas Bay reported in the State Lands Shipwreck Data Base. The earliest reported wreck is that of the *Duxberry*, wrecked in 1849. The location given in the database is at Duxbury Reef, and it is likely the reef was named after the wreck as is often the case. The second earliest reported wreck is that of the *El Dorado*, a sidewheel steamer wrecked in 1851. The reported location is Bolinas Bay. Because most of the wreck locations are vague, and the final outcome of the disasters are not always reported (some may have been salvaged), it will be necessary to complete a survey in areas where barge anchoring may occur.

3.5.3 Regulatory Considerations

Archaeological and Architectural Resources

Cultural resources are protected primarily through the National Historic Preservation Act (NHPA) of 1966 (16 U.S.C. § 470 et seq.) and its implementing regulations (found at 36 CFR 800). Other pertinent legislation covering this project includes the Archaeological and Historic Preservation Act of 1974 (16 U.S.C. §§ 469 – 469c); the Archaeological Resources Protection Act of 1979 (16 U.S.C. §§ 470aa – 470mm), and CEQA. If submerged cultural resources are encountered in Bolinas Bay or submerged in the lagoon, the Abandoned Shipwreck Act (ASA) (43 U.S.C. § 8) may also apply to the project. To determine if a property is considered "historic" the property must meet certain criteria and usually be of at least 50 years of age. If the property meets the criteria, it may be considered eligible for the National Register of Historic Places (NRHP) or the California Register of Historic Resources or both.

NRHP Listing requirements

The following significance criteria are the basis for determining inclusion of a property on the NRHP (36 CFR 60.4). The property must have or be:

- Association with events that have made a significant contribution to the broad patterns of our history;
- Association with the lives of persons significant to our past;
- Resources that embody the distinctive 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 component may lack individual distinction; or
- Resources that have yielded or may be likely to yield information important in prehistory or history.

Any property considered eligible for the NRHP is also automatically subject to protection under CEQA.

CEQA Requirements

Under Section 15064.5 of the CEQA guidelines, a "historic resource" is a property listed on the California Register of Historical Resources or a local register of historic resource, or determined eligible for the state or local register of historic resources by a lead agency, where such determination is supported by substantial evidence of the historical or cultural significance of the property. "Historic resources" under CEQA include archaeological sites.

The eligibility criteria of the California Register of Historic Resources are nearly identical to those of the NRHP and therefore are not repeated here.

Native American Resources

Section 101(d)(6)(A) of the NHPA, as amended, allows properties of traditional religious and cultural importance to a tribe to be determined eligible for inclusion in the NRHP. The *Guidelines for Evaluating and Documenting Traditional Cultural Properties* (Parker and King 1990) provide information on the identification, recordation, and evaluation of Native American sites that may be considered eligible for the NRHP and that are designated "traditional cultural properties (TCPs)." Some TCPs also may qualify as Sacred Sites under Executive Order 13007, which directs agencies, to the extent possible, to accommodate access to and use of such sites and to avoid adversely affecting their physical characteristics. The American Indian Religious Freedom Act of 1978 also allows for access to sites of religious importance to Native Americans. The Native American Graves Protection and Repatriation Act of 1990 provides for the repatriation of human remains and funerary items to identified Native American descendants. Section 15064.5 of CEQA contains provisions concerning the discovery of human remains that are of Native American origin.

3.6 PUBLIC ACCESS AND RECREATION RESOURCES

3.6.1 Introduction/Region of Influence

Within the project area are many recreational resources (Figure 3-13). These resources provide opportunities for hiking, biking, and horseback riding on the trails of GGNRA, PRNS, Mount Tamalpais State Park, MCOSD, and Audubon Canyon Ranch; boating on the lagoon and in Bolinas Bay; fishing in the lagoon and Bolinas Bay; swimming, surfing, boating, and beach-going along Bolinas Bay; and wildlife viewing nearly everywhere in the project area, but particularly in the lagoon.

The ROI for recreational resources encompasses the lagoon and its watershed, the beaches near the lagoon, and Bolinas Bay.

3.6.2 Public Access

Most of the project is in public ownership; however, there is some privately-owned land around the communities of Bolinas and Stinson Beach (MCOSD 1996). Public entities holding title to the watershed include the NPS (GGNRA and PRNS), GFNMS, Mount Tamalpais State Park, and MCOSD. GFNMS has jurisdiction over Bolinas Bay and the lagoon up to the high tide line. Audubon Canyon Ranch, a private non-profit organization dedicated to wildlife protection, owns and manages a preserve as an inholding within the boundaries of GGNRA.

All publicly held land within the watershed is accessible to the public; however, certain uses (such as the use of motorized vehicles) are prohibited on NPS or MCOSD lands. Among the approved recreational uses in the lagoon and its watershed are birding, photography, fishing, clamming, shrimping, kayaking, canoeing, sailing, horseback riding, bicycling, jogging, hiking, picnicking, and educational/environmental tours. Access to Bolinas Lagoon is provided by Highway 1, Olema-Bolinas Road, Wharf Road, Seadrift Road, and Dipsea Road (MCOSD 1996).

The public can access the shore along Bolinas Bay east of the inlet via the publicly-owned access points at Stinson Beach (Stinson Beach Park and Upton Beach), as well as via public easements from Calle del Arroyo (MCCPD 1980). There is an easement in place for public access to the privately held beachfront in Seadrift, between the mean high tide line and the riprap; however this easement can only be used for low-intensity recreation activities. In addition, the California Tidelands Trust mandates that the public must have access to all beaches below the high tide line. Bolinas Beach runs from the lagoon inlet west to Duxbury Point, and is a popular location for beach-going, boating, surfing, and fishing. Agate Beach is a County Park west of Duxbury Reef, and provides access to nearly two miles of beach (Marin County Parks 2001).

3.6.3 Fishing

Clamming in Bolinas Lagoon was prohibited in the 1970s because of sewage contamination in the lagoon from Stinson Beach. That prohibition is no longer in place,

3-13 Recreation Resources

and clamming and shrimping are now permitted in the lagoon; however, changes in habitat have severely limited opportunities for these activities on both a sport and commercial level (Moore 1999).

Recreational fishing is common in Bolinas Lagoon. People fish along Highway 1 from Audubon Canyon Ranch east to Stinson Beach during the incoming and high tides for striped bass, rays, and leopard sharks. Others fish in Bolinas Channel on the west side of the lagoon, and those fishermen catch striped bass, rays, leopard sharks, surf perch, and the occasional smelt (O'Connor 2001). In addition, recreational anglers fish in Bolinas Bay, both from the shoreline and from motorboats in the bay.

3.6.4 Boating

Motorboat use in Bolinas Lagoon is extremely limited, as they are only permitted to be used at the extreme southwestern corner of the lagoon, near the inlet, unless they have special permits. However canoe and kayak use is much less restricted. Approximately 1,800 to 2,500 people per year take commercial kayak tours through the lagoon (Tye 1999). It is estimated that each year somewhere between 3,000 and 5,000 private individual day-trips are taken on the lagoon in kayaks, canoes, and rowboats. "User-days" are difficult to define, as kayak and other boat uses of the lagoon are dependent upon tide, weather, and light issues; however, kayaking may occur year-round, weather permitting. An average kayak trip in the lagoon usually lasts no more than three hours because of tidal constraints. Commercial kayak outfitters estimate that the increasing sedimentation of the lagoon has greatly reduced the amount of kayaking in the lagoon during the past ten years. Commercial kayak trips usually include no more than six boats, which may be doubles or singles. Most commercial outfitters make an effort to avoid seal haul-outs and migratory birds while staying within the confines of the lagoon.

Boat launches used by kayakers include a launch site on Highway 1 across from the Stinson Beach School and another in Bolinas at Wharf Road. Other put-in places exist, but the MCOSD discourages their use in order to reduce the impact to wildlife. The Wildlife Disturbance Subcommittee of the BLTAC has developed signs and pamphlets for public awareness and education regarding wildlife viewing on Bolinas Lagoon (Tye 1999, MCOSD 2000a). These include pamphlets distributed to outfitters in Stinson Beach and around Marin and signs erected around the lagoon.

In addition to boating in the lagoon itself, extensive surfing and boating occurs along Bolinas Beach and Stinson Beach. The breaking surf along the beaches, combined with the strong Bolinas Beach currents in the channel, make this a popular site for surfing and white-water kayaking. The commercial sea kayak outfitters rarely leave the lagoon because of the strong currents in the channel (Tye 1999), however private recreational kayakers can often be seen paddling in Bolinas Bay.

Windsurfing is legal in the lagoon but is not common, as the water depth limits the use. Personal motorized water craft (such as Jet Skis ®) have been banned from the lagoon

(MCOSD 1996), and as noted above, motorboat use in the lagoon is extremely restricted.

There are approximately 50 private moorings in the lagoon, approximately half of which are owned and maintained by the Bolinas Rod and Boat Club (BRBC) (O'Connor 1999; MCOSD 1996). The ramp on the beach at the end of Wharf Road in Bolinas belongs to Marin County, however the BRBC maintains access rights to it. This ramp is also used for beach access in cases of accident or emergency. A ramp located off Dipsea Road in Seadrift is available only to Seadrift residents and their guests (O'Connor 1999). Across from Volunteer Canyon on Highway 1 is an illegal launch site that is used occasionally by power boats in bad weather (O'Connor 1999). Boaters with a permit from MCOSD may stay overnight on the lagoon (MCOSD 1996). Docking facilities include "finger wharves" and "strings" in Bolinas Basin (a deeper section of the lagoon located in front of the Bolinas downtown area) which are maintained by the BRBC, and are open to the visitors approved by BRBC. There is no official harbormaster in Bolinas; however, the BRBC Docks and Yards Committee serves unofficially to regulate docks and moorings in the lagoon (O'Connor 1999).

3.6.5 Hiking/Biking

Hiking is permitted on all trails within MCOSD's jurisdiction; however, bicycling is permitted only on fire roads. GGNRA has extensive hiking trails throughout the park. GGNRA allows biking on approximately 64 percent of the trails within the Marin County portion of the park (NPS 1992). Point Reyes allows biking within the National Seashore but limits it to paved roads, fire roads, and some trails, all outside the wilderness areas (NPS 1997). Bicycling is allowed in Mount Tamalpais State Park but is limited to fire roads and paved roads (California State Parks 1999a).

The entire watershed is traversed by a network of hiking trails, only a few of which are mentioned here. Bolinas Ridge Trail starts on Bolinas-Fairfax Road, at or near the summit of the ridge, and runs northwest along the ridgeline all the way to just east of Olema. There it meets up with the Jewell Trail and eventually ends at Sir Francis Drake Boulevard. On the western side of the watershed, Teixeira Trail leads west from the Olema Valley Trail up to the Inverness Ridge Trail within PRNS. The Ridge Trail has views of the watershed, and a spur trail leads to Pablo Point, an 800-foot high ridge. However, the trail to Pablo Point has been closed because of severe damage from the storms of recent winters (NPS 1999b).

While there are no formal bike routes or paths along the paved roads in the project area, bicyclists are common in the summer months, especially on Highway 1 between Stinson Beach and Bolinas-Fairfax Road. On summer weekends dozens of bicyclists may pass through the project area.

3.6.6 Education

GFNMS, PRNS, MCOSD, and the Audubon Canyon Ranch provide educational information about the lagoon. PRNS runs numerous educational programs open to the public, ranging from free half-hour lectures to extended courses on wildlife photography. In addition, the park has a curriculum for school children, designed for use by local teachers, with participation by park rangers (NPS 2000). GFNMS runs school programs to educate Bay Area students in the ecological importance of the sanctuary, including Bolinas Lagoon.

MCOSD rangers lead nature walks and discussions about the lagoon's environmental significance. MCOSD has recently developed, with input from the BLTAC Wildlife Disturbance Subcommittee, a brochure on nonintrusive methods of viewing wildlife in the lagoon (MCOSD 2000b). Audubon Canyon Ranch maintains a small museum with historical and environmental exhibits on the lagoon. Point Reyes Bird Observatory (PRBO) maintains an office on the east side of the lagoon, but its field station and visitor center, the Palomarin Field Station, is located outside the lagoon watershed on the west side of the Bolinas mesa.

Bolinas Museum, in downtown Bolinas, maintains a collection of historical artifacts to educate the public about prehistoric and historic life in the Bolinas area. The Stinson Beach Historical Society maintains an extensive collection of material relating to the history of West Marin, which is located at and curated by the Stinson Beach Public Library.

Commercial kayak outfitters often take advantage of the opportunity to educate their customers about the sensitive ecosystem and wildlife in Bolinas Lagoon (Tye 1999).

Marin County Park Rangers have initiated more public education efforts at Agate Beach, in order to protect Duxbury Reef from illegal gathering of sensitive species (Bolinas Lagoon Technical Advisory Committee 1999b).

3.6.7 Parks

Agate Beach

Agate Beach is a 6-acre County Park located off Elm Road on the west side of Bolinas, north of Duxbury Point. While outside the immediate project area, this beach gives the public access to the shoreline. Parking is free, but there are no facilities at the beach. (Marin County Parks and Recreation Department 2001),.

Bolinas County Park

Located on Brighton Avenue in Bolinas, this small community park contains a tennis court and restrooms. There is no parking lot. The park is used for occasional local community events and year-round tennis. During 1999, Marin County purchased an adjoining parcel, increasing the size of the park to nearly 3 acres (Jauch 1999).

Bolinas Lagoon Open Space Preserve

Managed by the Marin County Open Space District, this 1,100 acre preserve encompasses the area of the lagoon itself. Management of the lagoon was transferred from Marin County Parks to Marin County Open Space District in 1988 (Bramham 2000). The lagoon is part of a larger protected natural habitat that is part of the Gulf of the Farallones National Marine Sanctuary, Point Reyes National Seashore, Golden Gate Biosphere Reserve, Mount Tamalpais State Park, and the GGNRA. The preserve offers protected habitat for a variety of species, including fish, migratory birds, and harbor seals. The preserve also provides an area for recreational pursuits such as wildlife viewing and fishing (MCOSD 2000b).

Golden Gate National Recreation Area

GGNRA is a multi-parcel unit of the National Park Service, covering 76,500 acres in three counties. Among the property under its jurisdiction is the section of the Bolinas Lagoon watershed on the east side of Highway 1, running from a point approximately 2 miles north of the lagoon to its border with Mount Tamalpais State Park on the south edge of the watershed.

Hiking and walking are activities available throughout the park. Bicycling is allowed on fire roads only. There is limited parking at some of the trailheads in the GGNRA, including at Five Brooks and the Bolinas Ridge Trailhead on Bolinas-Fairfax Road. Visitor centers are located at Muir Woods National Monument and the Marin Headlands and contain restrooms, picnic tables, parking lots, and educational exhibits. There are two small campgrounds in the Marin Headlands portion of the Park, available to hikers, bikers, and groups. In addition, there is a youth hostel that sleeps 109 near the Marin Headlands Visitor Center (NPS 1999c).

Gulf of the Farallones National Marine Sanctuary

West of San Francisco north to Bodega Bay, the GFNMS is 1,235 square miles of near shore and offshore waters ranging from wetlands and inter-tidal to pelagic and deep-sea communities. Recreational uses include fishing, sailing, kayaking, surfing and whale watching. Shipping lanes pass through the Sanctuary into the San Francisco Bay. Bolinas Lagoon and the surrounding ocean waters fall within the jurisdictional boundaries of the Sanctuary.

Mesa Park

Mesa Park is a twelve acre park that surrounds the firehouse located on Mesa Road in Bolinas. The land, which was originally privately owned, was acquired by the Bolinas Community Public Utility District (BPUD) (Buchanan 2001a) in the late 1970's through money made available by a community block grant program. Mesa Park is now jointly owned by the BPUD and the Bolinas-Stinson Union School District, and managed by the appointed Mesa Park Board of Commissioners. (Buchanan 2001b).

Mesa Park hosts a number of community activities through its soccer field, softball field, baseball field, playground, and basketball court. The park is accessible during daylight hours, and has a parking lot off of Mesa Road. A water reclamation project proposal is currently being developed through BPUD to facilitate the construction of a recreation center and public restrooms, and to begin irrigation of the park (Buchanan 2001b).

Mount Tamalpais State Park

Part of the upper section of the Easkoot Creek watershed runs through Mount Tamalpais State Park. The park includes 6,300 acres of redwood groves and oak woodlands with a spectacular view from the 2,571-foot peak. The Upper Mountain is open during daylight hours only, with all highway access gates locking at sunset. Campgrounds and lower portions of Mt. Tamalpais are accessible 24 hours a day. More than 50 miles of trails are within the park and connect to a larger, 200-mile-long trail system. Bicyclists are welcome on the park's fire roads but are prohibited on single-track or hiking trails. The park has a picnic area with tables, stoves, piped drinking water, and flush toilets. The East Peak Summit features a visitor center, refreshment stand, phone, picnic tables, and fully accessible restroom. Camping is available, and facilities include 16 developed sites with parking, 6 environmental walk-in sites, and 10 rustic cabins with running water and pit toilets (California State Parks 1999).

Olema Ranch Campground

This private campground is located outside of the Bolinas watershed on Highway 1, about 13 miles north of the lagoon. Its facilities include 203 campsites, including 175 tent sites. It is a full-service campground and provides showers, restrooms, laundry, store, bicycle rentals, kayak tours, conference facilities, and a post office to its visitors (Olema Ranch Campground 1999).

Point Reyes National Seashore

PRNS is an independent unit of the National Park System, covering nearly the entire Point Reyes peninsula. Part of the park extends into the Bolinas watershed, on the west side of Highway 1. Recreational activities allowed in the park include kayaking, hiking, camping, bicycling, horseback riding, wildlife viewing, and ranger-led tours on local history, geology, and environmental issues. Visitor centers with facilities, including parking, picnic tables, telephones, educational exhibits, and restrooms, are located at Bear Valley, Drakes Beach, and Point Reyes Lighthouse.

There are also parking and restrooms at the Five Brooks Trailhead on Highway 1, Limantour Beach on Drakes Bay, McClures Beach, Kehoe Beach, Point Reyes Beach North, and Point Reyes Beach South. Four campgrounds exist within the park, but there are no car-camping sites available; all campgrounds are accessible only by hiking, biking, or horseback (NPS 1999b).

Stinson Beach Park

Stinson Beach Park was originally a state park, but by 1977 it had been transferred to the federal government. It is now administered by GGNRA. The park covers approximately 50 acres, including 0.6 miles of beach. Park facilities are free to the public and include picnic tables and barbecue grills, restrooms, changing rooms, and one outdoor shower. Volleyball poles are permanently erected on the beach, and visitors can borrow nets and balls from the park. Park users include bathers, surfers, boogie-boarders, kayakers, and surf fishers. Lifeguards are on duty May through October. The central area of the park has 160 parking spaces, and two auxiliary lots accommodate over 1,000 additional cars. Peak use of the park occurs on hot summer weekends, when all the parking lots may fill up, and traffic may back up for up to a mile north and south on Highway 1 (Giambastiani 1999).

Stinson Beach Village Green

Stinson Beach Village Green, administered by Marin County, was completed in 1994. It is located in Stinson Beach at the intersection of Highway 101 and Calle del Mar. The less than one acre plot of land is used for recreational purposes only and includes a playground, a basketball court, an amphitheater, and a grassy area (Jauch 2000).

Upton Beach

Upton Beach is an approximately 1.5-mile-long public beach that is between Seadrift Beach and the Stinson Beach area of GGNRA. The beach has been managed by Marin County since 1932, and is zoned for recreational use only. To date, there has been no recreational development at Upton Beach (Jauch 2000). Upton Beach, like Stinson Beach and PRNS, borders the GFNMS.

3.6.8 Regulatory Considerations

The section below summarizes the plans and policies relevant to recreation and public access issues resulting from the two project alternatives.

Stinson Beach Community Plan

Objective 7.1: Visitor oriented facilities and activities should not be substantially increased and should be provided through cooperation with the National and State Parks.

Policy F: Existing hiking trails around and within Stinson Beach must be maintained and repaired on a regular basis.

Bolinas Community Plan

The Bolinas Community Plan calls for full support of the preservation and minimal development of the Bolinas Lagoon Park.

Marin Countywide Plan

Environmental Quality Element, Open Space and Recreation

Policy EQ-4.1 Provision of Facilities. Adequate parks, recreation facilities, and open space shall be provided. Appropriate public access shall be established.

Policy EQ-4.4 Categories of Open Space Preservation. The Countywide Plan identifies permanent preservation open space in the following categories: ... Recreation: Public parks, trails, water sports areas, commercial recreation.

Policy EQ-4.7a Public Open Space. Bolinas Lagoon, formerly a County Park, is now managed by the Marin County Open Space District as an Open Space Preserve. The District is currently evaluating its management policies in order to develop a management program for the lagoon that will balance public use with preservation of the lagoon's fragile resources.

Policy PR-2.3 Replacing Closed Facilities. The county will attempt to replace countywide park and recreation facilities that are closed or that become unavailable for other reasons, if the need for these facilities still exists.

Policy TR-4.1 Trails Maintenance Responsibility. Trails should be maintained by Property owners or entities accepting dedicated trails or easements unless other arrangements have been contractually agreed upon.

3.7 LAND USE

3.7.1 Introduction / Region of Influence

This section discusses current land ownership and land use in and surrounding the proposed project area. In addition, local policies relating to land use are summarized. The ROI for the project includes the project site and surrounding land that would directly interact with or be influenced by the project or its components. The types of land use surrounding the lagoon have been divided into three broad categories that describe the type of development and activity that occur in the area including agriculture, public use, research and education, and urban land use. The predominant use of the land within the watershed is for recreational purposes, a public use discussed in detail in Section 3.6.

3.7.2 Land Ownership

The land within the Bolinas Lagoon watershed covers approximately 10,700 acres within Marin County. Figure 3-14 shows the distribution of land ownership and jurisdiction within the Bolinas Lagoon watershed. The majority of this land is publicly owned, while a small portion is privately held. Most of the acreage administered by government agencies is undeveloped open space property, while the privately held acreage is devoted to residential and agricultural uses.

Federal Land Ownership

The US government is the owner of extensive federal land within the watershed and National Park Service agencies manage this land. GGNRA manages federal lands in and around Stinson Beach and in the Olema Valley. Point Reyes National Seashore (PRNS) manages federal land bordering GGNRA lands in the Olema Valley. A total of approximately 4,121 acres are part of the GGNRA and 2,647 acres at PRNS.

State and Local Land Ownership

The 1,100-acre Bolinas Lagoon is owned by Marin County and managed by the Marin County Open Space District as the Bolinas Lagoon Open Space Preserve. Marin County also owns a small parcel immediately adjacent to the west side of the lagoon north of the community of Bolinas. Mount Tamalpais State Park, managed by the California Department of Parks and Recreation, is the largest state land area and a portion of this park falls within the watershed. Approximately 1,572 acres of the park fall within the watershed. Marin Municipal Water District is the owner and manager of land that borders the State Park but this District land is not in the Bolinas Lagoon watershed and therefore is not part of the ROI for this project. Small land holdings are owned by the College of Marin, which maintains a marine biology station on the shore of the Lagoon and the Bolinas Public Utilities District and the Bolinas-Stinson Beach School District. (MCPRD 1996). The Marin Municipal Water District holds land on the west side of the lagoon.

3-14 Land Use and Ownership in Bolinas Watershed

Private Land Ownership

The Audubon Canyon Ranch, an environmental, research, and education organization, is the largest private landowner, with 1,014 acres in the eastern portion of the watershed. The remaining private lands are owned by individuals and are located throughout the watershed, but primarily in the Bolinas, Stinson Beach, and Seadrift communities. A portion of privately held land on the west side of the watershed is used for agriculture; however, exact acreages are not available at this time. There are small private parcels of land in and around the lagoon on the Stinson Beach sand spit and along the entrance to the Lagoon in Bolinas.

3.7.3 Public Land Use

Public land within the watershed is managed by federal agencies, including the National Park Service, and by state agencies, including the California Department of Parks and Recreation.

Federal Land

Land within the Olema Valley portion of the Golden Gate National Recreation Area makes up most of the watershed east of Bolinas Lagoon. The property includes forested canyons, tree-lined ridges, open grassy slopes, and historic farm buildings. The Olema Valley property is zoned as Natural Space, for which the management emphasis is on the conservation of natural resources and processes and the accommodation of uses that do not adversely affect these resources and processes (National Park Service 1992). This land is largely undeveloped and provides numerous hiking and biking trails. Golden Gate National Recreation Area (GGNRA) also manages three properties on the west side of the lagoon that occupy a combined area of approximately 45 acres (Fong 2000a). The NPS operated a shooting range for Park Service law enforcement training in Morses' Gulch during the 1980s; it was closed primarily because of community complaints about the noise, and the training was moved to San Quentin (Danielsen 2001).

Property within the Point Reyes National Seashore covers most of the watershed west of Bolinas Lagoon. This property is used for purposes similar to those of Olema Valley, including hiking and mountain biking. Stinson Beach, part of GGNRA, is managed for typical beach activities, including swimming and sunbathing. The beach also provides barbecue and picnic facilities.

State Land

A small portion of Mount Tamalpais State Park is present at the southern tip of the Bolinas Lagoon watershed between McKennan Gulch and Stinson Gulch above Stinson Beach. Most of this property is undeveloped with few hiking or biking trails. The park includes Red Rock Beach, a hike-in beach that people usually access by parking their cars on the shoulder of Highway 1; the beach is for day use only and no amenities are present.

Local Government Land

Bolinas Lagoon is used primarily for natural resource protection and for recreation. Recreation activities described in section 3.6 include swimming, surfing, boating, and beach-going along Bolinas Bay; and wildlife viewing nearly everywhere in the watershed, but particularly in the lagoon.

A small area below the high water line of the lagoon was used as an unofficial dumpsite by Bolinas residents in the 1950s and 1960s. Refuse was dumped, burned, and bulldozed into the mud on the edge of the lagoon (Cammiccia 2001). This area is not within the excavation footprints of any of the project alternatives.

Although not landowners themselves, the unincorporated Marin County communities of Bolinas and Stinson Beach are both within the watershed. Land use within the two communities is primarily residential, as discussed in the Urban Land Use section below.

Research and Education Land Use

While much of the public lands discussed above have research and education as a component of their management strategy, Audubon Canyon Ranch's Bolinas Lagoon Preserve is managed primarily for research and education activities. The public is admitted to the preserve from mid-March to mid-July on weekends between 10 AM and 4 PM and on weekdays by appointment. Research activities are conducted throughout the preserve by groups from the Point Reyes Bird Observatory and the University of California at Berkeley, among others. Educational facilities at the preserve include teaching ponds, artificial wetlands, a display, and a library. The ranch also conducts nature hikes for Bay Area schoolchildren. The natural areas of the preserve are passively managed as plant and wildlife habitat. The Ranch preserves nesting habitat of the Great Blue Heron.

In addition to research and educational activities operated through the preserve, the College of Marin operates a marine laboratory off Wharf Road in the town of Bolinas.

3.7.4 Private Land Use

Bolinas

The Bolinas community is located between Bolinas Lagoon and the Pacific Ocean. The 2000 Census reports that the population of Bolinas is 1,246 (US Census Bureau 2002). The portion of Bolinas within the watershed is zoned for single-family residential, residential commercial, open space, and agriculture. The areas adjacent to the lagoon are zoned for Coastal Open Space, Coastal Agriculture and Coastal Single Family (Figure 3-15). The Marin LCP identifies agricultural uses on the west side of Bolinas Lagoon, including livestock and other domestic animal husbandry, and small and large scale vegetable cultivation.

3-15 Bolinas Land Use Policy Map

Stinson Beach

The Stinson Beach community is located primarily southeast of the lagoon, but also includes the Seadrift sand spit . The 2000 Census records the population of Stinson Beach (including Seadrift) to be 751 (US Census Bureau 2002). Areas of Stinson Beach that are not adjacent to the Lagoon are are zoned for retail, residential, commercial, open space, and agriculture (Figure 3-16).

Seadrift

Seadrift is a gated community that is officially part of Stinson Beach. It is a thin strip of filled lagoon located south of the lagoon and encompasses approximately 125 acres. This land is privately owned and subdivided into 320 single-family residences, of which 280 have been developed and approximately 15 are under construction. Areas in Seadrift that are adjacent to the Lagoon are zoned for Coastal Single Family and Coastal Open Space (Figure 3-16). Located in the center of Seadrift is a 45-acre human-made lagoon, also privately owned. No commercial activity currently occurs on Seadrift (Kamieniecki 2000).

Agriculture

While no longer a dominant land use in the watershed, agriculture was historically important in the Bolinas watershed (see Appendix B, Land Use History of Bolinas Watershed). Agricultural uses are currently confined to the northern and western sections of the watershed, particularly in the Pine Gulch Creek watershed. These uses include vegetable cultivation and the raising of livestock.

Full time farms in Marin County totaled 172 in 1997 (USDA 1997), approximately two dozen of which are dairies (MALT 2001). These dairies provide 20 percent of the Bay Area's milk supply. Dairy cows in the area are housed indoors in winter by some ranchers, but generally are grazed on pastures for most of the year. Approximately 4,500 head of beef cattle are raised in Marin County (MALT 2001). About 17,000 sheep and lambs were raised and 140,000 pounds of wool produced in Marin County in 2000.

Within Point Reyes National Seashore, working ranches exist under special use agreement with the National Park Service. This area of open landscape is known as the "Pastoral Zone" and is intended to preserve the agricultural history of the Peninsula. There are currently 13 working ranches in the park. Holstein dairy cows are found on seven of these ranches. Six beef ranches have Black Angus and Herefords. These ranches were purchased by the National Parks Service in 1962 when the National Seashore was created, and leased back to the existing ranchers with 5-20 year terms. Local grass is now supplemented with feeds grown in drier climates.

3.7.5 Regulatory Considerations

Most of the major landowners and government agencies with management authority within the watershed have management plans or policies that guide the activities allowed on their properties or in their jurisdiction. The sections below summarize the portions of those plans that are applicable to the restoration of Bolinas Lagoon.

3-16 Stinson Beach Land Use Policy Map

Gulf of the Farallones National Marine Sanctuary

Bolinas Lagoon is within the Gulf of the Farallones National Marine Sanctuary (GFNMS) and is identified in the GFNMS Management Plan as an area of overlapping resources and as an impacted area. The Management Plan states that its highest priority is the, "protection of the marine environment and resources of the sanctuary." (NOAA 1987). Permitted sanctuary uses include recreation, commercial fishing and mariculture, shipping, education and interpretation, scientific research and military operations. GFNMS regulations contain provisions that state that prohibited activities include, "Dredging or otherwise altering the seabed in any way … except for routine maintenance and navigation, ecological maintenance, mariculture…" (15 CFR 922.82). The Director of the GFNMS has the discretionary authority, however, to permit activities that are normally prohibited in National Marine Sanctuaries (15 CFR 922.48).

Golden Gate National Recreation Areas/Point Reyes National Seashore

There is a General Management Plan for both GGNRA and PRNS that gives background and general guidance regarding these two areas. (National Park Service 1980). The southern Olema Valley, which is in the Bolinas Lagoon watershed, is identified in this Plan as a Natural Landscape Management Zone. GGNRA also has prepared a Resources Management Plan which includes a natural resources section that identifies natural resource values, conditions and threats in the GGNRA. (National Park Service 1994). There is also a GGNRA Statement of Management which includes broad natural resource inventories and management objectives. (National Park Service 1992). This plan identifies the areas in GGNRA that serve as watershed west of Bolinas Lagoon as a "Natural Zone." There is little mention of Bolinas Lagoon or specific management measures for the Bolinas Lagoon watershed. However, management objectives for GGNRA include, "Minimize or avoid human caused or accelerated impacts and processes including erosion, invasion by alien plants, degradation of air and water quality and disruption of the natural flow of water." (National Park Service 1992).

California Coastal Act

The proposed project is within the designated coastal zone of Marin County and is therefore subject to the California Coastal Act of 1976 (California Public Resources Code § 30001 et seq.). The Coastal Act provides statutory protection for coastal zone areas and provides for local government entities, such as Marin County to prepare Local Coastal Plans (LCPs) and permit activities, in accordance with the LCPs. The following provisions of the Coastal Act (located in the California Public Resources Code) are particularly relevant to any development or alteration of Bolinas Lagoon:

> <u>Section 30230</u>
> Marine resources shall be maintained, enhanced, and where feasible, restored. Special protection shall be given to areas and species of special biological or economic significance.

Section 30233
(a)The diking, filling, or dredging of open coastal waters, wetlands, estuaries, and lakes shall be permitted in accordance with other applicable provisions of this division, where there is no feasible less environmentally damaging alternative, and where feasible mitigation measures have been provided to minimize adverse environmental effects, and shall be limited to the following:

… (7) Restoration purposes.

(b) Dredging and spoils disposal shall be planned and carried out to avoid significant disruption to marine and wildlife habitats and water circulation. Dredge spoils suitable for beach replenishment should be transported for such purposes to appropriate beaches or into suitable long shore current systems.

(c) In addition to the other provisions of this section, diking, filling, or dredging in existing estuaries and wetlands shall maintain or enhance the functional capacity of the wetland or estuary. Any alteration of coastal wetlands identified by the Department of Fish and Game … shall be limited to very minor incidental public facilities, restorative measures, nature study, commercial fishing facilities in Bodega Bay, and development in already developed parts of south San Diego Bay, if otherwise in accordance with this division.

Section 30236
Channelizations, dams, or other substantial alterations of rivers and streams shall incorporate the best mitigation measures feasible, and be limited to (1) necessary water supply projects, (2) flood control projects… or (3) developments where the primary function is the improvement of fish and wildlife habitat.

Section 30251
The scenic and visual qualities of coastal areas shall be considered and protected as a resource of public importance. Permitted development shall be sited and designed to protect views to and along the ocean and scenic coastal areas, to minimize the alteration of natural land forms, to be visually compatible with the character of surrounding areas, and, where feasible, to restore and enhance visual quality in visually degraded areas.

Tidal and Submerged Land – State Approval

Special consideration would be taken regarding that portion of the project that would take place in tidelands trust land, which is defined as that area water ward of the mean high tide line. For activities in those areas, the State Lands Commission would need to approve a special lease and the California Coastal Commission would be consulted regarding special permit requirements (Cal. Public Resource Code §§6103, 30600.5, 30601).

The proposed project would include activities within that portion of the coastal zone (below mean high tide) for which the California Coastal Commission has retained jurisdiction, and therefore a coastal development permit from the Coastal Commission could be required. In addition, because the proposed project is being conducted in part by a federal agency (the Corps), a coastal consistency determination pursuant to the Coastal Zone Management Act (16 U.S.C. §§ 1451 et seq.) will be required. A coastal consistency determination is required for all federal actions within the coastal zone to ensure project consistency with the provisions of the LCP and must be submitted to the California Coastal Commission for concurrence. (The coastal consistency determination will be prepared as a separate document).

Marin County Local Coastal Program

In accordance with the Coastal Act, Marin County must prepare a Local Coastal Program (LCP) Land Use Plan for land within the coastal zone of the county. Marin County has developed an LCP, which the California Coastal Commission has certified (MCCPD 1980). Certification of the LCP grants permitting authority to the county for development actions within the coastal zone. In accordance with this permitting authority, this project, which involves construction and movement of earth material within the coastal zone, will require a Level 5 development permit from the county. The entire project area, including most of the Bolinas Lagoon watershed, is within the coastal zone. The LCP contains policies that apply to Bolinas Lagoon. The LCP incorporates by reference the Bolinas Lagoon Management Plan.

The Marin County Local Coastal Program (LCP), Unit I (MCCPD 1980) is divided into resource areas. LCP policies regarding public access and recreation are addressed in Section 3.6. LCP policies regarding habitat protection are addressed in Section 3.3. The LCP includes the following applicable land use policies:

Stream Protection

> Policy II-1
>
> Stream impoundments and diversions shall be limited to necessary water supply projects, flood control projects where no other method for protecting existing structures in the flood plain is feasible and where such protection is necessary for public safety or to protect existing development, or developments where the primary function is the improvement of fish or wildlife habitat.
>
> Policy II-2
>
> All such developments (mentioned above in Policy 1) shall incorporate the best mitigation measures feasible, including erosion and runoff control measures and revegetation of disturbed areas with native species.

Policy II-4

No construction, alteration of land forms, or vegetation removal, shall be permitted within the riparian protection area [defined as "all existing riparian vegetation on both sides of the stream"]. However, if a parcel is located entirely within the stream buffer, design review shall be required for any proposed structure and shall consider impacts on water quality, riparian vegetation, and the rate and volume of streamflow. In general, development shall be located on that portion of the site which results in the least impact on the stream, and shall include provision for mitigation measures to control erosion and runoff and to provide restoration of disturbed areas by replanting with plant species naturally found on the site.

Lagoon Protection

The Bolinas Lagoon Plan's primary emphasis is summarized as: "Restoration and preservation of the intertidal and subtidal marine environment.

Policy II-12

A single coordinated resource management plan to guide the future use and activities in and around Bolinas Lagoon shall be developed with the involvement of the various public agencies….

Policy II-13b

The diking, filling, dredging and other alternations of these wetlands shall occur only for minor public works projects and shall be in conformance with Coastal Act Section 30233.

Policy II-16

The vacant lots along the east sides of Calle de Arroyo and Dipsea Road shall be redesignated as a Resource Management Area. Permitted uses of the Resource Management Area shall include fishing, birdwatching, photography, nature study, and other similar scientific and recreational uses. Uses that may be allowed by a use permit include small boat and equipment storage, non-commercial private parking, apiaries, truck farming (with application of pesticides and toxic chemicals prohibited), and other uses of similar type and intensity.

Policy 17

Changes in grazing use of the 11-acre Henry Wilkins property shall be preceded by detailed environmental investigation and shall assure protection of the habitat values, and public acquisition of the site is encouraged.

Policy

Any conflicts between agriculture and resource protection or public access or recreational uses within the Golden Gate National Recreation Area and Point

> Reyes National Seashore should be resolved in such a way that resources and public safety are protected and agricultural operations can continue.

Bolinas Lagoon Resource Management Plan

Marin County prepared the Bolinas Lagoon Resource Management Plan (Bolinas Lagoon Plan) that was adopted by the County Board of Supervisors in 1981 and updated in 1996 (MCPRD 1981, MCPRD 1996). The Bolinas Lagoon Plan, while not establishing land use designations, is referred to in the LCP and incorporated into LCP policies on Lagoon Protection (MCCPD 1980). Specific relevant policies from the 1996 Management Plan follow:

Geology and Morphology

Dredging should be permitted only after documentation of need is established and the absence or mitigation of adverse environmental impacts is established.

Hydrology and Water Quality

Proper land use practices shall be followed to minimize degradation of water quality in the Lagoon.

Biotic Resources

Diking, filling, dredging and other alterations of the Bolinas Lagoon wetlands may occur only as permitted under existing Coastal Act Policies. Any further impoundments and diversions on Pine Gulch Creek should be limited to developments where the primary function is the improvement of fish and wildlife habitat.

Goals of the 1996 updated Bolinas Lagoon Plan include preserving and enhancing diversity and aquatic habitats. More specifically,

> Goal I is to preserve and restore the ecological values of Bolinas Lagoon. Objectives are to: 1) Preserve the abundance and diversity of Lagoon life; 2) Preserve and enhance, over the long term, an ecological system including aquatic habitats(subtidal, intertidal, marsh, riparian, sand bar, and beach) that best protects the abundance and diversity of Lagoon life; 3) Restore water quality and hydraulic functions that will decrease sedimentation and prevent the loss of rich estuarine habitats.

The Bolinas Lagoon Plan also states that "it is likely that remedial actions are necessary to meet the stated management goals and objectives" The Plan further states, "Limited dredging could occur in areas where hydraulic studies indicate sediment removal would open channels and promote ongoing tidal scouring." and that "further studies are required to identify the range of dredging options" (MCPRD 1996).

Marin Countywide Plan

The Countywide Plan contains general designations and policies for land use in Marin County. However, some specific land use designations and restrictions are listed in the Local Coastal Plan which is incorporated by reference into the Countywide Plan. Policy EQ-2.41 regarding Conservation of Coastal Resources states that "The conservation of coastal resources shall be maintained following detailed policies in the Local Coastal Plans I and II adopted by the County and the Coastal Commission." The project area is located completely within Local Coastal Plan I.

The Community Development Element of the Marin Countywide Plan (MCCDA 1999) includes the following policies for the West Marin Planning Area, of which the Bolinas Lagoon watershed is a part:

> Policy CD-15.1 Designation of Lands for Agriculture
> The county shall designate land for agriculture at very low densities in the Inland Rural and Coastal Recreation Corridors and maintain these land use designations.
>
> Policy CD-15.2 Lands in the Coastal Zone
> The LCP, Parts I and II, shall govern land use in the Coastal Zone. Community plans in the Coastal Zone shall be subject to LCP policies.
>
> Policy CD-15.3 Mariculture
> The county supports and encourages mariculture in the Coastal Zone for the purposes of producing food, enhancing and restoring fisheries stocks, and contributing to the state's economy. The need for mariculture sites in coastal waters should be balanced with the need to provide for other uses, such as commercial fishing, recreational clamming and boating, and the need to protect coastal wildlife, water, and visual resources.

Bolinas areas alongside the Bolinas Lagoon are classified, from south to north, as Coastal Single Family, Coastal Agricultural 1 Unit/10-30 Acres and Coastal Agricultural 1 Unit/31-60 acres. Stinson Beach areas alongside Bolinas Lagoon are classified as Coastal Single Family and at the tip of Seadrift Spit, Coastal Open Space. (MCCDA 1999). The east and north sides of Bolinas Lagoon are designated as Open Space. Figure 3-15 shows the Bolinas Land Use Policy Map and Figure 3-16 shows the Stinson Beach Land Use Policy Map from the Countywide Plan.

Stinson Beach Community Plan

The Stinson Beach Community Plan (Marin County Planning Department 1985) contains the following "Land Use Goal and Objective:"

<u>General Goal</u>

Maintain the present balance between commercial, residential, and recreational uses within Stinson Beach. Foster the maintenance of the present socio-economic diversity and levels within the town.

<u>Objective 4.0</u>

Restructure land use controls to reflect the general and specific goals of this plan.

Bolinas Community Plan

The Bolinas Community Plan (MCCDA 1997) contains the following goals:

<u>Community Goal</u>

The Community Plan recognizes a reasonable mix of agricultural and residential uses as the 'highest and best' use for the land in the planning area. Both growth rate and scale of future development should not drastically change the existing pattern. The community has expressed preference for a growth rate lower than that which has occurred since 1960. Speculation on Bolinas land is not considered an essential element of the community.

<u>Agriculture Goal</u>

Agriculture on the peninsula will be encouraged as a source of food, income, and way of life.

<u>Landforms (Opens Space, Parks) Goal</u>

The unique aesthetic value of Bolinas landforms both spatially and visually shall be preserved. Areas of geologic and hydrologic hazard shall be defined, and limitations placed on their future development due to these hazards.

<u>Bolinas Lagoon Goal</u>

The Bolinas community shall be responsive to all the elements of this extraordinary lagoon including the effects of human activity in its watershed and on its shoreline.

Under Parks, recreation and Open Space, the Bolinas Community Plan states that,

"11. ... We urge the county to begin studies to determine the possibility of dredging the mouth of the channel, to improve the flushing capabilities of the lagoon, and to allow Bolinas fisherman better access to the sea."

3.8 AIR QUALITY

3.8.1 Introduction/Region of Influence

This section provides a discussion of ambient air quality standards, the general federal and state regulatory context associated with those standards, and existing air quality conditions for the project area. The project area is in Marin County, which is part of the nine-county San Francisco Bay Area. The regional Bay Area Air Quality Management District exercises local air quality management responsibilities. The ROI for air quality issues should generally be considered to be the entire San Francisco Bay Area, although the area of impact for some pollutants tends to be much more localized.

Air quality can be affected by primary pollutants, such as carbon monoxide and directly emitted particulate matter, which have localized areas of effect, and secondary pollutants, such as ozone, which have broader areas of effect.

3.8.2 Regional Air Quality Conditions

Both the federal government, through the Clean Air Act (CAA), and the state of California have established ambient air quality standards to protect public health and welfare. Standards have been adopted for six criteria pollutants—ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, inhalable and fine particulate matter (PM_{10} and $PM_{2.5}$), and airborne lead particles. Federal and state ambient air quality standards are presented in Table 3-4.

Areas that violate air quality standards are designated nonattainment areas for the relevant pollutants. Nonattainment areas are sometimes further classified by degree (marginal, moderate, serious, severe, extreme). Areas that comply with air quality standards are designated attainment areas for the relevant pollutants. Areas of questionable status generally are designated unclassifiable areas.

3.8.3 Local Air Quality Conditions

The California Air Resources Board (CARB) publishes annual summaries of air quality monitoring data collected by various agencies within California. The Bay Area Air Quality Management District (BAAQMD) operates the monitoring stations within the Bay Area. The closest monitoring station to Bolinas Lagoon is in San Rafael, approximately 10 miles east of Stinson Beach. This station is also approximately eight miles south of one of the potential disposal sites in Novato, California. The station monitors a variety of pollutants, including ozone, carbon monoxide, and PM_{10}. The monitoring results for these pollutants from 1992 through 1999 are shown in Table 3-4. These are the most current years for which air quality data are available.

As shown in Table 3-4, federal air quality standards were not exceeded between 1992 and 1999. The state PM_{10} standard has been exceeded a few times each year between 1992 and 1999, and the state ozone standard was exceeded a few times in 1996, 1997, and 1999. As of August 30, 1999, the Bay Area had exceeded the federal 8-hour ozone

Table 3-4
Air Quality Standards and Summary of Recent Air Quality Monitoring Data for Marin County

Pollutant	Parameter	1992	1993	1994	1995	1996	1997	1998	1999	Federal Standard	State Standard
Ozone	Peak 1-hour value (ppm)	0.07	0.08	0.09	0.09	0.11	0.11	0.74	0.102	0.12	0.09
	Days above federal standard	0.0	0.0	0.0	0.0	0.0	0.0	0	0	NA	NA
	Days above state standard	0.0	0.0	0.0	0.0	2.0	1	0	2	NA	NA
Carbon Monoxide	Peak 1-hour value (ppm)	8.0	9.0	6.0	6.0	7.0	6	NA	NA	35.0	20.0
	Peak 8-hour value (ppm)	5.0	4.0	3.0	3.3	4.0	2.6	3.30	2.92	9.0	9.0
	Days above federal standard	0.0	0.0	0.0	0.0	0.0	0.0	0	0	NA	NA
	Days above state standard	0.0	0.0	0.0	0.0	0.0	0.0	0	0	NA	NA
Inhalable Particulate Matter, PM_{10}	Peak 24-hour value ($\mu g/m^3$)	63.0	69.0	72.0	74.0	50	72	52.4	75.6	150	50
	Annual geometric mean ($\mu g/m^3$)	22.0	21.3	21.6	19.2	20.0	20.2	18.7	19.5	NA	30
	Annual arithmetic mean ($\mu g/m^3$)	24.5	23.3	24.1	20.9	21.8	21.9	20.1	22	50	NA
	Number of 24-hour samples	61.0	61.0	61.0	61	61	61	61	61	NA	NA
	% of samples above federal standard	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0	0	NA	NA
	% of samples above state standard	8.2%	1.6%	6.5%	1.6%	0.0%	3.2%	1.6	33.3	NA	NA

Notes: ppm = parts per million by volume.
$\mu g/m^3$ = micrograms per cubic meter.
NA = not applicable

Source: CARB 1992; CARB 1993; CARB 1994; CARB 1995; CARB 1996, CARB 1997; CARB 2000.

standard on six days and the one-hour state ozone standard on eleven days. According to the BAAQMD, during 1999, the North Counties, including Marin County, have exceeded the state one-hour ozone standard four times, and the federal 8-hour ozone standard once (BAAQMD 1999).

Because the monitoring station is 10 miles from the project area and on the opposite side of the ridge, the data are not a direct indication of the air quality in Stinson Beach.

3.8.4 Existing Air Emission Sources

The primary sources of air emissions within the Bolinas Lagoon watershed include building heating, maintenance activities, vehicle use (both land and water), recreation, and agriculture. These activities are small in scope and do not require air permits from the BAAQMD. No emission inventory data by source category are currently available for the project area.

3.8.5 Regulatory Considerations

The CAA requires federal agencies to comply with state and local air quality regulations. Section 176(c) of the act requires that federal agencies evaluate their proposed actions before proceeding to ensure consistency of such actions with the act and with applicable state air quality implementation plans. Proposed federal actions must not cause or contribute to new air quality standard violations, must not increase the frequency or severity of any existing violations, and must not delay the timely attainment of air quality standards.

The US Environmental Protection Agency (US EPA) has promulgated rules establishing conformity analysis procedures for transportation-related actions and for other (general) federal agency actions. The US EPA general conformity rule requires preparation of a formal conformity determination document for federal actions in federal nonattainment areas when the total direct and indirect emissions of nonattainment pollutants (or their precursors) exceed specified thresholds. The federal nonattainment and maintenance pollutants subject to conformity analyses in the Bay Area include ozone precursors (reactive organic compounds and nitrogen oxides) and carbon monoxide. Applicable threshold levels for federal actions in the San Francisco Bay Area are 100 tons per year of reactive organic compounds, 100 tons per year of nitrogen oxides, and 100 tons per year of carbon monoxide.

3.9 ONSHORE TRAFFIC AND TRANSPORTATION

3.9.1 Introduction / Region of Influence

This section provides a discussion of the transportation system in the vicinity of Bolinas Lagoon, including a description of the regional and local street system serving the watershed. The ROI for traffic and transportation is wider than for most other resource areas, and would include the routes followed by loaded trucks between the lagoon and Redwood Landfill.

3.9.2 Road Network

Bolinas Lagoon is bounded by Highway 1, the Shoreline Highway, Calle del Arroyo and Dipsea Road on the Seadrift peninsula, Olema-Bolinas Road, and Wharf Road in downtown Bolinas (Figure 3-17). Access to the sites where dry materials would be extracted from the lagoon would occur along these roadways. Staging of trucks, materials and other project related equipment is planned toward the northern end of Bolinas Lagoon at Winnebago Point located about 0.3 miles north of the Audubon Canyon Ranch on Highway 1. Other staging areas may be developed along Olema-Bolinas Road; however, very few locations in the form of pull-outs exist along any of the roads that access Bolinas Lagoon.

The project sponsor has recommended using Redwood Landfill in northern Marin County for disposal of upland soils and vegetative debris. To access Redwood Landfill, trucks could take one of several possible routes. One route would involve traveling north on Highway 1 through Point Reyes Station, east on Point Reyes-Petaluma Road to Novato Boulevard and San Marin Drive, and then north three miles on Highway 101 to the landfill. Another route would be south from Bolinas Lagoon along Highway 1 through Tamalpais Valley to Highway 1 near Manzanita. Trucks would then proceed northward on Highway 101 to either Hamilton Army Airfield or the Redwood Landfill in Novato.

Highway 1

Highway 1 (Shoreline Highway) is a two-lane state highway that links the Golden Gate Bridge to the south with Marin County and other coastal counties and communities to the north. Highway 1 is a rural coastal roadway and provides access to Mount Tamalpais State Park and Muir Woods. Highway 1 has numerous switchbacks and significant changes in grades. During the summer, significant numbers of visitors travel to Stinson Beach and Muir Beach, which are located along Highway 1 south of Bolinas. Traffic volumes along Highway 1 west to the west of Highway 101 in Marin County is highest just west of Highway 101 in Tamalpais Valley, where the daily traffic reaches about 31,500 trips and the peak hour traffic is about 2,700 trips. West of the Tamalpais Valley, traffic reduces to about 3,400 daily and 370 peak hour vehicle trips near Muir Beach. Near Stinson Beach the traffic increases again to about 5,400 daily and 590 peak hour trips. These traffic levels continue past Bolinas Lagoon to a point just north of the intersection of Highway 1 and Olema-Bolinas Road, where the daily traffic decreases to about 2,600 daily and 290 peak hour trips.

3-17 Local Roadways

Highway 1 to Redwood Landfill

Point Reyes-Petaluma Road is a two-lane rural highway that travels northeast toward Novato and Petaluma. East of Point Reyes Station, Point Reyes-Petaluma Road accesses the Nicasio Valley past the Nicasio Reservoir into the Hicks Valley. In Hicks Valley, it intersects with Novato Boulevard. Novato Boulevard proceeds easterly into the city of Novato along the northern portions of Highway 101 in Marin County. Novato Boulevard is a two-lane roadway to the west of the city in the rural portions of Marin County. Novato Boulevard intersects with San Marin Drive about three miles west of Highway 101. San Marin Drive proceeds north and east to Highway 101. San Marin Drive is a four-lane arterial roadway and a designated truck route within Novato. At Highway 101, the Redwood Landfill is located about three miles north of the San Marin Drive interchange.

Highway 101

Highway 101 near Manzanita has eight lanes and carries about 133,000 daily trips and about 10,600 peak hour trips. Highway 101 maintains eight lanes northward to the Sir Francis Drake interchange, where it reduces to six lanes. The six-lane section is maintained throughout most of Marin County to a point just north of San Marin Drive in Novato where it is reduced to four lanes. The peak traffic loads along Highway 1 occur in San Rafael at San Pedro Road. At this location, the average daily traffic reaches about 188,000 vehicles, while the peak hour traffic is about 15,000 vehicles per hour. Congestion occurs during the peak hours along Highway 101 during the AM and PM peak hours. Morning congestion occurs southbound from the junction of Highway 101 and Route 580 in southern San Rafael backward to the north to locations near the Marinwood exit south of Novato. During the PM peak hours, the northbound portions of Highway 101 are congested between Manzanita and San Pedro Road. In addition, on Highway 101 north of San Marin Drive in Novato, where the highway narrows from six to four lanes, congestion occurs during the PM peak hours. Vehicles queue toward the south as far as Highway 37. In May 2002, Caltrans started construction of the Highway 101 Gap Closure Project. This project will create a reversible High Occupancy Vehicle (HOV) lane between the Sir Francis Drake Boulevard/Highway 101 interchange and the existing HOV lane just north of San Pedro Road in San Rafael. Construction is estimated to require two to three years to complete.

Local Roadways

Olema-Bolinas Road is a two-lane roadway, which has no sidewalks, curbs, or gutters. The roadway is about 24 feet wide and accommodates unmarked parking. Traffic counts along Olema-Bolinas Road were not available.

Seadrift

Calle Del Arroyo provides access to the residential areas to the north of Stinson Beach. It is a two-lane roadway without curb and gutter. The roadway is about 24 feet wide and accommodates parking. No traffic volume data was available for this facility.

Seadrift Road and Dipsea Road are at the northern terminus of Calle Del Arroyo and serve as the internal roadways within the Seadrift residential area. Both of these roadways are between 20 and 24 feet wide. They have no sidewalks and accommodate parking on both sides. Access to the Seadrift community is controlled with security gates at the main entrance.

3.9.3 Traffic Volumes

Roadway operating conditions are described in terms of level of service (LOS), which indicates operational conditions as influenced by speed, travel time, freedom to maneuver, safety, driving comfort, and convenience. Uncongested free flow conditions are assigned LOS A, while gridlock conditions are represented by LOS F. Marin County has not yet made a finding concerning LOS in the area around Bolinas Lagoon (Wagner 1999).

Caltrans conducts annual average traffic counts on Highway 1 at the intersections with Bolinas Road and Bolinas-Fairfax Road. As can be seen from Table 3-5, the traffic counts on Highway 1 are relatively low.

Table 3-5
2000 Traffic Counts on Highway 1 near Bolinas Lagoon and on Highway 101 through Marin County

					Two-Way Traffic			
District	**Route**	**County**	**Milepost**	**Description**	**Peak Hour**	**Peak Hour LOS**	**Peak Month ADT**	**Annual ADT**
4	1	Marin	17.07	Fairfax/Bolinas Roads	590	A	5,800	5,400
4	1	Marin	17.2	Bolinas Road	280	A	2,750	2,550
4	101	Marin	5.69	Junction Route 131 East	13,300	E	176,000	166,000
4	101	Marin	12.69	San Rafael – San Pdero Road	14,100	F	181,000	176,000
4	101	Marin	19.09	Junction Route 37	12,100	D	151,000	147,000
4	101	Marin	22.00	San Marin Drive/Atherton Avenue Interchange	6,100	F	81,000	78,000

Source: Caltrans 2001
ADT: Average Daily Traffic

Anecdotal evidence from GGNRA staff indicates that although average traffic volumes are low through the lagoon watershed, traffic on hot summer weekends can be very heavy. When the parking lots at Stinson Beach Park are full or close to full, traffic on Highway 1 can back up for close to a mile in each direction (Giambastiani 1999).

3.9.4 Public Transportation

Golden Gate Transit provides weekend-only bus service from Marin City to Stinson Beach. Bus 63 stops at Stinson Beach Park. Eight buses run each weekend day at one-hour intervals, from 9 AM until approximately 6 PM. This is the only scheduled public transportation in the Bolinas watershed (Bay Area Transit Information Project 1999).

3.9.5 Parking

There are a few pull-outs along Highway 1 where people, such as birdwatchers and picnickers, park their cars in order to observe the wildlife on Bolinas Lagoon (MCOSD 1996). MCOSD allows these uses, although overnight parking or camping is not permitted (MCOSD 1996). Stinson Beach Park, administered as part of GGNRA, has over 1,000 parking spaces in its three lots, and these lots sometimes fill up on hot summer weekends (Giambastiani 1999). There is a small amount of public parking in Bolinas, along Wharf Road, and on Brighton Avenue, near the public access point to Bolinas Beach.

3.9.6 Regulatory Considerations

The following transportation objectives for Marin County (MCCDA 1999) are particularly applicable to the Bolinas Lagoon Watershed:

> Policy
>
> To minimize environmental disruption and condemnation of private or publicly owned land due to implementation of transportation projects.
>
> Policy
>
> To maintain the rural character of West Marin by maintaining the transportation system at a rural scale.

3.10 MARINE TRAFFIC AND TRANSPORTATION

This section focuses on the existing conditions of commercial vessel transportation in and around San Francisco Bay. The ROI for marine transportation is Bolinas Bay to SFDODS.

3.10.1 Vessel Transportation Service (VTS)

Pursuant to the passage of The Ports and Waterways Safety Act of 1972, the Coast Guard established a Vessel Transportation Service (VTS) for San Francisco Bay. The VTS is used to monitor all commercial, Navy, and private marine traffic within San Francisco Bay and local coastal waters. Vessels required to use the VTS are as follows:

- Power-driven vessels of 40 meters or more in length;
- Towing vessels of 8 meters or more in length, while navigating; and
- Vessels certificated to carry 50 or more passengers for hire, when engaged in trade (US Coast Guard 1999).

The only vessels excluded from coordinating traffic movements with VTS are small private vessels. However, all vessels over 20 meters long, as well as all dredges and floating plants, are required to keep VHF watch on designated sector frequencies. In addition, all fishing vessels and recreational vessels are encouraged to monitor VTS radio channels in order gather traffic movement information.

VTS services include the following:

- Designation of traffic lanes for inbound and outbound vessel traffic;
- Designation of separation zones between vessel traffic lanes; and
- Development of a set of rules to govern vessel traffic entering and leaving ports and San Francisco Bay.

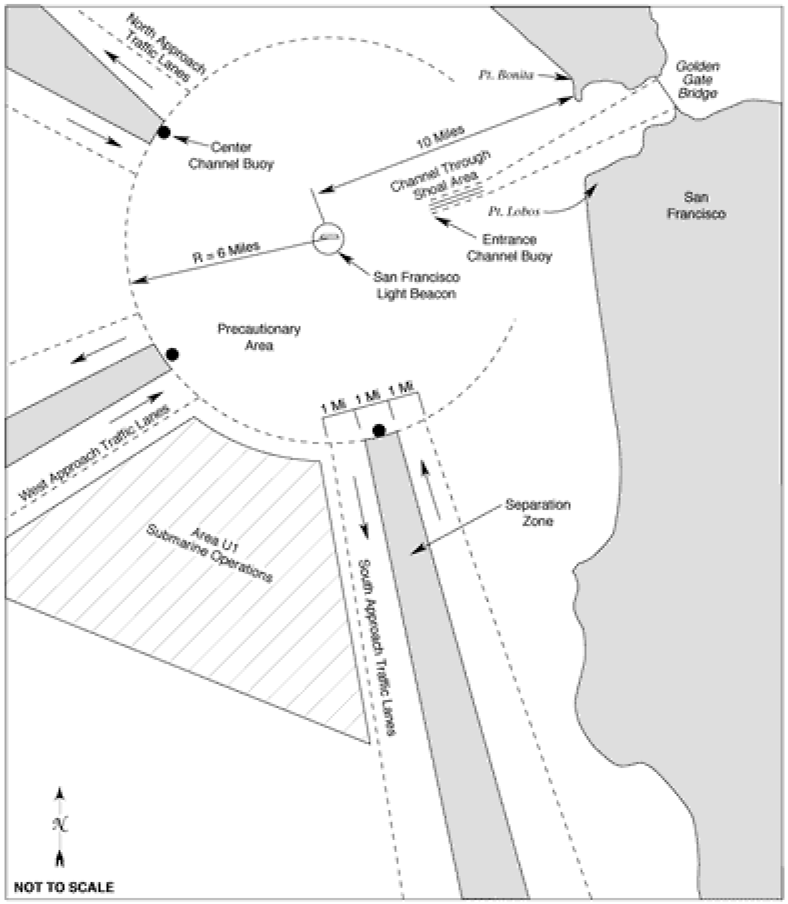
The VTS, which is on Yerba Buena Island, controls marine traffic throughout the San Francisco Bay Area.

Designated Traffic Lanes approaching San Francisco Bay

Dredge barges traveling from Bolinas Lagoon to the San Francisco Deep Ocean Disposal Site (SFDODS) would need to travel through the designated navigation channels approaching the Golden Gate Bridge. The following section describes the navigation channels in these areas.

Approach lanes to the entrance of San Francisco Bay have been established west of the Golden Gate Bridge in the Gulf of the Farallones, from the north, west, and south, as shown in Figure 3-18. Approach lanes are composed of one-mile-wide inbound and outbound traffic lanes, with a one-mile-wide separation zone between the traffic lanes.

Figure 3-18
Navigation Channels into San Francisco Bay



Source: Corps and Port of Oakland 1998.

The US Navy has designated areas for submarine operations outside these lanes, in which barge operations are not allowed. The approach lanes lead to an offshore light station with a rotating beacon that marks the beginning of the main channel to the Golden Gate Bridge. The beacon, 10 miles west of Point Bonita, is in the center of a precautionary area where all ships leaving and entering port converge.

Piloting in and out of the bay and adjacent waterways is compulsory for all vessels of foreign registry and US vessels under enrollment not having a federally licensed pilot on board. San Francisco Bar Pilots, who provide pilotage for vessels moving to and from all terminals in the bay and tributaries to the bay, embark or disembark from vessels at this point.

Ships bound for San Francisco Bay proceed in an easterly direction toward the Golden Gate Bridge through a narrow channel, which consists of inbound and outbound traffic lanes that are 600 yards wide with a separation zone between them (approximately 150 yards wide).

3.10.2 Hazards to Navigation

Hazards to navigation can be caused by a combination of shoals and islands, bridges and other structures, fog and inclement weather, vessel traffic, and, tides and currents.

The four-fathom bank (or Potato Patch) shoals are just west of the Golden Gate Bridge and north of the main entry channel to the bay.

Fog during the warmer months and storms in the winter can contribute to navigation difficulties. Fog typically occurs during the summer, especially in the late afternoon.

Strong currents are created in San Francisco Bay during periods of maximum ebb and maximum flood tides, reaching 4.5 knots at maximum ebb. However, currents above two knots are considered strong and potentially hazardous if not properly adjusted for. Currents are strongest at the Golden Gate and from the Golden Gate Bridge to the Bay Bridge.

In conjunction with the severe tides and currents in the bay, and the possibility of other ships straying from the traffic lanes, navigation can be extremely difficult during bad weather conditions.

Vessel traffic is the greatest hazard to vessel navigation in San Francisco Bay. As documented above, large commercial and naval vessels are required by US Coast Guard regulations to use designated traffic lanes when traveling into and within San Francisco Bay. However, smaller commercial vessels, such as tugboats, ferryboats, and private vessels, often do not navigate within specific traffic lanes, but rather travel in the most direct route. These vessels can pose hazards to navigation, particularly if other circumstances such as fog are present. Private vessel traffic is heaviest during weekend days and can pose hazards to dredge scows under tow, if the tugboats have trouble controlling their tows. Sporadic incidents, such as towing bridles that break and barges that run aground, can be found in many US Coast Guard vessel traffic reports (Corps and Port of Oakland 1998).

3.10.3 Vessel Traffic Entering/Exiting San Francisco Bay

The US Army Corps of Engineers reports that 7,541 commercial vessels transited the entrance to San Francisco Bay in 2000, including both inbound and outbound trips (i.e., 3,797 inbound and 3,744 outbound transits). Foreign vessels accounted for approximately 72 percent of these transits (5,444 transits) with domestic vessels accounting for the remaining 28 percent of transits (2,097 transits). Most of the transits were by self-propelled vessels (94 percent, or 7,059 transits) with six percent by auxilliary-propelled vessels (482 barge transits) (Corps 2000).

The US Coast Guard VTS Service in San Francisco Bay reported that more than 100,000 vessels participated in the VTS program in 1998 and 1999 (111,273 in 1998 and 107,826 in 1999) (Table 3-6). Most of the vessels were ferry/passenger boats and tug/tow boat combinations that remained inside San Francisco Bay and did not transit outside into the Pacific Ocean. Vessels transiting outside San Francisco Bay accounted for approximately six percent of all vessels tracked by the VTS system (US Coast Guard 2001).

Table 3-6
Participants in VTS in San Francisco Bay in 1998 and 1999

# of Participants	1998	1999
Tanker	3,136	3,039
Freighter	7,128	7,798
Tug/Tow	19,239	19,115
Ferry/Passenger	76,421	73,694
Public	2,179	2,542
Other	3,168	1,945
Total	111,273	107,826

Source: US Coast Guard 2001

According to San Francisco VTS, dredges or tug and tow combinations were involved in a limited number of physical incidents, in which damage actually occurred, including 14 incidents in 1998, 13 incidents in 1999, and 7 incidents in 2000. These incidents primarily involved striking a fixed object, such as a pier or bridge abutment, and vessel casualties. Some incidents also involved dragging anchors, a drifting barges, and a near miss, among other incidents. Only three of these incidents occurred in the deep water channels leading outside San Francisco Bay (US Coast Guard 2001).

3.10.4 Boating Activity

Recreational Vessels

According to the California Department of Boating and Waterways, there were approximately 173,000 registered recreational boats in the counties surrounding San Francisco Bay, down slightly from 177,000 registered boats in 1997.

Most recreational boating activity takes place between May and September. In addition, approximately 63 pecent of boating activity occurs on weekends, with the remaining 37 percent spread across all weekdays.

Most recreational boating activity in the area occurs inside San Francisco Bay. However, a small percentage of boaters also exit San Francisco Bay for trips along the coast to Bodega Bay, Drakes Bay, Pillar Point Harbor, and other coastal destinations or for an ocean cruise or for longer voyages to southern California, the Pacific Northwest, and beyond. Boaters frequently wait until there is a slack tide prior to crossing the bar. A frequent waiting place is along Bolinas Bay, where the beauty of the coastline combines with calmer water to make the crossing easier.

In 2000, a total of 906 boating accidents were reported to the Department of Boating and Waterways, involving 524 injuries, 51 fatalities, and $3,038,400 in property damage throughout all areas of California (California Dept. of Boating and Waterways 2000). Most of the accidents involved collisions with other vessels (341 instances, involving mainly other recreational craft, 33.4 percent of total), skier mishap (113 instances, 11.1 percent of total), flooding/swamping (88 instances, 8.6 percent of total), grounding (88 instances, 8.6 percent of total), and sinking (76 instances, 7.4 percent of total). Most of these accidents were caused by operator inexperience (381 instances, 28.2 percent), operator inattention (286 instances, 21.2 percent), excessive speed (219 instances, 16.2 percent), passenger/skier behavior (107 instances, 7.9 percent), hazardous weather/water (94 instances, 7.0 percent) (California Dept. of Boating and Waterways 2000).

Most fatalities involved falls overboard (15 instances, 25.4 percent), capsizing (15 instances, 25.4 percent), skier mishap (6 instances, 10.2 percent), flooding/swamping (4 instances, 6.8 percent), and collision with a fixed object (4 instances, 6.8 percent). Most of the fatalities were caused by operator inattention (18 instances, 21.4 percent), operator inexperience (16 instances, 19.0 percent), overloading/improper loading (10 instances, 11.9 percent of total), hazardous weather/water (8 instances, 9.5 percent of total), and excessive speed (7 instances, 8.3 percent of total) (California Dept. of Boating and Waterways 2000).

Approximately 73 percent of vessels involved in all accidents and 89 percent of vessels involved in fatal boating accidents were less than 26 feet in length. Accidents occurred mostly from May through September, on weekends, between 10:00 A.M. and 6:00 P.M. (California Dept. of Boating and Waterways 2000). The largest number of accidents (50 percent) occurred on lakes, followed by ocean/bay waters (28 percent) (California Dept. of Boating and Waterways 2000).

Commercial Fishing Vessels

There is an active commercial fleet engaged in fishing the waters in and around San Francisco Bay. In 1999, approximately 79 million pounds of fish products, with a value of nearly $27 million, was harvested in the area immediately in and around San Francisco Bay, representing 17 percent of the catch in California waters and 20 percent of the value (California Department of Finance 2000).

Safety Trends in Boating Accidents & Fatalities

There are several instructions for recreational and commercial boaters to improve safe transit.

As noted above, the most dangerous part of the San Francisco Bay Bar is considered to be the shallow northwest portion, better known as the Potato Patch. The Bonita Channel, between the shoal and the Marin coast, can also become very dangerous during large swell conditions. The safest part of the bar is the main ship channel

Table 3-7
Participants in VTS in San Francisco Bay and Number of Vessels not in Compliance

Area	Landings (In pounds)	Value
Bodega Bay	2,758,325	3,945,468
San Francisco	14,912,621	12,100,340
Monterey	61,376,614	10,634,184
subtotal	79,047,560	26,679,992
% total	14%	20%
Total	**545,299,578**	**132,701,264**

Source: US Coast Guard 2001

through the center of the bar; but even that area can be extremely dangerous when the tidal current is ebbing. It may be safer to remain at sea or in the bay until tide and wind conditions change and calmer seas occur. This is a very difficult crossing to make in bad weather or predominantly strong ebb tide conditions. Steep waves 20 to 25 feet high have been reported over the bar. Conditions over the bar may change considerably in a relatively short period. These are the conditions facing boaters attempting to transit the bar, as well as those boating along the coast of Marin County (US Coast Guard 1999).

Boaters are advised not to attempt to cross the bar without first consulting Chart #18649 of San Francisco Bay and the US Coast Pilot No. 7. The chart and the Coast Pilot No. 7 can be purchased through authorized nautical chart agents (US Coast Guard 1999).

To minimize the risk of collisions and groundings of large ocean-going vessels, the US Coast Guard's Vessel Traffic Service (VTS) was established in 1972. The system designates separated traffic lanes, a precautionary area and restricted areas, to coordinate the flow of deep-draft traffic into, out of and within the central portion of the bay (US Coast Guard 1999).

The rules state that vessels of less than 20 meters (66 feet), vessels engaged in fishing, and all sailboats shall not impede the passage of a vessel that can safely navigate only within a narrow channel or fairway (i.e., the traffic routing system). When practicable, boaters should travel in the direction specified by the routing system, staying to the right-hand side of channels, precautionary areas, and traffic lanes. In addition to these legal requirements, common sense should tell boaters that the right-of-way should be given to any large vessel navigating in a narrow channel. Because these ships require a greater area to maneuver and longer distances to stop, small craft should give them a wide berth. Due to their size, large vessels may appear to move slowly, but actually move very rapidly. The traffic lanes to which the deep-draft vessels are restricted are deeply dredged but narrow; because of the length of the deep-draft vessels, a sharp maneuvering turn can easily result in grounding. The location of the pilot houses on some vessels and their height above the water may limit the visibility afforded pilots of the areas directly surrounding their ships, particularly the area immediately to the fore and aft of the ship. In addition, the superstructure of a large vessel may block the wind, and persons operating sailboat and sailboard may unexpectedly find themselves unable to maneuver. Bow and stern waves can be hazardous to small vessels. Because of these factors and the congestion of vessels in the bay, it is essential that recreational boaters observe the rules and use common sense. Boaters should use extreme caution in the Precautionary Area between Treasure Island and the San Francisco waterfront because larger vessels and ferries transit this area from various directions. Boaters are cautioned that inbound deep-draft vessels normally use the Deep Water Route north of Harding Rock and Alcatraz Island. The traffic lanes are shown in Figure 3-18, along with the Precautionary Area and the Deep Water Route. Chart #18649, which shows the route and the routing system in detail, can be obtained from authorized chart agents (US Coast Guard 1999).

Boaters transiting the bay should first obtain information regarding major shipping traffic in their area by temporarily monitoring Channel 13 VHF-FM or Channel 14 VHF-FM. The VTS is in operation 24 hours a day and in all types of weather. In addition to the traffic system, VTS incorporates radar surveillance of marine traffic, radiotelephone communication, and information gathering and display.

Outside the bay, the Coast Guard maintains the Offshore Sector (see Figure 3-18). Regular broadcasts of the reported movement of large vessels transiting the approaches to San Francisco Bay are made at 15 minutes and 45 minutes past the hour. Boaters can listen to these broadcasts on Channel 12 VHF-FM (US Coast Guard 1999).

3.11 NOISE

3.11.1 Introduction / Region of Influence

This section provides a discussion of noise terminology, relevant state and local guidelines concerning land use compatibility with respect to noise, important aspects of local noise ordinances, and the general range of existing noise levels expected for various land use conditions. Because noise levels decline rapidly with increasing distance from the noise source, the ROI for noise issues is localized in the immediate vicinity of the areas where construction activity would occur. In general, noise intensities associated with project construction activities would become similar to background noise conditions at distances of about 1,000 to 2,000 feet from the construction site.

3.11.2 Noise Terminology

Noise can be defined as "unwanted sound." Sound travels through the air as waves of minute air pressure fluctuations caused by some type of vibration. Sound level meters measure pressure fluctuations from sound waves, with separate measurements made for different sound frequency ranges. These measurements are reported in a logarithmic decibel (dB) scale. Because the human ear is not equally sensitive to all frequencies, the "A-weighted" decibel scale (dBA) is used to weight the meter's response to approximately that of the human ear.

Average noise exposure over a 24-hour period is often presented as a community noise equivalent level (CNEL). CNEL values are calculated from average hourly noise levels, with the values for the evening period (7 PM to 10 PM) increased by 5 dB and values for the nighttime period (10 PM to 7 AM) increased by 10 dB. The weighting of evening and nighttime noise levels reflects the greater disturbance potential from nighttime noises.

The geographic area where noise effects may be felt from any potential Bolinas Lagoon sedimentation project is currently defined as the Bolinas Lagoon watershed. A secondary area of effects includes disposal truck routes to the upland disposal sites, as well as the area of the disposal sites themselves.

3.11.3 Existing Noise Conditions

Noise Receptors

Sensitive receptors are land uses, such as residences, schools, libraries, hospitals, and other similar uses, that are considered to be sensitive to noise. Sensitive receptors located within the watershed include hundreds of residences, two schools, and two libraries within the communities of Stinson Beach and Bolinas, which are both within three miles of the lagoon and the expected project area.

The sensitive noise receptors in the project area also include the Golden Gate National Recreation Area and Point Reyes National Seashore lands surrounding the lagoon, as well as the lagoon itself. In addition, although wildlife populations are not highly sensitive to noise per se, the protected harbor seal and bird populations within the lagoon would be considered sensitive receptors.

Noise Sources

The primary noise source at Bolinas Lagoon is motor vehicle use from traffic on major roads such as Highway 1, Olema-Bolinas Road, Bolinas-Fairfax Road, and smaller local thoroughfares. Although such motor vehicle use is generally low in comparison to traffic levels in the rest of the San Francisco Bay Area (see Traffic discussion section), traffic on hot summer weekends can be quite heavy and may have some noise effects. In addition, motorboat traffic from Bolinas Bay and the limited motorboat traffic on the lagoon itself may be audible within the lagoon watershed.

Ambient noise levels will vary somewhat, depending on proximity to highways and urban development. Wind conditions, insects, birds, and other wildlife will contribute to noise conditions away from developed areas. In general, ambient noise levels are likely to vary from about 35 dBA during quiet periods to about 60 dBA during windy periods. Depending on wind and wave conditions, noise levels may exceed 65 dBA at times along the Bolinas Bay beach portions of the Seadrift spit. Average CNEL levels for undeveloped areas around Bolinas Bay would be expected to be about 45 to 50 dBA. Average CNEL levels may be about 55 dBA for areas near highways.

3.11.4 Regulatory Considerations

The federal Noise Control Act of 1972 (P.L. 92-574) established a requirement that all federal agencies must comply with applicable federal, state, interstate, and local noise control regulations. Federal agencies also were directed to administer their programs in a manner that promotes an environment free from noise that jeopardizes public health or welfare.

Although the lagoon itself is not within National Park Service (NPS) control, the extent of NPS jurisdiction within the watershed would require the application of NPS noise regulations. Under 36 CFR 2.12, the use of machinery or instruments to create a noise exceeding 60 dBA, or the use of a motor or engine without a permit, is forbidden within park boundaries.

The California Department of Health Services (1987) published guidelines for the noise element of local general plans. These guidelines include a noise level/land use compatibility chart that categorizes various outdoor CNEL ranges into as many as four compatibility categories (normally acceptable, conditionally acceptable, normally unacceptable, and clearly unacceptable), depending on land use.

The state noise element guidelines chart identifies normally acceptable noise levels for low-density residential uses as CNEL values below 60 dB. The normally acceptable range for high-density residential uses is identified as CNEL values below 65 dB. For educational and medical facilities, CNEL values of 60 to 70 dB are identified as conditionally acceptable. For office and commercial land uses, CNEL values of 67.5 to 77.5 are categorized as conditionally acceptable. For recreation uses, CNEL values of 65 to 70 are conditionally acceptable.

The Marin Countywide Plan standards are based on the state guidelines. Under the Land Use Compatibility standard in the plan, residential neighborhoods, schools and libraries, and neighborhood parks are considered compatible with a CNEL of up to 60 dB. Such sensitive land uses cannot occur where the CNEL is between 60 and 70 dB unless noise reduction features are implemented in the new construction (MCCDA 1994.)

The Noise Element also sets forth the standard for stationary noise sources. Nighttime noise levels must be kept below 45 dB, with single-event noises of no more than 60 dB.

In addition, the lagoon is subject to the requirements set forth in the Marin County Open Space District (MCOSD) Code, which does not establish numerical noise standards but does prohibit “any loud, unnecessary or unusual noise which disturbs the peace or quiet within any area within the district.” (MCOSD 1999).

3.12 AESTHETICS AND VISUAL RESOURCES

3.12.1 Introduction/Region of Influence

This section addresses visual quality issues related to the proposed project. The visual character of the project area is described, and potentially sensitive visual resources are identified. In addition, local policies relating to the maintenance of visual quality are summarized. The ROI for the visual resources analysis encompasses the project site, as well as those portions of the adjacent residential and rural areas that are visible in the line of site of the proposed project. This would include the lagoon and adjacent upland, areas of the watershed with views of the lagoon and Bolinas Bay, Bolinas Bay itself, and Stinson and Bolinas beaches.

3.12.2 Character of Project Area

Bolinas Lagoon is a roughly triangular body of water separated from the waters of Bolinas Bay only by a narrow spit along the southeast edge of the lagoon. Much of the lagoon floor is exposed at ebb tide, and even at high tide numerous islands and marshes are exposed (Figure 3-19).

The lagoon rests in a narrow cleft running northwest to southeast, bordered on the northeast by Bolinas Ridge, which rises to approximately 1,500 feet above sea level, and on the southwest by a plateau that rises to about 450 above sea level and culminates at Duxbury Point on the southern tip of the plateau. The visual color of the watershed uplands varies with the season. In the winter months, depending on the amount of rain, the predominant color of the study area ranges from medium to bright green. In the drier summer and fall months, open lands are typically tan or light gold, with the wooded canyons and hillsides remaining the dark green of evergreen foliage.

West of the lagoon the land nearest the shore is wooded but clears to meadow and scrub as one moves westward towards the ocean. Highway 1 parallels the shore of the east side of the lagoon; from there the ground climbs quickly eastward into the heavily wooded slopes of Bolinas Ridge.

The southern edge of the lagoon is a long narrow spit of sand, which was developed in the 1950s as a gated community with an artificial lagoon in the center of the spit. On the other side of the Stinson Beach sand spit is a 3-mile expanse of private beach and then Bolinas Bay.

On the southwest corner of the lagoon is the Bolinas business district, which includes a small developed waterfront and a small harbor with docks and moorings. A number of houses along Wharf Road in Bolinas are built on stilts over the lagoon. South and west of the lagoon inlet is Bolinas Beach. Both Stinson Beach and Bolinas Beach look south over Bolinas Bay.

3-19 Views of Bolinas Lagoon and Bolinas Ridge

3.12.3 Views of Project Area

While title to the lagoon itself is held by the County of Marin, much of the watershed is in federal ownership. The two national parks, GGNRA and PRNS, meet in the Bolinas Lagoon watershed. As a result, the public has access to most of the watershed for recreational purposes.

Uplands

The hills and canyons east of the lagoon are mostly wooded with some meadows and scrub. The ground rises sharply from the shore of the lagoon to the top of Bolinas Ridge (Figure 3-19). Seven creeks have carved canyons into the western face of Bolinas Ridge and feed directly into the lagoon on its eastern side. Farther north, four other creeks feed into Pine Gulch Creek, which curves west around the north end of the lagoon to enter just above Bolinas. These canyons are overgrown with riparian trees and low-growing vegetation.

The view west of the lagoon is less dramatic visually, rising gradually to the mesa overlooking Duxbury Point. Much of this area is in private ownership, and there is extensive residential development on the southwestern tip of the mesa near Duxbury Point. The hills south and west of the Bolinas downtown are wooded but developed with residential and vacation houses, many of which can be seen from Agate Beach.

Lagoon Views

The southern boundary of the lagoon is a sand spit approximately three miles long. The northern third of the sandpit, known as Seadrift, was developed in the 1950s as a gated community with a long artificial lagoon occupying the inner portion of the Seadrift sand spit. The residences are mostly one- and two-story single-family homes, constructed in a variety of architectural styles. Most have extensive landscaping, including trees and fenced yards. The development on Seadrift is clearly visible from the north.

At the far western end of the spit are sand dunes and the narrow channel that is the mouth of the lagoon, opposite the buildings and piers of the community of Bolinas. The southern side of the Stinson Beach sand spit is a private beach with public access provided through Upton Beach. Above the high tide line on the ocean side of the Seadrift subdivision is a rock revetment designed to protect Seadrift residences from winter storm damage. Much of the western length of the lagoon is wooded along the shoreline, with little development discernable from other locations. The heavily-vegetated area of Pine Gulch Creek Delta protrudes into the lagoon and can be easily discerned from the road along the western and northern edges of the lagoon. Similarly, Kent Island is heavily wooded and can be seen clearly from Wharf Road in Bolinas, as well as from the Stinson Beach spit along the inlet, although it is less clearly discerned from the eastern or southern portions of the lagoon. The eastern shore of the lagoon is bordered by Highway 1, which, with its associated traffic, can be seen from other areas of the lagoon.

The lagoon itself, as seen in Figure 3-19, can appear to be either a broad expanse of open water interrupted by mudflats, or a broad expanse of mudflats interrupted by water, depending on the tide cycle. The edges of the lagoon and Kent Island contain wetland vegetation. The southeastern corner of the lagoon is primarily wetland, and there the vegetation is the primary visual element of the lagoon, along with the remains of a dredge that has in the past decades become a roost for a variety of bird-life.

Ocean Views

The expanse of Bolinas Bay immediately adjacent to Stinson Beach is within the project area. This area can be seen from the hillsides in the Bolinas watershed, as well as from Agate and Stinson Beaches. Visual elements frequently identified in Bolinas Bay include fishing vessels, recreational motor boats, kayakers, and surfers. The beaches are rarely devoid of human activity except in inclement weather, and during the summer months Stinson Beach in particular can be quite crowded.

3.12.4 Key Viewing Locations

Viewers most sensitive to changes in visual quality are local residents and those engaged in recreational activities. In general, motorists are only moderately sensitive to visual considerations because of their transitory exposure to the viewshed. However, there are multiple pull-outs along Highway 1 where motorists can watch wildlife and the scenery of the lagoon. The most sensitive viewers in the Bolinas Lagoon watershed are the permanent residents of Stinson Beach, Bolinas, and Seadrift, followed by the more transient recreational users of the public uplands, the lagoon, and Bolinas Bay.

Residential Views

The residents of the communities in the watershed have varied exposure to the visual resources of the project area because of their differing geographical locations. Stinson Beach and Seadrift residents would be particularly sensitive to visual impacts in the project area because of their location at the southeastern tip of the lagoon. Residents of Seadrift in particular have extensive views of the entire watershed, as well as views of Bolinas Bay. Residents whose homes overlook the lagoon from either side of Seadrift lagoon would also be sensitive to visual impacts in the lagoon. Residents of Bolinas and Stinson Beach whose homes overlook the ocean would be sensitive to visual impacts in Bolinas Bay.

Bolinas residents generally have views of the eastern side of the watershed. Although there is some residential development close to the lagoon, most Bolinas residential development has occurred closer to the ocean, just north of Duxbury Point. Only some of the residences in this area are within the watershed, and most of them have only limited views of the lagoon or Bolinas Ridge. However, many of the houses along the bluff have views of Bolinas Bay and the hills south of Stinson Beach.

Recreational Views

Because of the public status of most of the watershed, recreational users have extensive opportunities to appreciate the visual quality of the project area. The watershed is traversed by a network of hiking trails, many of which offer excellent views of not only the lagoon and Bolinas Ridge, but of the open ocean, Point Reyes, and Mount Tamalpais. Hiking trails are further described in Section 3.6, Public Access and Recreation.

Highway 1, which parallels the eastern side of the lagoon, has a number of unofficial pull-outs built upon deposited fill that provide clear views of the lagoon. Birders and other wildlife enthusiasts often use these pull-outs to observe wildlife in the lagoon. South of Stinson Beach, Highway climbs rapidly and provides extensive views of Bolinas Bay as well as the entire watershed.

Kayakers frequent the lagoon when the tides allow, and they appreciate the visual quality of the lagoon and the watershed during their paddling trips. Although kayaking is most popular in the summer, some recreational kayaking occurs year-round, weather allowing. The view of Bolinas Bay is appreciated by recreational users of Bolinas Beach and Stinson Beach, as well as surfers and boaters in Bolinas Bay.

3.12.5 Regulatory Considerations

Marin Countywide Plan Visual Protection Policy

According to the Marin Countywide Plan (MCCDA 1999) visual and aesthetic resources, especially scenic vistas, shall be protected by review of planned projects and removal of inconsistent existing elements.

> Policy EQ-2. 72, Viewshed Protection. The County shall protect visual access to the bay front and scenic vistas of water and distinct shorelines through its land use and development review procedures.
>
> Policy EQ-2. 73, View Corridor Identification and Enhancement. Existing built elements, such as overhead utilities, which detract from the shoreline and marsh landscape should be eliminated or blended into the environment. Sites with opportunities for near and distant views of the bay front and bay should be identified, protected and enhanced by improvements (turnouts, benches, etc.) where possible. View corridors and a low profile should be maintained on adjoining sites as well.
>
> Policy EQ-2. 74, Design of Waterfront Development. Waterfront development should be designed for openness and to permit optimal views for public enjoyment of the bay front.

3.13 PUBLIC SERVICES AND UTILITIES

3.13.1 Introduction/Region of Influence

This section describes public services, utilities, and related infrastructure that could be affected by the Bolinas Ecosystem Restoration Project. Placement of utility pipes and cables and ownership of such utilities are considered. Although utilities include freshwater distribution and treatment services, wastewater and sewage collection and treatment, telephone, gas, electricity, and solid waste, only those utilities that may have piping or cables that could interfere with the proposed project were considered in depth in this section. These utilities include: freshwater distribution and treatment services, wastewater and sewage collection and treatment, and telephone, gas, and electricity utilities.

Local agencies, municipalities, and companies, including the MCOSD, the Marin County Department of Public Works, Caltrans, Pacific Bell, the Bolinas Community Public Utility District (BPUD), the Stinson Beach Community, and the Stinson Beach County Water District (SBCWD) were contacted to provide information on the positions of utilities and location maps of utilities that may be impacted by the project.

The ROI for public utilities are all areas of the Bolinas Lagoon and watershed. Particular focus, however, was given to those areas where excavation is proposed.

3.13.2 Water and Wastewater

There are two water and wastewater districts in the Bolinas Watershed responsible for ensuring the adequate treatment and distribution of freshwater and for maintaining the sanitary sewer system. These districts include the BPUD and the SBCWD.

Bolinas Community Public Utility District (BPUD)

The BPUD manages the freshwater system, sanitary sewer system, and associated treatment facilities for the community of Bolinas. The area of jurisdiction ranges from historic downtown Bolinas to the Bolinas Mesa. The area of jurisdiction also stretches eastward along Olema-Bolinas Road to Dogtown (Kirker 1972).

All active water and sewage mains under BPUD jurisdiction are located at or above sea level. The only pipe that actually exists within the lagoon within BPUD jurisdiction is an unused sewage pipe that juts into the Bolinas Channel from the last house on Wharf Road. This pipe had marginal functionality until 1990. At this point, plans are not underway to reinstate the usability of this pipe, as such use would violate GFNMS regulations (Buchanan 2001a).

The BPUD constructed a pump station, a force main, and a treatment facility in 1975 in response to a state order to cease and desist disposing of system waste into Bolinas lagoon (BPUD 2000). The 90 acre sewage treatment facility, owned by BPUD, is located adjacent to Mesa Road (Buchanan 2001a).

The BPUD experiences occasional difficulties with the sanitary sewer system during times of particularly high rainfall or extremely high tides. These problems have been alleviated somewhat as a result of the ongoing Sanitary Sewer Collection System Rehabilitation Project (BPUD 2000).

In addition to managing water and wastewater, BPUD has joint ownership of Mesa Park, a recreation area located on Mesa Road, with the Bolinas-Stinson Union School District as the co-owner of Mesa Park. Other public utilities with potential to be managed by the BPUD include solid waste and energy. The BPUD and its associated five-member commission has served in the past as a forum for people to voice comments on community and government issues (Buchanan 2000).

Stinson Beach County Water District (SBCWD)

The SBCWD provides water and wastewater management services for the Stinson Beach community. The area of jurisdiction includes the areas of Stinson Beach and the Seadrift Community, and all areas of the watershed east of Highway 1 (Dinges 2001).

Several water and/or wastewater pipes maintained by the SBCWD exist within or adjacent to the lagoon. These include, in particular, one eight-inch PVC pipe, that serves the community of Seadrift with fresh water. The pipe runs between Highway 1 and Seadrift sand spit, along the route of an old causeway. A four-inch pipe also runs parallel to Highway 1, between the lagoon and the highway. The pipe is exposed in some areas (Dinges 2001).

3.13.3 Electricity and Natural Gas

Pacific Gas and Electric Company (PG&E) has ownership of the electric lines within the Bolinas watershed and supplies the communities of Stinson Beach, Seadrift, and Bolinas with electricity. Electric lines are located both above and below ground throughout the developed areas of the watershed, and above-ground mounted on poles in the lagoon parallel to Highway 1. There is no natural gas supplied to the areas of Stinson Beach, Seadrift, or Bolinas.

3.13.4 Telephone and Cable

Pacific Bell manages the telephone and cable equipment within the towns of Stinson Beach, Seadrift, and Bolinas. Telephone and cable lines are located both above and below ground throughout developed areas of the watershed. In particular, a bundle of cable is located under water in the Bolinas Channel running from the western tip of Seadrift sand spit to Wharf Road in the town of Bolinas. This line, which originates at the Pacific Bell switch on Calle del Arroyo in Stinson Beach and runs underground along the right side of Seadrift Road until it reaches the channel, is the only source of telephone and cable service for the town of Bolinas (Ford 2001).

Other telephone and cable lines are located parallel to Highway 1, mounted on poles that are in the lagoon during high tide. These lines provide telephone and cable service to areas north of Stinson Beach in the watershed, including Audubon Canyon Ranch (Ford 2001).

3.14 SOCIOECONOMICS

3.14.1 Introduction/Region of Influence

This section describes the contribution of Bolinas, Stinson Beach, and Marin County to the economy and social conditions in the region. The socioeconomic indicators for this study include economics, general population, race and ethnicity populations, and school, police, and fire information.

The ROI for socioeconomics is defined as Marin County and the unincorporated cities of Bolinas and Stinson Beach. Marin County encompasses 332,660 acres and is one of nine counties that comprise the San Francisco Bay Area. Bolinas Lagoon is approximately 12 miles north of San Francisco. Stinson Beach is immediately east and Bolinas is directly west of Bolinas Lagoon.

3.14.2 Economics

Employment

Between 1990 and 1999, total employment in Marin County increased by 19.6 percent (Table 3-8). The greatest increase at 38.3 percent was in the services sector, followed closely by transportation and public utilities at 36.0 percent and construction and mining at 32.7 percent. Wholesale trade experienced the largest decline in employment (-12.2 percent), and employment in the finance, insurance, and real estate, state government, and manufacturing sectors decreased by 5.9 percent, 5.5 percent, and 2.0 percent, respectively.

Table 3-8
Sector Employment, Marin County

Sector	1990	1995	1999	Percent Change 1993 to 1999
Farm	**0**	**700**	**500**	**NA**
Nonfarm	**93,300**	**100,000**	**111,100**	**19.1**
Mining and Construction	5,200	4,600	6,900	32.7
Manufacturing	5,100	4,700	5,000	-2.0
Transportation and public utilities	2,500	2,600	3,400	36.0
Wholesale trade	4,900	4,800	4,300	-12.2
Retail trade	21,500	23,200	24,300	13.0
Finance, insurance, and real estate	10,100	9,200	9,500	-5.9
services	31,100	37,300	43,000	38.3
Government	**12,900**	**13,600**	**14,700**	**13.9**
Federal	900	1,100	1,100	22.2
State	1,800	1,800	1,700	-5.5
Local	10,200	10,700	11,800	15.7
Total	**93,300**	**100,700**	**111,600**	**19.6**

Source: California Employment Development Department 1999.

In 1999, the civilian labor force for Marin County totaled 135,700, and 2,600 people were unemployed (1.9 percent unemployment rate). The unemployment rate was slightly higher for 1990 at 2.5 percent; whereas, in 1995 the unemployment rate was 4.3 percent (Table 3-9).

Table 3-9
Marin County Labor Force and Unemployment

	1990	1995	1999	Percent Change 1990-1999
Labor Force	130,600	128,600	135,700	3.9%
Employed	127,200	123,100	133,100	4.6%
Unemployed	3,300	5,600	2,600	-2.1%
Unemployment Rate	2.5%	4.3%	1.9%	-0.6%

Sources: California Employment Development Department 1999, DOF 2000b.

Marin County is primarily a residential county, with nearly half of the employed residents commuting to jobs in San Francisco or other Bay Area locations (Corps 1998). Most of the commercial and industrial development within the county is located along the US Highway 101 corridor that links communities within the county to San Francisco. Many also commute out of the area to find higher paying jobs in order to afford the higher cost of living in Marin County. Employment is concentrated in the services, retail, and government sectors, while agriculture and mining do not employ many county residents. More than 600 business establishments have been added to the county between 1987 and 1994. Most establishments (91 percent) are small businesses, employing fewer than 20 persons. Nearly one-quarter of all Marin resident workers are employed in professional occupations (Marin Economic Commission Undated).

Income

Marin County residents tend to have exceptionally high per capita incomes, with large sums derived from sources other than wages, and work in jobs that generally pay well. On a per capita basis, Marin County is California's wealthiest county. The county ranked first in the state in per capita personal income every year from 1981 through 1994 (Corps and Port of Oakland 1998).

In 1998, the per capita personal income for the affected area was $52,897, an increase of 47.2 percent over the 1990 income. Total personal income increased from $8,277 million in 1990 to $12,497 million in 1998, an increase of 51.0 percent. Between 1997 and 1998 total personal income increased by 5.4 percent, and per capita income increased by 4.6 percent. Table 3-10 lists the annual income in the affected area between 1990 and 1998.

Table 3-10
Personal Income Marin County

	Total Personal Income ($1,000,000s)	Per Capita Income ($)
1990	**8,277**	35,944
1991	8,515	36,679
1992	8,980	38,447
1993	9,230	39,346
1994	9,583	40,828
1995	9,747	41,679
1996	10,992	47,278
1997	11,856	50,556
1998	12,497	52,897

Sources: BEA Undated b, 2000.

Earnings by Industry

Earnings by persons employed in Marin County increased from $3,816,358 thousand in 1990 to $6,186,500 in 1998, an increase of 62.1 percent. The largest industries in 1998 were services with 44.0 percent of earnings; finance, insurance, and real estate, with 14.8 percent; and retail trade with 10.8 percent. Of the industries that accounted for at least 5 percent of earnings in 1998, the slowest growing from 1997 to 1998 was state and local government, and the fastest growing sector was construction (BEA Undated c). Between 1990 and 1998 earnings in transportation and public utilities; finance, insurance, and real estate; and services experienced the greatest amount of growth (more than 80 percent each); while farm earnings declined by 26.4 percent (Table 3-11).

Table 3-11
Earnings by Industry ($1,000s), Marin County

Sector	1990	1995	1998	Percent Change 1990 to 1998
Farm	15,116	10,630	11,132	-26.4
Agricultural services, forestry, fishing	57,006	66,348	NA	NA
Mining	1,923	5,496	NA	NA
Construction	334,285	310,235	430,556	28.8
Manufacturing	195,068	225,376	287,101	47.2
Transportation and public utilities	108,983	146,945	200,785	84.2
Wholesale trade	220,798	247,506	258,591	17.1
Retail trade	488,682	569,267	669,521	37.0
Finance, insurance, and real estate	499,577	659,897	917,701	83.7
Services	1,508,185	2,148,891	2,721,556	80.5
Government and government enterprises	386,735	561,297	605,401	56.5
Total	**3,816,358**	**4,951,888**	**6,186,500**	**62.1**

Sources: BEA 2000, Undated b.

The primary sources of income within the areas surrounding Bolinas Lagoon are recreation and tourism, with some agriculture on the western and northern sides of the watershed. The many parks and other recreational resources (discussed in Section 3.6) draw tourists and locals to these areas. Businesses in Stinson Beach and Bolinas rely on these summer and weekend visitors to provide income through boat rentals and recreation supplies, lodging, and food service. In the greater Bolinas/Stinson Beach area, sports-related recreation generates approximately $1.5 million per year, and more general tourism and recreation income is estimated at approximately $10 million per year (Tye 2000).

Stinson Beach

Stinson Beach derives much of its income from recreation and tourism. Businesses that rely heavily on these visitors include two kayak shops that provide boat rentals and guided tours of the lagoon, a theater, motels and hotels, gift shops, and restaurants. The Stinson Beach Community Plan has adopted goals for recreational use and activities for this area:

> Resident oriented recreational facilities should be provided within the village. Visitor oriented recreational facilities should not be substantially increased but improvements should be made through cooperation with the national park service and the state park system. (MCPD 1985).

Bolinas

As discussed in Section 3.6, there are various recreational areas throughout Bolinas. Businesses within Bolinas itself that rely on tourism and recreation include a surf shop, several small restaurants, and a small number of bed-and-breakfasts. While the Bolinas community benefits from recreational visitors, the stated community goals are to resist the pressure to overdevelop these resources. The Bolinas Peninsula Community Plan goals related to recreation are as follows:

> The Bolinas Lagoon community shall be responsive to all the elements of this extraordinary lagoon including the effects of human activity in its watershed and on its shoreline;
>
> The Bolinas Planning Area should not become the site of major commercial, tourist, and recreational development, either as a comprehensive plan for undeveloped lands, or as a piecemeal granting of larger scale development approvals;
>
> Tourist facilities (e.g., hotels, resort developments, motels, lodges, restaurants, bars, sports clubs, camp grounds, recreational vehicle parks, retail complexes) of such scale that they become destinations in their own right are not considered appropriate for the Bolinas Planning Area;

> The degree of environmental impact of the project on all natural systems but especially [causing] increased recreational use will affect beaches reefs, water edge lands, and other recreational areas endangered by overuse. (MCCDA 1997).

Commercial Fishing

While reduced in recent years, commercial and recreational fishing remains a source of income in the ROI, particularly in the community of Bolinas. There are approximately 12 commercial fishing craft and 25 to 30 recreational fishing boats out on Bolinas Bay on any given day in the season. Most activity occurs in the summer months (July through September), when there are around 30 to 45 total fishing boats on the Bay per day.

An estimated twelve commercial fishing boats are based in Bolinas Harbor. Fishing has diminished substantially since 1988, when there were more than 20 commercial fishing boats and 5,000 crab pots. The decrease in commercial (and recreational) fishing is due to the shallow depth of the water in the lagoon. The conditions under which boats can enter and exit the lagoon are much more limited, since higher tides are required to float the boats through the inlet. Sedimentation and the shallowness of the inlet have also made the surf line more hazardous and difficult to get through. When the lagoon inlet was less shallow, larger boats of up to 40 feet were able to dock in Bolinas Harbor; now the largest boats are no more than 24 feet long.

Salmon and halibut have been caught within 100 feet of the lagoon inlet, and halibut can be found all around the bay. Crabbing occurs between 3 and 15 miles out. Crabbing is a winter activity, occurring primarily November through June. Commercial fisherman receive a significant percentage of their income from Dungeness crab.

Species diversity has declined substantially: there are almost no perch anymore. However this is not the cause for the decline in commercial fishing, since the principal commercial fisheries are salmon, halibut, and crab.

3.14.3 Demographics

Population

As reported in the 2000 census, the population of Marin County was 247,289, that of Stinson Beach was 751, and that of Bolinas was 1,246 (US Census Bureau 2000; US Census Bureau 2000a; US Census Bureau 2000b). The population distribution of Marin County residents is concentrated along the US 101 corridor. This highway extends in a north-south orientation and provides a key transportation link between the employment centers of San Francisco and the suburban cities of Marin County. Extensive portions of central and western Marin County are sparsely populated with low density residential, agricultural, and recreational open space areas.

Regional growth since 1970 has been steady, with the total Marin County population increasing from a 1970 level of 208,652 to a 2000 level of 247,289 (California Department of Finance 1970; California Department of Finance 1980; MCCDA 1998).

Housing

Marin County had 104,990 housing units in 2000 with a 4.1 percent vacancy rate. The housing stock increased approximately 4.7 percent from the 1990 level of 99,757 when vacancy was around 4.8 percent. Approximately 63.6 percent of the housing is single-family units. Mobile homes make up about 1.7 percent of the Marin County housing stock. Multiple-family residences comprise about 29.4 percent of the remaining housing stock (DOF 2000a).

There are 629 housing units in Bolinas, with a 22.7 percent vacancy rate due primarily to seasonal and recreational usage (US Census 2000). Stinson Beach has 693 housing units with a 46 percent vacancy rate, again due to seasonal and recreational usage (US Census 2000a).

3.14.4 Public Health and Safety

The Marin County Sheriff's Point Reyes substation is responsible for 420 square miles, the vast majority of which is rural property. This substation, approximately 20 minutes north of Bolinas, covers both Bolinas and Stinson Beach. Other areas that are covered within this substation include Point Reyes, Olema, Inverness, Marshall, Tomales, and Dillon Beach. Police coverage is 24 hours a day, seven days a week. Substation staff includes one sergeant, one lieutenant, and eight deputy sheriffs. One officer is on duty per shift and patrols occur on two shifts, with each shift lasting twelve hours (Brunslick 1999).

The Bolinas Fire Department is at 100 Mesa Road, between Overlook and Olema-Bolinas streets. The fire department is approximately 2.5 miles from Bolinas Lagoon and is the only fire department in Bolinas. The department has four fire engines and two pickups and is manned from 8:00 AM to 5:00 PM with full-time employees. Between the hours of 5:00 PM and 8:00 AM, one duty officer is on-call, with volunteers available upon request if emergency assistance is needed. The Bolinas Fire Department has 1 fire chief, 5 full-time firefighters, 1 assistant chief, and 20 volunteers, 16 of which are Emergency Medical Training Defibrillator-certified (EMTD) (Brown 1999).

The Stinson Beach Fire Department is at 3410 Shoreline Highway and is the only fire department in Stinson Beach. The department has two type I engines, one type III engine, and one water tender, squad, ambulance, and utility vehicle. A type I engine is used in structural fires, while a type III engine is used for wildland fires. The department has one fire chief and 40 volunteers, 20 of which are EMT trained and a number of which are trained in cliff rescue work. Because the department is manned entirely by volunteers, there is not a staff consistently present at the station for a determined amount of time; however, all volunteers are on-call 24 hours a day, 7 days a week (Rand 1999).

CHAPTER 4
ENVIRONMENTAL CONSEQUENCES

4.1 INTRODUCTION

This chapter describes potential environmental impacts of the Bolinas Ecosystem Restoration Project. This chapter is organized into sections corresponding to the general resource categories identified as possibly being affected by the proposed project.

Each of the sections in this chapter contain the following information:

***Impact Methodology*—**Identifies the analytical tools, such as modeling, that are used to determine the level of impact.

***Significance Thresholds*—**Identifies Marin County significance thresholds and CEQA-based significance factors used to determine whether the proposed project would result in a significant adverse impact to the resource areas identified in the EIS/EIR.

***Impact Analysis*—**An in-depth analysis of potential environmental impacts associated with the proposed project. Impacts are only discussed under each reach if there will be an impact associated with that criteria. Impacts are identified as *Significant*, *Significant but Mitigable*, and *Less than Significant*.

***Mitigation Measures*—**Identifies potential measures to lessen or avoid environmental impacts.

4.2 Hydrology and Groundwater

4.2.1 Impact Criteria and Methodology

Criteria of Significance

Appendix G (Environmental Checklist Form) of the CEQA *Guidelines* indicates that a project's effects on water resources could be significant if the project were to result in substantial degradation of surface or groundwater resources compared to prevailing conditions or were to increase the potential for substantial flooding, erosion, or siltation.

Substantial degradation refers to a change in water quality that results in exceedance of, or noncompliance with, a regulatory standard or a loss of one or more existing or potential beneficial uses of the water. An impact to water quality would be considered significant if it were to result in any of the following:

- Violation of water quality objectives stated in the Water Quality Control Plan for the San Francisco Bay Region (SFB-RWQCB 1995);
- Impairment of beneficial uses of waters of Bolinas Lagoon or its tributaries, as defined in the Water Quality Control Plan for the San Francisco Bay Region (SFB-RWQCB 1995);
- Water or sediment quality conditions that could be harmful to aquatic life or human health, even if an accepted standard were not formally violated;
- An increase of potential for substantial off-site flood hazard (substantial flood hazard is greater than one percent, or once in one hundred years), erosion, or sedimentation; or
- Uses or facilities that would substantially degrade surface or groundwater quality.

Judgment must be used in determining the potential for erosion or siltation, as well as in determining the significance of water quality and flood hazards where no standards or flood zones have been identified.

Criteria of Success

In addition to the above evaluation criteria, the potential for the alternatives to meet the project objectives is discussed in this section. The project objectives include restoring hydraulic functions to Bolinas Lagoon that existed circa the early 1950s, while minimizing the need for future human intervention to maintain those functions. The discussion of the physical effects of the alternatives on circulation patterns, volume and depth, and their implications for water chemistry, turbidity, and flow velocity forms a basis for the discussion of these functions in relation to other resource categories (biological, recreational, and visual).

Stated simply, the lagoon is a delicate transitional region between a freshwater and seawater environment that is capable of providing a rich diversity of habitats. The project area is recognized as valuable for the biological diversity it supports and for the benefits it provides to people. The interaction of the lagoon's setting (watershed processes and tidal processes) with its geometry is ultimately responsible for this diversity.

The accumulation of sediment in the lagoon is a natural process that already might have caused the lagoon to evolve into a lake or upland if it were not offset by two other processes: Global sea level rise and subsidence of the graben due to activity of the San Andreas Fault. Within the recent geologic past, the area that is now lagoon has probably experienced large fluctuations in its size and character, sometimes becoming upland and sometimes becoming an arm of Bolinas Bay. Left alone, the lagoon might survive the threat of closure of its inlet channel if the graben undergoes another episode of subsidence. It is almost certain that the fault processes that have maintained the lagoon will continue to occur. But the risk that the inlet channel will close and that more lagoon habitat will be lost before the next major subsidence event occurs is thought to be unacceptable, given the consequences of lagoon closure on the habitats and species that the lagoon supports.

Dredging the lagoon to remove sediment has one thing in common with the natural processes of graben subsidence and sea level rise that have served to preserve the lagoon: It increases the lagoon volume and the tidal prism. However, subsidence and sea level rise differ from dredging in that the first two increase depth over the entire area of the lagoon, while dredging increases depth in certain selected portions of the lagoon. Subsidence during an earthquake is a sudden event, while sea level rise is almost imperceptibly slow. But neither process substantially alters the shape of the bottom of the lagoon, so that established channels, islands, and deltas retain their forms and locations. Dredging, on the other hand, could dramatically alter the shape of the lagoon bottom, allowing for the creation of new channels and lowering or removing existing high points to achieve a desired effect. With this ability to reshape the lagoon comes a degree of uncertainty about the effects of the changes. However, altering the shape of the lagoon to meet human objectives is not something new in the lagoon's history. Seadrift Lagoon provides an observational reference for understanding how the larger lagoon responds to a major alteration of its geometry. Computer modeling can also help in predicting and comparing the hydrodynamic effects of specific alterations in the lagoon geometry.

4.2.2 Riparian Alternative

Significant Impacts

Impact 4.2.1: Subsidence Impacts from Earthquake Activity

The lagoon graben (the block of earth's crust underlying the lagoon that lies between two active traces of the San Andreas fault) could subside after the dredging project has been completed. As described for the No Action Alternative, a strong earthquake would liquefy the sand spit and probably level the lagoon bottom, as well as destroy structures underlain by sandy sediments. While not a direct impact of the project, these conditions would form the backdrop for additional hydraulic effects related to the project.

A one-foot drop in the lagoon floor after completion of the dredging project would probably increase the effective tidal prism by much more than 720,000 cy. Additional volume would also be added below the range of low tides. Because more of the lagoon would be below the tidal elevation for more of the tidal cycle, the movement of water into and out of the lagoon would be more efficient, increasing the effective tidal prism and creating higher tidal current velocities. The higher current velocities might increase both the width and the depth of the inlet channel and might further erode shallow portions of the lagoon.

This increase in the lagoon opening would allow larger waves to enter the lagoon, transferring wave energy farther into the lagoon. The lowering of Kent Island would also allow waves to move farther into the lagoon. The effect would be greatest during southerly or southwesterly storms that are associated with El Niño conditions. An increase in the amount of wave energy entering the mouth of the lagoon could lead to enhanced erosion of the cliffs along the west side of the inlet channel and other shoreline effects.

Assuming that one foot of subsidence occurred and that this increased the volume of the lagoon by 1.5 million cy, in addition to the increase of about 1.2 million cy from dredging (this does not include the volume of emergent land on Kent Island), the resulting increase in the tidal prism would be about 2.7 million cy. At the current estimated rate of 26,000 cy of net sediment deposition per year (which may be an overestimate, given the higher tidal velocities in the lagoon following such an increase), it would take more than 100 years for the tidal prism to decrease again to current levels.

Higher current velocities and more efficient tidal exchange would increase the rate at which freshwater is flushed out of the lagoon and would increase mixing of fresh and seawater in the lagoon. This would increase the average salinity of the waters inside the lagoon and would result in more homogeneous salinity throughout the lagoon.

Mitigation 4.2.1: No feasible mitigation has been identified for this impact.

Significant but Mitigable Impacts

Impact 4.2.2: Water Quality Impacts from Construction

During construction, dredging would increase suspended sediment in the vicinity of the dredging activity. Cutterhead suction dredges operate by cutting into the sediment with a rotating cutterhead, while the suction line behind the cutterhead pulls the disturbed sediment into it. There is always some "spill," reportedly ranging from 5 percent to 40 percent of the disturbed material. This spilled material would be dispersed in the water surrounding the dredge and would be transported on currents. The percentage of spilled material generated would depend on the characteristics of the dredge, the angle of attack, and the way the dredge is operated. Once disturbed, sediment dispersion would depend on the sediment particle size and the current velocity. Sediment would be transported northward into the lagoon on flood tides and toward the inlet on ebb tides.

The bottom sediments consist of both fine-grained and coarse-grained sediments and organic matter, with coarse-grained sediments more abundant in the central lagoon. Coarse-grained sediments would be redeposited rapidly, while fine-grained sediments and organic matter would remain in suspension, increasing the turbidity of the water. Although some of the resuspended spilled sediment would be deposited in the interior of the lagoon, some would be transported out of the lagoon on ebb tides. Under a worst-case scenario, using the maximum dredging rate of 230 cy/hr and a moderate spillage rate of 20 percent, the spillage rate would be about 50 cy/hr. Assuming that half of the spilled sediment remains suspended in the water column for a six-hour tidal period, this would be an effective rate of sediment generation of 240 cy per tidal period. Assuming one ton per cubic yard, and further assuming a tidal exchange rate of about 4 million cy of water, this would result in an average increase in turbidity in the lagoon of about 50 milligrams per liter (mg/L), which is not significant. However, in practice the increase would be greatest near the dredge and would decrease farther from it. Depending on various factors, the turbidity could significantly increase near the dredge above background levels.

If enough decayed organic matter is suspended or dissolved in the water column, it may produce odors or change the chemical composition of the water, including decreasing pH and oxygen concentrations, increasing nitrogen and sulfide concentrations, and causing other chemical changes. Rapid changes in water chemistry might stimulate responses in the populations of organisms. Suspension of fine-grained sediments, either during dredging or when cut surfaces are exposed to high current velocities after dredging, could reduce water clarity in the lagoon. The magnitude and distribution of these water quality effects would depend on the nature of the sediments in the area being dredged, the method of dredging, and the velocity of currents that distribute the sediments after they are suspended. The effects of sediment disturbance would be greatest at times when the ambient water clarity is high and minor when the ambient water is already turbid, such as after a storm. Dredging is likely to take place during the summer and fall, when storms are less likely. Increased suspended sediment and changes in water quality are potentially significant, but mitigable, water quality impacts.

Some sediments in the lagoon may contain toxic compounds that when suspended could affect water quality. Former landfill materials along the margin of the lagoon may contain toxic substances. Runoff from farm areas to the North Basin, as well as rapid aquatic plant growth and decay in this area, may have resulted in organic matter accumulating and an oxygen-depleted, chemically reducing environment developing. Exposing these sediments by dredging and excavating could result in a significant but mitigable impact on water quality.

Mitigation 4.2.2: Sediment sampling and testing will be performed during the Project Engineering Design (PED) phase, to help identify potential conditions of concern to water quality prior to dredging. The use of small cutterhead dredges designed for minimizing sediment disturbance would reduce the impacts of turbidity. Sediment curtains or other barriers would be used, as needed, to isolate areas being dredged from ambient conditions. Water quality monitoring will enable dredging methods and practices to be adjusted to reduce adverse effects.

Impact 4.2.3: Long-Term Water Circulation Impacts

Changes in the shape of the bottom of the lagoon may substantially change circulation patterns within the lagoon, resulting in uncertain impacts. Many of the effects are likely to be beneficial because they will bring circulation to areas of the lagoon that have become isolated by sediment deposition. This is one of the intended effects of the alternative. The Riparian Alternative is intended to result in increased volume of tidal exchange, overall. However, the dynamic conditions to which the lagoon must adjust are complex, and the end result depends both on cyclical events and on the order in which noncyclical events occur. As a rule, the more alterations are made to the existing bottom topography, the less predictable would be the ultimate equilibrium bottom topography that results from the alterations, and therefore, the more likely that some additional adjustment of the bottom topography would be needed to correct an undesirable effect. Because the Riparian Alternative involves a large number of alterations, some of the results may not be desirable. An example of an undesirable result would be the creation of a large pool that does not fill or drain adequately and therefore experiences radical variations in water quality. Potentially adverse circulation impacts are expected to be mitigable.

Mitigation 4.2.3: Sediment transport modeling will be performed during PED. Potential adverse effects on lagoon circulation patterns will be identified by monitoring water quality and flow patterns, monitoring bathymetric changes, and observing the ways in which the lagoon geometry changes over time. If adverse effects are identified, the need for additional adjustments will be evaluated. Most of the adverse effects are expected to be identified during the construction period.

Less than Significant Impacts

Order of Project Implementation

The lagoon has evolved to its present state in response to a specific sequence of events (for example, large sediment inputs caused by logging, large storms, and subsidence) superimposed on a set of cyclical tidal events. These events tend to result in the network of branching tributary and distributary channels that circulate tidal waters into and out of the lagoon, somewhat in the way that lungs circulate oxygen and carbon dioxide to and from the blood. The sequential events are responsible for some of the larger features, such as islands, the Pine Gulch Creek delta, and the North Basin. The ultimate configuration of the lagoon is therefore highly influenced by the specific nature and order of the sequential events. In the same way, the ordering and rate of construction of project components may have an effect on the end result. For example, reestablishing the channel through Kent Island first may have a different outcome than doing it last. The impacts of the proposed order compared to some other order are uncertain. The proposed order is intended to maximize the early increase in tidal prism, both to achieve the greatest benefits and to enable the effects of the most substantial changes to be observed over the course of the construction period, when adjustments can be made most easily. One of the impacts of the proposed ordering of the construction schedule is that abrupt changes in water quality may occur early in the project, making it more difficult to discern the effects of small adjustments later on. The significance of the ordering is uncertain, and, other than altering the construction schedule in response to observations, there is no mitigation.

Water Quality in Bolinas Bay

Dredged sediments in a slurry form would be pumped to barges moored offshore in Bolinas Bay. The slurry would be contained in the barges and would not be dewatered before being transported to the disposal site. A rupture in the transfer pipeline could allow sediment to be pumped for a short time into Bolinas Bay until discovered and shut off. The volume of sediment released would not be large relative to normal sediment outflows following a rainfall/runoff event, for example. Therefore, water quality in Bolinas Bay is not expected to be significantly affected by the project.

Beneficial Impacts

The Riparian Alternative would increase the tidal prism, preventing the inlet channel from closing and maintaining tidal circulation in the lagoon, which would help to maintain the lagoon water quality. This is considered a beneficial impact of the alternative.

4.2.3 Estuarine Alternative

The Estuarine Alternative is nearly identical to the Riparian Alternative, and the water resources impacts are expected to be generally the same as those described for the Riparian Alternative, except those related to the dredging of the Pine Gulch Creek delta. Therefore, only the additional effects of this dredging are discussed below.

Significant but Mitigable Impacts

Impact 4.2.4: Water Quality Impacts from Excavation Materials

During delta dredging, spillage would contribute to turbidity. Deltaic sediments are rich in organic matter, and spilled sediment may enrich nutrient levels in the lagoon water, enhancing algae growth. Deltaic sediments are probably chemically reduced, so that when exposed to air, the sediments would liberate swampy odors and possibly some toxic forms of natural compounds, including ammonia and hydrogen sulfide.

Mitigation 4.2.4: The impacts of dredging on water quality would be carefully monitored to ensure that water quality is not significantly affected, and dredging would be performed slowly and during periods that are not critical for migrating fish. The rate of dredging may be reduced or the dredged area may be kept isolated from the lagoon to the extent necessary to maintain effects below a significant level.

Less than Significant Impacts

No other water resources impacts not previously identified for the Riparian Alternative are expected to result from the Estuarine Alternative.

Beneficial Impacts

The delta of Pine Gulch Creek is, like the channel of Pine Gulch Creek, a source of sediment to the lagoon. The distributary channels of Pine Gulch Creek can erode sediment stored on upland portions of the delta. Vegetation established on the delta helps to trap sediment and contributes to the growth of the delta. The geometry of the delta influences circulation patterns in the lagoon, for example, channeling sediment into the north lagoon. Removing portions of the delta would help to reverse these effects and would improve sediment transport from the lagoon.

4.2.4 No Action

Significant Impacts

Impact 4.2.5: Lagoon Closure

Under the No Action Alternative, the PGC Delta is projected to continue to build up and expand, and the tidal prism of the lagoon would continue to decrease. The effective tidal prism, as of 1998, was estimated from bathymetry and measured tide data inside the lagoon at 3,210,000 cy. The effective tidal prism is predicted to decrease to 1,640,000 cy by 2058, based on the current annual sedimentation rate. However, temporary or intermittent closure of the inlet channel is predicted as soon as 2058 (Corps 1999). This estimate is based on conservative assumptions and on the assumptions that there will be no major subsidence of the lagoon, and it takes into account only tidal flows, not freshwater inflows. When freshwater inflow is taken into account, the inlet channel would not begin to close until sometime after 2058.

Closure of the lagoon would allow the sand spit to extend across what is now the lagoon inlet channel. Wave action would build up the dune across the former inlet channel as it has built the dune elsewhere along the sand spit. This would create a dam or berm that would impound in the lagoon freshwater inflows from Pine Gulch Creek and other lagoon tributaries. Cut off from tidal exchange, the lagoon water chemistry would become increasingly dominated by freshwater inflows. A temporary freshwater/brackish water lake might form behind the sand spit, its depth and area depending on the rate of freshwater inflow. In the winter, when rainfall and runoff is higher, the lake level would rise. If left to natural processes, the elevation of the lake would be limited by the balance between inflow and losses from seepage through the sand spit and from evaporation. If inflows were great enough, the lake level would rise high enough to exceed the capacity of the berm formed by the beach sand dunes along the sand spit, and/or the sand spit might be eroded by winter storm waves. Eventually, the sand spit would be breached. The lake would then rapidly drain to the sea, and for a time the eroded breach in the sand spit would allow for tidal exchange into the lagoon/lake area. In practice, the lake level would probably rise too quickly, and the sand spit would need to be artificially breached to protect Highway 1 and other developed areas.

It could be possible to construct a permanent outlet structure for the freshwater so that it would not be necessary to breach the sand spit. This would result in the formation of a permanent channel and floodplain for Pine Gulch Creek and its tributaries. What is now the lagoon would remain low marshy ground, with areas below mean sea level. The other streams from the eastern slopes of the watershed would become tributaries to Pine Gulch Creek, as they extend their channels outward and join the main channel at points within what is now the lagoon. During the wet season, in high flows, the streams east of Highway 1 would continue to deposit a portion of their sediment loads upstream of Highway 1 to the extent that the culverts are undersized to accommodate storm flows.

Streams would remain within their channels as long as they were able to transport their sediment loads to the sea. However, the streams would adjust their gradients by depositing sediment in flat slow reaches or by eroding their channels in steep fast reaches until a channel network is created that transports the sediment load. In high flows, the area that is now the lagoon would be flooded periodically, and sediment would be deposited on the floodplain.

Inevitably, the graben underlying the lagoon would subside due to fault activity on the San Andreas Fault, as occurred in the 1906 earthquake. It is this periodic subsidence of Bolinas Lagoon by faulting that has maintained the lagoon when other tidal lagoons tend to fill with sediment and eventually evolve into woodlands. If the land surface subsides enough, tidal exchange to the low lying lands behind the sand spit could be reestablished, rejuvenating the tidal lagoon.

Intense ground shaking and extensive damage to property could occur as a result of a major earthquake on the San Andreas fault. Ground shaking would probably result in liquefaction of wet sandy sediments, which could cause foundations of structures constructed on the sand spit or other sandy areas with a shallow water table to sink.

The effects of closure of the lagoon inlet described above are considered significant because they would result in substantial changes in the lagoon geometry and function and in the water chemistry and beneficial uses of the lagoon. Because these changes would be due to natural conditions, they would not have regulatory significance. However, the changes in water quality and loss of a significant water resource (the lagoon) would be of a magnitude that would be considered significant if they were caused by human action. These impacts are not mitigable, except by increasing the tidal prism.

Significant but Mitigable Impacts

Impact 4.2.6: Flooding Impacts

The closure of the lagoon inlet could result in a significant increase in the risk of flooding of developed areas.

Mitigation 4.2.6: The hazard of flooding might be mitigable through engineering action to create a permanent outflow structure, but the feasibility of this has not been evaluated. Alternatively, the sand spit could be artificially breached, as needed, to prevent flooding. It is also possible that beach-building processes responsible for the expected closure of the inlet channel could be controlled by constructing groins, for example. Groins might prevent the accumulation of sand in the inlet channel and enable the channel to remain open despite a decreasing tidal prism. Any of these mitigation measures could reduce the risk of flooding to less than significant levels.

Less than Significant Impacts

Seismic and Subsidence Impacts

An earthquake of magnitude similar to the 1906 San Francisco earthquake is estimated to occur on average about once every 300 years on the portion of the San Andreas Fault that lies north of Monterey County. An earthquake of this magnitude, even if it were not centered near Bolinas Lagoon, might stimulate subsidence of the lagoon. The 1906 earthquake resulted in about one foot of subsidence in the lagoon. Assuming that one foot of subsidence occurred over the entire area of the current lagoon, it would result in a net increase in the effective tidal prism of about 720,000 cy (based on an effective tidal prism equal to 65 percent of the potential tidal prism and using the elevation-volume curve developed by the Corps [1999]). It would also increase the volume of the lagoon that lies deeper than the effective tidal prism by about 300,000 cy. The latter volume represents capacity for sediment storage that does not reduce the tidal prism. Assuming that the sedimentation rate remained at the current estimated rate of 26,000 cy per year, it would take approximately 46 years to fill this storage volume.

Under the subsidence scenario described above, the impacts of the No Action Alternative on water resources would be less than significant.

4.3 BIOLOGICAL RESOURCES

4.3.1 Impact Criteria and Methodology

Standards of significance are used to analyze potential project impacts and include factual and scientific information and regulatory standards of county, state, and federal agencies, including any regional guidelines. A threshold is used to differentiate whether there is a significant environmental impact or not. As this assessment is focused primarily on biological habitat and species, impact thresholds are based on factual evidence of physical disturbance of habitat, loss of habitat, and the loss or disturbance of listed species. Impact thresholds are reached and could have significant impact on biological resources if activities within the project area result in the following:

- A population of a threatened, endangered, regulated, or other sensitive species is adversely affected, for example, by reduction in numbers, by alteration in behavior, reproduction, or survival, or by loss or disturbance of habitat. Any "take" of a listed species is considered significant;
- Loss of a substantial number of individuals of a nonlisted species or loss that could affect abundance;
- A substantial adverse effect on a species, natural community, or habitat that is specifically recognized as biologically significant in local, state, or federal policies, statutes, or regulations;
- A substantial adverse effect on a species, natural community, or habitat that is recognized for scientific, recreational, ecological, or commercial importance;
- Permanent loss or significant degradation of any designated critical habitats, breeding areas, or any sensitive coastal, pelagic, or benthic habitats especially for any endangered, threatened, or rare species;
- Any impedance of fish or wildlife migration routes lasts for a period that significantly disrupts that migration;
- Any alteration or destruction of habitat prevents reestablishment of biological communities that inhabited the area prior to the project;
- Extensive alteration or loss of biological communities in high-quality habitat lasts longer than one year;
- Harassment (take) of a special status marine mammal species. There are two levels of harassment defined in the MMPA. Level A is defined as "any act of pursuit, torment, or annoyance that has the potential to injure a marine mammal or marine mammal stock in the wild"; Level B is defined as "harassment having the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering";

- Disruption of the feeding, breeding, nesting or roosting habits, directly or indirectly, of special status species (including federally and state-listed species, California fully protected species, and species of concern) or their habitats, as designated by federal, state, or local agencies;
- Result in substantial loss, reduction, degradation, or disturbance in native species habitats or in their populations. These impacts could be short- or long-term impacts; for example, short-term or temporary impacts may occur during project implementation, and long-term impacts may result from the loss of vegetation and thereby loss of the capacity of habitats to support wildlife populations. Degradation of native species could also result from introduction of invasive exotic species;
- Result in a net loss of wetland area or habitat value, either through direct or indirect impacts to wetland vegetation, loss of habitat for wildlife, degradation of water quality, or alterations in hydrological functions. This includes riparian habitat and federally protected wetlands;
- Result in substantial loss, reduction, degradation, or disturbance of sensitive plant communities and habitat types;
- Result in substantial interference with the movement of any resident or migratory species of fish or wildlife or with established native resident or migratory wildlife corridors;
- Conflict with any local policies or ordinances protecting biological resources; or
- Conflict with the provisions of an adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, or state habitat conservation plan.

Impacts, whether they are significant or not, can be direct or indirect. Direct impacts to biological resources result when biological resources or critical habitats are altered, destroyed, or removed during the course of project implementation. Indirect impacts to biological resources may occur when project-related activities result in environmental changes that indirectly influence the survival, distribution, or abundance of native species (or increase the abundance of undesired nonnative species). Examples of indirect impacts may include effects of noise, presence of chemical contamination, or incidence of human activity levels that may disturb or harm wildlife. It is also possible to have beneficial impacts, directly or indirectly. Finally, impacts may be short- or long- term. Short-term impacts are generally not considered significant, by definition.

4.3.2 Riparian Alternative

Activities associated with the proposed action would occur within habitat for several listed species. Dredging and disposal would occur for approximately three months per year over four to seven years. This alternative would affect riparian forest, upland, salt marsh, and intertidal habitat.

Significant Impacts

During construction, dredging would increase suspended sediment in the vicinity of dredging activity, increasing turbidity of the water. This in turn could reduce water clarity in the lagoon. This would be a significant impact for biological resources as it would affect survival of phytoplankton and zooplankton, which form the prey basis for many of the wildlife, fish, and bird species in the lagoon. Dredging processes could disrupt activities of wildlife around Bolinas Lagoon, and the presence of the pipeline and barge, as well as tugboat and barge movements, could affect biological resources in Bolinas Bay for the duration of the dredging. Noise, human disturbance, mechanical barriers from equipment and boats, all would affect wildlife, fish, and birds in the lagoon. Finally, some sediments in the lagoon may contain toxic compounds that, when suspended, could affect water quality, which in turn could affect biological resources. Highly toxic drilling fluid additives could contaminate local ponds, either by washing down natural drainages or binding to soil or via aeolian forces. Over time, this increase in toxicity could destroy microorganisms in the water or affect larger wildlife, fish, and bird species. Long-term impacts could come about from the loss of intertidal mudflat habitat as a result of dredging. This is a potentially significant impact because most of the benthic invertebrates that provide the main forage for birds are located in this important habitat type.

Impact 4.3.1: Impact on Benthic Invertebrates

The most basic, and potentially most significant, impact of dredging and increased turbidity would be on benthic (bottom- or mud-dwelling) and aquatic invertebrates in the vicinity of the cutterhead. Although no threatened or endangered invertebrates are reported to exist in the lagoon, these species are of vital importance because of the link that they provide in the food chain of the lagoon. Many of these species are filter-feeders, meaning that they feed by filtering organic matter out of water that passes through their bodies. Although most filter-feeders are adapted to a moderate amount of turbidity, as found under normal conditions, heightened levels of turbidity can clog their filters, making it difficult or impossible for them to continue feeding. This could result in mortality of many individuals of these species.

Invertebrates could be affected in other ways. A direct impact would come from the loss of invertebrates via mortality during dredging and removal of sediment. A disruption of habitat or life cycle of phytoplankton, benthic diatoms, and zooplankton, which form the very basis of the food chain and provide prey for filter-feeders, could occur.

Because invertebrates, particularly benthic invertebrates, form one of the first links in the food chain in the lagoon, the health of the invertebrates will influence the health of the rest of the species throughout the food chain. Any impacts to this level of the food chain would culminate in an indirect impact on the bird species that are at the top of the food chain.

It is impossible to fully assess the degree to which invertebrates would be affected by the project because there is no published material available that is specifically related to invertebrate ecology in Bolinas Lagoon. Furthermore, several factors may influence the degree to which this impact is realized. The first is that, of the 750 acres of lower inter-tidal (intermittently-exposed mudflat) habitat in the lagoon, approximately 174 acres would be dredged. This represents approximately 23 percent of the mudflat habitat in the lagoon. Dredging would take place over nine years, meaning that approximately 2.5 percent of the mudflat habitat available for habitation by benthic invertebrates and foraging by birds would be affected at any given time. Estimates regarding regeneration times for benthic invertebrates vary, but the HEEP estimates that these communities could begin to regenerate within two years. In this case, which is the best-case scenario, approximately five percent of the benthic habitat would be unavailable for invertebrates or the birds that feed on them during the project period. Total regeneration of benthic communities under this scenario would therefore occur within eleven years of the onset of the project, with varying levels of regeneration in dredged areas in the intermediate years.

A more probable scenario is that while total regeneration of certain components of benthic communities would take longer than two years (for example certain hardshell clams that may take up to twenty years to achieve maturity [Fong 2002]), other species, such as tubeworms and soft-shelled organisms, would begin to come back sooner. In such a case, while the quality of foraging habitat for birds and other organisms in the food chain would be compromised, this effect would become less pronounced over time.

It is possible that benthic invertebrate communities would experience significant regeneration within two years of dredging in any given area on their own, in which case the impacts would be diminished. However, because of the extremely important role these organisms play in the ecology of Bolinas Lagoon, impacts to them resulting from project activities are considered significant and unmitigable.

Mitigation 4.3.1: Impacts to benthic invertebrates are considered unmitigable because the project involves dredging and removing the habitat in which these species reside, as well as direct mortality (from mechanical processes or increases in turbidity or toxicity of their habitat) to individuals in the populations. Most of these species are found in the substrate throughout the year; therefore, there are no work windows that can be established to offset impacts to these species.

Impact 4.3.2: Loss of Jurisdictional Wetland

Jurisdictional wetland and waters of the US are found throughout the project area. Waters of the US include all unvegetated intertidal and subtidal areas within the lagoon, while wetlands are found in the vegetated salt marsh, freshwater marsh, and riparian areas of the uplands. Approximately 100 acres of wetland would be affected in PGC Delta and Kent Island. During the design phase of the restoration project, the Corps will comply with the requirements of the CWA and the Rivers and Harbors Act.

Destruction of over 0.5 acre of any wetlands is considered a significant impact, according to the CWA. Furthermore, salt marsh habitat of the type that would be removed is an important source of food for small organisms in the lower intertidal area (intermittently exposed mudflats), which then provide food for birds. Salt marsh, especially in the PGC Delta, is also an important refugia for certain sensitive bird species, such as the black rail and the salt marsh common yellowthroat.

Mitigation 4.3.2: No feasible mitigation has been identified for this impact. Appropriate mitigation for loss of approximately 100 acres of jurisdictional wetlands is creation of similar wetlands, on-site. However creation of this amount of intertidal wetlands within the lagoon restoration area is not physically possible as it would conflict with the basic objectives and purposes of the project, which is intended to increase tidal volume in Bolinas Lagoon. Wetlands are upper intertidal habitat, and creation of such habitat would lower tidal prism rather than increase it. As a result, there is no feasible on-site mitigation for the loss of wetlands.

Off-site mitigation would require the creation of 200 acres of wetlands at the 2:1 ratio preferred by the CWA. This is infeasible as well because it would be inconsistent with County policies regarding keeping the mitigation in geographic proximity to the project site, there are no acceptable locations close to Bolinas Lagoon, and the cost of creating, restoring or enhancing this amount of wetland offsite could prevent completion of the lagoon restoration project as proposed.

The goal of the project is to restore valuable lower intertidal and subtidal habitat, found at a lower elevation than salt marsh. Although dredging would eliminate jurisdictional wetlands, this loss would be replaced by more than 2 million cy of new or restored highly ecologically valuable lower intertidal and subtidal habitat in furtherance of the project's purpose and need. While this does not technically constitute mitigation for the loss of jurisdictional wetlands, there would be an overall substantial net environmental benefit derived from the increase of these other types of habitat, which otherwise significantly offsets the loss of the jurisdictional wetland/intertidal habitat. Additionally, some salt marsh vegetation is expected to reestablish in the zone between 2 and 4.5 feet NGVD, and this would also partially offset impacts caused by the loss of salt marsh. (This re-established salt marsh in the lagoon margin would not fully mitigate the loss of jurisdictional wetlands to less than significant).

Impact 4.3.3 Loss of Black Rail Habitat

Excavation of salt marsh habitat would have significant impacts on the state-listed as threatened California black rail. Although salt marsh habitat is found in many parts of the lagoon, the largest patches are around the apron of PGC Delta. This area offers the best habitat for this species and is where informal surveys have detected the most members of the species (HEEP 2001). Furthermore, as the habitat available for this species diminishes on a regional basis, remaining patches, such as that found in PGC Delta, become increasingly important. PGC Delta offers uniquely suitable habitat for the black rail in that bulrush is found near the pickleweed salt marsh there, a combination preferred by the species.

Mitigation 4.3.3: The only way to mitigate for loss of black rail habitat would be to restore salt marsh vegetation that would be lost as a result of project activities. As there are no plans to mitigate for the loss of salt marsh habitat, impacts on the black rail are unmitigable.

Less than Significant Impacts

Foraging and resting habitats of many bird species, including the federally listed endangered brown pelican and the federally listed threatened western snowy plover, are found in the project area.

Sensitive Bird Species

Brown pelican: The affected areas for the brown pelican would be in the north basin and open water areas of the central and south lagoons. Activities such as dredging, equipment installation, and lights and noise from equipment may cause minor impacts to pelicans. Breeding and nesting would not be affected, as pelicans do not conduct those activities in northern California. Pelicans are in the proposed project area from late June through October.

The pelican's ability to forage would be slightly compromised near the dredge due to noise from the equipment and turbidity from the dredging process, and lights and noise may disturb them while they are roosting. Increased turbidity is not expected to be a significant impact, in that pelicans feed on surface fish, and turbidity would be greatest toward the bottom of the lagoon around the cutterhead. The duration of impacts to the pelican in this area would not exceed two months per year in the North Basin. The central lagoon would be excavated from July through October, most of the time that the pelican is present, while the south lagoon would be open for dredging from July through February. The GFNMS would retain final discretion regarding times when dredging equipment could enter the lagoon. Overall impacts to the pelican would be considered short-term and nonsignificant. The proposed action presents a relatively low amount of impact at any given time, and the impacts at any given time are confined to an area that is only a small percentage of the available habitat at Bolinas Lagoon.

Western snowy plover: The western snowy plover forages within the project area, primarily at the tip of the Seadrift sand spit, just south of the mouth of the lagoon (Stallcup 2001) but also in the sand bars of the open water areas during low tide. Although the project area is in proximity to critical habitat for the snowy plover, the species does not nest or mate in the project area. The proposed action would involve placing a pipe across the northern end of Stinson Beach, in the area used as foraging habitat by the western snowy plover, which would fragment the area in which the plover could forage without taking flight. Removing some tidally exposed sandbars would remove a small amount of foraging habitat for the western snowy plover. The annual placement of the pipe over the beach might temporarily disrupt the plover's foraging activities, but the amount of foraging habitat lost would be minimal, and no significant impacts to this species would occur as a result of project activities.

Northern harrier: The northern harrier would lose some nesting habitat when salt marsh is removed. This would be a temporary and less than significant impact, as the species would be able to find sufficient alternative wetland while the affected salt marsh regenerates.

Salt marsh common yellowthroat: The salt marsh common yellowthroat may be temporarily affected by project activities because it resides in salt marsh habitat. Impacts are expected to be less than significant because the species would be able to find sufficient alternative wetland while the affected salt marsh regenerates.

Other bird species: Other listed or sensitive bird species, such as the marbled murrelet and the northern spotted owl, are not expected to be significantly affected by the proposed project activities because these species lack habitat in the project area. Both of these species require old-growth temperate forest composed of redwood and Douglas fir trees, species that are not found in the project area. The California clapper rail is considered to be extirpated in the project area and therefore would not be affected by project activities (Stallcup 2001).

Sensitive Fish Species

Steelhead trout: Project activities that are most likely to affect the steelhead trout are removal of sediment east of the riparian area of the PGC Delta and removal of vegetation within the upland and riparian area itself. This area would be excavated between July and October, outside of the time that the steelhead would normally be present. Short-term effects would be disturbance from excavation in the delta and riparian area, as well as increased turbidity from sediment removal in the vicinity of the cutterhead. Permanent effects would be loss of marginal spawning habitat in the riparian zone.

In-migrating trout may encounter some turbidity in the excavation area of PGC Delta. This would occur between the mouth of the creek and the open water areas. Some loss of marginal spawning habitat may occur in areas that are cut to restore tidal flow. Removal of riparian vegetation may result in slightly higher water temperatures in Pine Gulch Creek. Access to spawning grounds would be increased after the sediment bar at the mouth of the stream was removed. Any sediment removal from the mouth of Easkoot Creek would enhance access to this stream. In this respect, the project would have a net beneficial impact on the steelhead trout.

Coho salmon: Project activities that are most likely to affect the coho salmon are removing sediment east of the riparian area of the PGC Delta and removing vegetation within the upland and riparian area itself. This area would be excavated between July and October, outside of the time that the coho would normally be present. Short-term effects would be disturbance from excavation in the delta and riparian area, as well as increased turbidity from sediment removal in the vicinity of the cutterhead. Permanent effects would be loss of marginal spawning habitat in the riparian zone.

Excavation in the PGC Delta would improve the coho's access to Pine Gulch Creek. Lowering sandbars and excavating open water channels would remove possible impediments to their historic spawning grounds, resulting in a beneficial impact to the species. Increased turbidity near the cutterhead is not expected to affect the coho, as it does not linger in the open water channels. Channels within Pine Gulch Creek would be disturbed in the short term during removal of upland and riparian vegetation. Vegetation removal may result in slightly higher water temperatures in the more easterly portion of the stream that is now shaded by willows and alders.

A colony of approximately 50 harbor seals is frequently found on the edge of the open-water channel in the east-central part of the lagoon. Increasing the size of these channels could improve the chances that fish would be able to make it through this area without being preyed on by seals.

Waterborne Invertebrates

Some invertebrates that exist in the water column may be present only seasonally. Furthermore, these species are generally more mobile than species that exist only in the mud and are therefore more able to avoid construction impacts. Impacts to species that exist in the water column could be mitigated by working only during windows that correspond to times when these species would not likely be present in the lagoon. In order to establish these windows, the lead agency would conduct surveys to determine the presence of these species.

Sensitive plant species

Numerous sensitive, threatened, or endangered plant species are listed as possibly occurring in the project area. Those that occur in open water, salt marsh or riparian habitat would be most at risk of impact from the proposed action. Those that may occur in these habitats within the project area are listed below. During the planning phase, proposed excavation areas would be surveyed for the presence of sensitive, threatened, or endangered plant species. If it were determined that these species were present, the restoration alternatives would be planned in such a way that these plants would be avoided. The project proponent would salvage, grow, and replant any sensitive plants that could not be avoided during excavation

Point Reyes bird's-beak: Figure 3-10 indicates that Point Reyes bird's beak is found on Kent Island, and would therefore be impacted by excavation of the island. The site will be surveyed for this species before construction, and the project proponent will reestablish impacted populations in a different part of the lagoon, overseen by a qualified botanist. This revegetation effort will be monitored for five years to ensure that the population becomes established. Compliance with this mitigation will ensure that impacts to this species are less than significant.

Sonoma alopecurus: This species is known only to five native occurrences, totaling 200 individuals. This species has not been recorded in PGC Delta, and it is doubtful that it occurs there. There would be no impact to this species from project activities.

Marin knotweed: This species is known from only fifteen locations (CNPS 2001). Although not reported in the project area, it occurs in habitat such as that found in PGC Delta. If it were present, it would be affected by project activities. Construction in this area should be preceded by surveys for this species. If it were determined that the species is present, the project proponent will reestablish populations in a different part of the lagoon, overseen by a qualified botanist. Compliance with this mitigation would ensure that impacts to this species are less than significant.

No Impact

Harbor seals: There would be no impacts to harbor seals from dredging as no dredging would occur during the seal pupping and molting periods (March through July).

Other species: There would be no impact to any other species mentioned in Table 3-3. In all cases, either there is no habitat for the species in the project area, or the habitat that is available would not be impacted by project activities.

4.3.3 Estuarine Alternative

Impacts and mitigations occurring under the estuarine alternative would be the same as those for the riparian alternative, except that there would be additional impacts to the California red-legged frog. This is because the two alternatives are the same, except that the estuarine alternative also proposes removal of seven additional acres of riparian and 10 additional acres of upland and intertidal habitat in PGC Delta. This would result in a greater impact to jurisdictional wetlands: as much as 10 acres more would be lost under this alternative.

Significant but Mitigable Impacts

Impact 4.3.4: Impact to the California red-legged frog

The part of the proposed action area that offers best potential habitat for the California red-legged frog is a riparian zone that has formed in the PGC Delta. The proposed action would eliminate seven acres of riparian vegetation that offers abundant streamside vegetation, pools up to six feet deep, and undercut banks, all qualities preferred by the species. Although the frog is not known to inhabit this part of the PGC Delta, it does occupy other streams found nearby (Fellers 2001). If the species were present, removal of this habitat would constitute significant impacts in the form of loss of foraging and breeding habitat, as well as take during construction.

Mitigation 4.3.4: The project proponent would conduct surveys to establish the presence of the species, in accordance with USFWS protocols. If the results of the survey indicated that the species were not present, the project proponent would restore suitable habitat for the species at a ratio of 3 to 1 on-site, for any riparian habitat that was destroyed as a result of the project, or at a ratio of 5 to 1 if the restoration were conducted off-site. If the survey indicated that the species is present in the proposed action area, the project proponent would consult with the USFWS to determine appropriate mitigation procedures, such as revegetation with native riparian plant species.

4.3.4 No Action

Significant Impacts

Impact 4.3.5: Loss of Habitats

Under the No Action Alternative, there would be no effort made to dredge or otherwise alter the lagoon. The lagoon would be allowed to siltify and eventually to close. This is a natural process in most lagoons, and under normal circumstances this would mean that there would be no significant impacts to biological resources, even though such sedimentation and closure would cause a drastic change in the ecological makeup of the lagoon. However, many of the reasons that Bolinas Lagoon is siltifying at an accelerated rate are due to human influence, either through human activity in the watershed or because of development that inhibits tidal flushing. Therefore, there is a strong argument that since human activities have strongly influenced the rate of ecological change in the lagoon, then the impacts of closure of the lagoon inlet should be considered significant and long-term. Under the No Action Alternative, sediment would continue to build up and fill in open water areas within the lagoon, which in turn would decrease the extent of tidal inundation, diminish water quality, and degrade existing habitat values. Over time, this would result in the loss of open water, salt marsh, riparian, and transitional habitats and associated plant and animal species. These would be direct significant impacts to biological resources based on the criteria presented in Section 4.3.1.

4.4 GEOLOGY

4.4.1 Impact Criteria and Methodology

Based on the Marin County significance criteria and the CEQA checklist, the project is considered to have a potentially significant impact on geological resources if:

- The project were located within an Alquist-Priolo Special Studies Zone, or a known active fault zone, or an area characterized by surface rupture that might be related to a fault;
- The substrate consists of material that is subject to liquefaction or other secondary seismic hazards in the event of groundshaking;
- There is evidence of static hazards, such as landsliding or excessively steep slopes, that could result in slope failure;
- The site is in the vicinity of soil that is likely to collapse;
- Soils are characterized by shrink/swell potential that might result in deformation of foundations or damage to structures;
- The site is in a Mineral Resource Zone;
- The site is next to a water body that might be subject to tsunamis or seiche waves;
- It would increase the potential for human injury or economic loss from earthquakes, slope failure, or other geologic hazards;
- It would result in a substantial loss of soil, a substantial reduction in important farmland, or loss of access to economically significant mineral deposits; or
- It would damage or degrade an important geologic feature or landmark.

4.4.2 Riparian Alternative

Significant but Mitigable Impacts

Impact 4.4.1: Erosion of the Tidal Inlet Channel and Banks

By increasing the tidal prism, tidal inflow and outflow velocities would increase. This would cause the inlet channel bottom to scour and the banks of the inlet channel to erode, with the result that the cross-sectional area of the tidal inlet channel would increase. This is actually one of the intended results of the project. The channel is most likely to be widened by erosion of the least resistant materials, so most of the channel widening would come from erosion of the west end of the sand spit. However, increased tidal flow velocities at the inlet may also increase erosion of the beach at the base of the cliffs on the west side of the channel inlet, and could increase erosion of the cliffs themselves. Similarly, enhanced bank erosion or channel scouring could affect the embankment supporting Wharf Road where it extends along the inner portion of the inlet channel. Minor loss of beach sand is not considered a significant impact, but undermining of the coastal bluff and undermining of Wharf Road would be significant impacts, if they occurred. It is not certain that significant erosion would occur. As the inlet channel widens and deepens in response to an increase in the tidal prism, the inflow and outflow velocity in the inlet channel would decrease, until eventually, velocities and channel dimension would approach an equilibrium condition, and the erosion process would slow down. The rate of widening of the inlet channel would be controlled by the rate of increase of the tidal prism by dredging, which would increase very slowly over a period of nine years. After project buildout, tidal inflows and outflows would be more efficient, with less channel friction. This may result in a small overall increase in channel flow velocities, relative to existing conditions.

Mitigation 4.4.1: If it occurs, enhanced erosion of the bluffs on the west bank of the inlet channel could be partially mitigated by placing protection structures at the base of the bluff, including riprap, cement walls, or bluff armoring. Bluff erosion is a natural process that occurs under current conditions. Some amount of bluff erosion is inevitable and acceptable. The rate of erosion would be monitored to determine if mitigation is warranted. Currently, the embankment supporting Wharf Road is partially armored (for example, by riprap and by concrete retaining walls). Because the rate of increase of the tidal prism would be slow, it is expected that the increased rate of erosion of the west bank of the channel would be slow enough, and the amount of increase in flow velocity would be small enough, that shore protection mitigation measures could be implemented, if needed, before significant damage occurred.

Less than Significant Impacts

Enhanced Wave Attack in Lagoon Interior

At high tide levels, when the depth of water in the inlet channel is greatest, more of the incident wave energy would travel farther into the lagoon than under current conditions or the No Action Alternative and would be expended on points inside the lagoon. This may increase erosion of shoreline features inside the lagoon, including the south shore of Kent Island, the bluffs on the west side of the inlet channel, and the eastern shoreline along Highway 1. It is expected that, due to the distance from the inlet channel to Highway 1, and the geometry of the lagoon channels, wave energy would be dissipated before it reaches the shoreline of Highway 1 and that the erosion impacts from increased wave energy would be less than significant. The magnitude of any increase in wave action along the west side of the inlet channel (and Wharf Road) is likely to be minor, relative to the range of existing conditions.

4.4.3 Estuarine Alternative

The impacts of the Estuarine Alternative would be the same as those described for the Riparian Alternative.

4.4.4 No Action Alternative

Significant but Mitigable Impacts

Impact 4.4.2: Inlet Channel Narrowing or Closure

A reduction in the tidal prism of the lagoon would eventually reduce the power of tidal flows and would result in closure of the lagoon entrance channel. Narrowing or closure of the lagoon would accelerate sediment deposition in the lagoon. Freshwater inflows to the lagoon would continue, and some of the freshwater would seep through the permeable sand spit. If inflows exceeded seepage rates, the level of freshwater behind the sand spit would increase. The higher water level could cause Highway 1, houses on the sand spit, and other shoreline features to flood. This would be a significant adverse impact of the No Action Alternative.

Mitigation 4.4.2: Because the flooding that would result from closing the inlet channel would not be acceptable, a method would have to be found to release the excess water. A number of engineering options are available for releasing the water from the lagoon, and it can be assumed that some workable engineering solution could be found, if cost were not a limiting factor. (Implementing such mitigation measures under the No Action Alternative is not within the project scope and would be the responsibility of the MCOSD or others.)

The characteristics of the lagoon area would become largely dependent on the nature of the outlet. Three general classes of mitigation to control the water level in the lagoon below flood levels can be envisioned: Measures that allow tidal exchange in the lagoon to continue (that cause the tidal inlet to remain open); measures that cut off the lagoon from tidal exchange; and measures that involve temporarily opening the lagoon to tidal flows (such as breaching the sand spit when needed). Details of the design and effectiveness of potential flood mitigation options are not currently available.

An example of the type of measure that might be used to keep the inlet channel open in spite of a reduced tidal prism is construction of groins seaward of the mouth of the lagoon. The groins would be designed to direct sand that is presently carried along the shoreline of the sand spit away from the tidal inlet and into the deeper waters of Bolinas Bay. Sand would presumably continue to build up on the east side of the groin, widening the beach there, but the groin would act as a barrier, preventing the extension of the sand spit. If successful in preventing the tidal inlet from closing, the tidal prism could continue to decrease, but the tidal inlet would continue to function as an outlet for the runoff from the lagoon watershed.

Less than Significant Impacts

Fault-Related Lagoon Subsidence

Subsidence of the lagoon by natural fault-related processes could increase the tidal prism and might result in many of the same benefits that the action alternatives are designed to provide. This would be a significant impact of the No Action Alternative. But the probability of it occurring is unknown.

Keeping in mind that there is a high degree of uncertainty associated with predicting the rate of subsidence of the lagoon graben or the probability that subsidence would occur within a given time, it is nevertheless likely that the lagoon graben will continue to subside in conjunction with movement on the San Andreas Fault. It is possible that a subsidence would occur within the next 50 years, the time predicted for the mouth of the lagoon to close. The USGS estimates that the recurrence interval for an earthquake with a 7.95 moment magnitude, originating on one of the segments of the San Andreas Fault from Santa Cruz north, is about 361 years.

Subsidence of the lagoon graben may very well occur in association with such a large magnitude earthquake, even if the earthquake were not centered near the lagoon. However, the smaller the event, the nearer to the lagoon the epicenter would need to be for subsidence to result. But smaller events are more frequent. Thus, for example, the USGS has estimated that there is a 10 percent probability of a magnitude 6.7 or greater earthquake centered on the northern segment of the San Andreas Fault within the next 30 years. A magnitude 6.7 earthquake is less powerful than the 1906 earthquake by a factor of 40. None of these estimates is intended as a direct measure of the probability of lagoon subsidence; but as an indirect measure, they suggest that an event large enough to cause major subsidence of the lagoon is an infrequent occurrence, relative to the predicted timeframe for closure of the mouth of the lagoon.

4.5 Cultural Resources

4.5.1 Impact Criteria and Methodology

National Historic Preservation Act

Section 106 of the NHPA requires federal agencies to consider the effects of their actions on properties listed on or eligible for listing on the NRHP. Section 106 and its implementing regulations state that an undertaking has an effect on a historic property (i.e., NRHP-eligible resource) when that undertaking may alter those characteristics of the property that qualify it for inclusion on the NRHP. An undertaking is considered to have an adverse effect on a historic property when it diminishes the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Adverse effects include, but are not limited to, the following:

- Physical destruction, damage, or alteration of all or part of the property;
- Isolation of the property or alteration of the character of the property's setting when that character contributes to the property's qualifications for the NRHP;
- Introduction of visual, audible, or atmospheric elements that are out of character with the property or changes that may alter its setting;
- Neglect of a property, resulting in its deterioration or destruction; and
- Transfer, lease, or sale of a property without adequate provisions to protect its historic integrity.

Native American sites (whether they are considered NRHP-eligible or not) may also be protected under the American Indian Religious Freedom Act of 1978 and the Native American Graves Protection and Repatriation Act of 1990.

An action that may alter any characteristic of a resource that contributes to its importance to Native Americans would be considered to have a significant effect on that resource. The significance of an effect to a Native American resource is determined based on the importance of the resource to Native American groups and the type of effect the project will have. These effects may include changes to the resource itself or to its setting.

Marin County CEQA Criteria

The significance of impacts to historical and archaeological resources is generally determined by whether federally or state-listed resources are affected by the project. Impacts are determined by asking the following questions:

- Does the project disrupt or adversely affect a prehistoric or archaeological site, or a property of historic or cultural significance to a community or ethnic or social group, or a paleontological site, except as part of a scientific study?

- Does the project affect a local landmark of local cultural or historical importance?

CEQA requires state agencies to consider the effects of their actions on historic resources (including archaeological sites), as described in the CEQA guidelines (Section 15064.5). The CEQA guidelines state that a project may have a significant effect on the environment when it causes a substantial adverse change to the significance of a historic resource. This substantial adverse effect is defined similarly to the adverse effects identified under the NHPA above, namely physical demolition, destruction, relocation, or alteration, such that the resource would no longer be considered eligible for the California or local historic register (Section 15064.5).

Marin County has made it unlawful to disturb in any fashion any Indian midden without a permit issued by the Department of Public Works (Marin County Code Ord. 1589 § 2,1967). Conditions for permits to be issued include, but are not limited to, a 60-day period to permit archaeological investigation and proper identification, classification, and analysis of recovered artifacts (Ord. 1825 § 2,1971).

4.5.2 Riparian Alternative

Significant but Mitigable Impacts

Impact 4.5.1: Damage to Undiscovered Cultural Resources

Impacts to cultural resources under this alternative could result from construction operations. Under this alternative, impacts could include the possible destruction of both previously recorded and undiscovered archaeological sites or sensitive Native American sites. Dredging operations that disturb strata below the 50-year-old silt deposition level and land-based excavation of upland sites could encounter archaeological sites.

Archaeological sites have been recorded along the shore of the Main Channel and under the fill of Highway 1, and evidence indicates there may be undocumented sites beneath accumulated deposits on the shore of the lagoon.

In Bolinas Bay, anchoring the barges and dragging the disposal pipeline along the bay bottom may disturb or destroy unrecorded submerged cultural resources, such as shipwrecks. These impacts could be mitigated by implementing the mitigation measures detailed below.

Mitigation 4.5.1: In areas where dredging or fill removal could dig below the 50-year silt accumulation or modern fill, the removed material should be monitored by a qualified archaeologist. The archaeologist would have the authority to stop work, record the material, and determine potential significance.

Native Americans should be consulted before any ground-disturbing activities begin to determine if sensitive resources could be affected, and monitoring for Native American artifacts should coincide with dredging of areas identified as sensitive.

Any areas within Bolinas Bay that could be affected either by either barge anchoring or disposal pipeline dragging should be surveyed for cultural resources. If resources are discovered, a plan would be developed to avoid and protect them.

4.5.3 Estuarine Alternative

For cultural and Native American resources, the impacts and mitigation measures described for the Riparian Alternative are the same as those for the Estuarine Alternative.

4.5.4 No Action

Under the No Action Alternative, any cultural resources would continue to be preserved under the tidal silt, within the Pine Gulch Creek Delta, beneath Kent Island, and under road fill along Highway 1.

Less than Significant Impacts

Previously recorded archaeological sites and undiscovered sites that may be covered by additional sand and silt would be buried further and would remain undisturbed.

4.6 PUBLIC ACCESS AND RECREATION RESOURCES

4.6.1 Impact Criteria and Methodology

Impacts to recreational resources were assessed by determining the types of recreational uses in the project area, then evaluating these uses to determine their sensitivity to the short-term and long-term project effects. Consistency of project activities with the objectives and policies of the Countywide Plan and LCP related to recreational resources, as summarized in Section 3.6, also was considered.

The criteria listed below have been developed to address likely impacts on recreational uses in the project area and would include any violation of Marin County plans and policies regarding recreational resources. A discussion of the visual impact of the project machinery on the recreational experience is presented in the visual resources analysis. The project is considered to have a significant impact on recreational resources under any of the following conditions:

- It were to interfere with recreational uses of the beach, ocean, lagoon, or parks for a substantial length of time or it were to interfere with the public's right of access to the sea;
- It were to substantially prevent a year-round recreational use or substantially prevent a recreational use during peak season;
- It were to increase the use of recreation resources such that substantial physical deterioration of the facility would occur or be accelerated;
- It were to require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment;
- It were to result in closure of countywide park and recreation facilities, if the need for these facilities still exists, in conflict with County Policy PR-2.3;
- It were to prevent or eliminate maintenance of dedicated trails or easements, unless other arrangements had been contractually agreed on, in conflict with County Policy TR-4; and
- It were to conflict with or be incompatible with recreation-related objectives, policies, or guidance of the Countywide Plan, the LCP, or management plans or policies of MCOSD or GFNMS.

4.6.2 Riparian Alternative

Significant but Mitigable Impacts

Impact 4.6.1: Lagoon Recreation Access

The presence of the pipeline in the lagoon would have an additional impact on recreational use of the lagoon. During the three-month construction period for each of the nine years of the project, the pipeline would run from the dredge to the end of the

Stinson Beach spit and then out to the disposal scow. During high tide the pipeline would float, and during low tide it would likely rest on the mudflats. Because the dredge would at least sometimes be at the north end of the lagoon, the pipeline would necessarily interfere with kayakers attempting to cross the lagoon. The pipeline might even completely close off access to certain areas of the lagoon for kayakers, depending on their entry point to the lagoon. If the dredge is excavating the North Basin, for instance, kayakers putting in along Highway 1 on the north end of the lagoon could find it impossible to cross over to the west side of Kent Island. However, these impacts would be limited to three months of the year, while kayakers use the lagoon nearly year-round, weather permitting, and could continue to kayak in other areas of the lagoon during excavation. In addition, there are other areas similar to Bolinas Lagoon outside the ROI that would continue to be available for kayaking, particularly Tomales Bay and Drake's Estero to the north.

Motorboats would be similarly affected by the presence of the pipeline; the residents of Seadrift put in their motorboats from the boat launch on the northwest of the Seadrift development. From there they can travel west to the lagoon inlet and out to sea. Regardless of the location of the dredge, the pipeline would cross directly in front of this route and prevent Seadrift boaters from leaving the lagoon. This would be a significant impact.

Mitigation 4.6.1: This impact on kayakers and Seadrift recreational boaters would be mitigated by submerging the pipeline at one or two places along its length within the lagoon. Kayaks draw only five inches of water, but motorboats draw no less than two feet. As part of PED, the pipeline would be anchored to the bottom of the lagoon as it crosses the Main Channel, and this location would be clearly marked by buoys in order to allow boaters to cross the pipeline at high tide. However, because motorboats draw two feet of water, and the pipeline is 12 inches in diameter, there would have to be at least three feet of water in the channel for motorboats to cross safely. It is possible that even in the deepest section of the Main Channel there would be insufficient water depth for motorboats to cross the pipeline during certain points in the tide cycle. This mitigation would, however, provide for some recreational access for motorboats and kayaks during the construction period.

Less than Significant Impacts

Construction Impacts: Lagoon Recreation Access

The presence of the dredge in the lagoon for up to three months per year for nine years would interfere to some extent with kayaking and other recreational activities in the lagoon. The physical presence of the dredge and associated machinery (siltation curtains and support boat, for instance) would prevent kayakers and anglers from entering whatever portion of the lagoon is being excavated. In addition, the dredge would indirectly interfere with recreational opportunities for kayaking, fishing, and wildlife viewing by whatever limited disturbance of wildlife might result from dredge activities. While dredge activities are being scheduled to limit fish and wildlife disturbance as much as possible, it is unlikely that no wildlife would be disturbed, and thus this would be an impact not only on the wildlife, but on those who engage in wildlife viewing as a recreational activity. Dredging in the lagoon would be localized and temporary, and these impacts would therefore be considered less than significant.

Removal of the vegetation and upland soils from PGC Delta would be staged from the MCOSD property along Bolinas-Olema Road. This would interfere with access by bird-watchers and hikers to recreation opportunities on this MCOSD property. However, this interference would be confined to the period during which construction was actually ongoing in this area, which would be only a small time, compared to the overall length of the project. Alternate locations for these activities include wildlife viewing along the shores of the lagoon and the beaches and hiking along trails in the watershed and along the beaches.

Construction Impacts: Highway 1 Access

The excavation of the Highway 1 fills would probably result in temporary closures of at least one lane of Highway 1 during the project period. Because the Highway 1 fills are not a major element of the project, these closures are unlikely to last more than one season out of the possible nine seasons of project activity.

These closures would temporarily interfere with motorists' opportunities to stop and view wildlife in the lagoon. It might also interfere with kayakers' and anglers' access to the lagoon along that side. Finally, it would have an adverse impact on bicyclists' use of Highway 1. Because the excavation along Highway 1 is of limited duration, these impacts are not considered to be significant.

Using Winnebago Point as a staging area for the entire project would interfere with use of that location for wildlife viewing. However, this is not a significant location for recreation activity, and several other turnouts would continue to be available for motorists along Highway 1.

Construction Impacts: Beach and Bay Recreation Access

The pipeline across Stinson Beach Spit would be in place for three months per year for up to nine years. Actual installation and removal of the pipeline each year would be of limited duration, and the pipeline would be constructed so as not to block access to beachgoers, probably by use of a bridge or walkway installed over the pipeline. The presence of the pipeline could be considered an interference with the public's right of access to the sea, but the pipeline would occupy an area where the public's right of access is already somewhat limited (the property it crosses belongs to the Seadrift Homeowners' Association to the high tide line), and where the public's activities are restricted to passage rather than in-place recreation. Therefore, this impact is not considered a significant impact.

The presence of the pipeline in Bolinas Bay during project construction would be mitigated by submerging the pipeline, rather than floating it on the surface of the water.

This should result in minimal interference with boaters, kayakers, swimmers, and surfers during the project period.

The disposal scow in Bolinas Bay may interfere to a limited extent with boating, but it is expected to be anchored well outside the surf range and would be present only during construction periods. Boaters, kayakers, and surfers would be able to navigate around the scow with minimal difficulty.

Long-Term Impacts: Lagoon Recreation Access

Excavation of the Highway 1 fills would prevent their future use by motorists to turn off the highway and observe birds and seals along the eastern side of the lagoon. However, not all turnouts would be removed under this alternative, and wildlife-watchers would still be able to access the lagoon from the remaining turnouts, including Winnebago point, and via the MCOSD property on Olema-Bolinas Road.

Removing the PGC Delta upland would have long-term impacts on wildlife viewing in PGC Delta, but, as noted above, there are other locations to access Bolinas Lagoon for wildlife viewing.

There would be no long-term impacts to recreational activities in Bolinas Bay, unless the increased tidal prism were to be reflected in stronger currents flowing through the lagoon inlet. This might increase surf disturbance at the mouth of the lagoon.

Consistency with Local Plans

The project does not conflict with any recreation-related policies within the Marin Countywide Plan or Local Coastal Program. This alternative furthers Marin County Plan Policy EQ-4.7a, which provides for protection of the lagoon's fragile resources while preserving recreation access to the lagoon for recreation.

Beneficial Impacts

While habitat restoration is the primary goal of this alternative, recreational uses would benefit from it as well. Maintaining the relative proportions of upland, intertidal, and subtidal habitat would allow kayakers and wildlife-viewers to continue to enjoy recreational opportunities in the lagoon, to a greater extent than would be possible under the No Action Alternative. More areas of the lagoon would be open to kayaking, and the increased volume of intertidal and subtidal habitat could result in greater numbers and variations of fish available for recreational capture.

It is possible (but difficult to predict with certainty) that surfers and surf-kayakers in Bolinas Bay may benefit long-term from the project. An increase in the tidal volume in Bolinas Lagoon would likely result in a greater volume and velocity of water leaving the lagoon through the inlet and probably a wider deeper inlet. This could result in greater velocity or magnitude of standing waves at the mouth of the inlet and could affect the relative position or depth of sand bars farther out in the bay, thus changing surf patterns.

4.6.3 Estuarine Alternative

Recreation impacts as a result of the Estuarine Alternative include all the impacts identified above for the Riparian Alternative, as well as one additional impact specific to the Estuarine Alternative.

Significant but Mitigable Impacts

Impact 4.6.2: Lagoon Recreation Access

The removal of seventeen additional acres of delta and upland habitat along Pine Gulch Creek under this alternative would substantially prevent year-round use of that area for hiking, walking, or wildlife viewing. Alternate locations for these activities include wildlife viewing along the shores of the lagoon and the beaches and hiking along trails in the watershed and along the beaches, but this is one of few areas along the lagoon where this type of habitat is open to the public. Additionally, County Policy PR-2.3 requires replacing closed or inaccessible trails if the demand for such trails still exists; failure to replace the lost trail would constitute a significant impact.

Mitigation 4.6.2: MCOSD would develop more trails to improve public access to lagoon frontage property after construction is complete. While seventeen acres of the delta and upland habitat would be removed, much of the reserve would be left in place, and MCOSD would build new trails or would provide educational materials to discuss the project and its projected benefits. This would mitigate the impact on recreation resources to less than significant.

4.6.4 No Action Alternative

Significant Impacts

Impact 4.6.3: Long-Term Impacts: Lagoon Recreation Access

Failure to address sedimentation in Bolinas Lagoon is likely to have impacts on a variety of recreational uses in the lagoon. Fishing in the lagoon would be affected by the significant reductions in intertidal and subtidal habitat predicted by the Corps to result from taking no action to address sedimentation. According to local anglers, lagoon fishing has declined over the past 20 years, and this decline is attributed to the habitat loss in the lagoon. A continuation of this decline would be likely to result in reduced catch for anglers. The potential intermittent closures of the lagoon, predicted to begin in 2038, would have severe and long-term effects on recreational fishing in the lagoon.

Similarly, kayaking would be adversely affected by a reduction in subtidal and intertidal habitat and an expansion of upland habitat. Fewer areas of the lagoon would be available for kayaking, and fewer species of birds or wildlife would inhabit the lagoon for the kayakers to observe. Wildlife viewers would be affected by the lessened quantity and diversity of wildlife in the lagoon.

Beneficial Impacts

The Corps has predicted that under the No Action Alternative, the lagoon would acquire significantly more upland acreage at the expense of subtidal and intertidal habitat. While the Corps has not identified precisely where these habitat changes would take place, it is probable that the upland area in PGC Delta would continue to expand. This could result in limited beneficial impacts for wildlife viewers, hikers, and others recreationists who would be able to access the delta from the MCOSD property on the west side of the lagoon.

4.6 PUBLIC ACCESS AND RECREATION RESOURCES

4.6.1 Impact Criteria and Methodology

Impacts to recreational resources were assessed by determining the types of recreational uses in the project area, then evaluating these uses to determine their sensitivity to the short-term and long-term project effects. Consistency of project activities with the objectives and policies of the Countywide Plan and LCP related to recreational resources, as summarized in Section 3.6, also was considered.

The criteria listed below have been developed to address likely impacts on recreational uses in the project area and would include any violation of Marin County plans and policies regarding recreational resources. A discussion of the visual impact of the project machinery on the recreational experience is presented in the visual resources analysis. The project is considered to have a significant impact on recreational resources under any of the following conditions:

- It were to interfere with recreational uses of the beach, ocean, lagoon, or parks for a substantial length of time or it were to interfere with the public's right of access to the sea;
- It were to substantially prevent a year-round recreational use or substantially prevent a recreational use during peak season;
- It were to increase the use of recreation resources such that substantial physical deterioration of the facility would occur or be accelerated;
- It were to require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment;
- It were to result in closure of countywide park and recreation facilities, if the need for these facilities still exists, in conflict with County Policy PR-2.3;
- It were to prevent or eliminate maintenance of dedicated trails or easements, unless other arrangements had been contractually agreed on, in conflict with County Policy TR-4; and
- It were to conflict with or be incompatible with recreation-related objectives, policies, or guidance of the Countywide Plan, the LCP, or management plans or policies of MCOSD or GFNMS.

4.6.2 Riparian Alternative

Significant but Mitigable Impacts

Impact 4.6.1: Lagoon Recreation Access

The presence of the pipeline in the lagoon would have an additional impact on recreational use of the lagoon. During the three-month construction period for each of the nine years of the project, the pipeline would run from the dredge to the end of the

Stinson Beach spit and then out to the disposal scow. During high tide the pipeline would float, and during low tide it would likely rest on the mudflats. Because the dredge would at least sometimes be at the north end of the lagoon, the pipeline would necessarily interfere with kayakers attempting to cross the lagoon. The pipeline might even completely close off access to certain areas of the lagoon for kayakers, depending on their entry point to the lagoon. If the dredge is excavating the North Basin, for instance, kayakers putting in along Highway 1 on the north end of the lagoon could find it impossible to cross over to the west side of Kent Island. However, these impacts would be limited to three months of the year, while kayakers use the lagoon nearly year-round, weather permitting, and could continue to kayak in other areas of the lagoon during excavation. In addition, there are other areas similar to Bolinas Lagoon outside the ROI that would continue to be available for kayaking, particularly Tomales Bay and Drake's Estero to the north.

Motorboats would be similarly affected by the presence of the pipeline; the residents of Seadrift put in their motorboats from the boat launch on the northwest of the Seadrift development. From there they can travel west to the lagoon inlet and out to sea. Regardless of the location of the dredge, the pipeline would cross directly in front of this route and prevent Seadrift boaters from leaving the lagoon. This would be a significant impact.

Mitigation 4.6.1: This impact on kayakers and Seadrift recreational boaters would be mitigated by submerging the pipeline at one or two places along its length within the lagoon. Kayaks draw only five inches of water, but motorboats draw no less than two feet. As part of PED, the pipeline would be anchored to the bottom of the lagoon as it crosses the Main Channel, and this location would be clearly marked by buoys in order to allow boaters to cross the pipeline at high tide. However, because motorboats draw two feet of water, and the pipeline is 12 inches in diameter, there would have to be at least three feet of water in the channel for motorboats to cross safely. It is possible that even in the deepest section of the Main Channel there would be insufficient water depth for motorboats to cross the pipeline during certain points in the tide cycle. This mitigation would, however, provide for some recreational access for motorboats and kayaks during the construction period.

Less than Significant Impacts

Construction Impacts: Lagoon Recreation Access

The presence of the dredge in the lagoon for up to three months per year for nine years would interfere to some extent with kayaking and other recreational activities in the lagoon. The physical presence of the dredge and associated machinery (siltation curtains and support boat, for instance) would prevent kayakers and anglers from entering whatever portion of the lagoon is being excavated. In addition, the dredge would indirectly interfere with recreational opportunities for kayaking, fishing, and wildlife viewing by whatever limited disturbance of wildlife might result from dredge activities. While dredge activities are being scheduled to limit fish and wildlife disturbance as much as possible, it is unlikely that no wildlife would be disturbed, and thus this would be an impact not only on the wildlife, but on those who engage in wildlife viewing as a recreational activity. Dredging in the lagoon would be localized and temporary, and these impacts would therefore be considered less than significant.

Removal of the vegetation and upland soils from PGC Delta would be staged from the MCOSD property along Bolinas-Olema Road. This would interfere with access by bird-watchers and hikers to recreation opportunities on this MCOSD property. However, this interference would be confined to the period during which construction was actually ongoing in this area, which would be only a small time, compared to the overall length of the project. Alternate locations for these activities include wildlife viewing along the shores of the lagoon and the beaches and hiking along trails in the watershed and along the beaches.

Construction Impacts: Highway 1 Access

The excavation of the Highway 1 fills would probably result in temporary closures of at least one lane of Highway 1 during the project period. Because the Highway 1 fills are not a major element of the project, these closures are unlikely to last more than one season out of the possible nine seasons of project activity.

These closures would temporarily interfere with motorists' opportunities to stop and view wildlife in the lagoon. It might also interfere with kayakers' and anglers' access to the lagoon along that side. Finally, it would have an adverse impact on bicyclists' use of Highway 1. Because the excavation along Highway 1 is of limited duration, these impacts are not considered to be significant.

Using Winnebago Point as a staging area for the entire project would interfere with use of that location for wildlife viewing. However, this is not a significant location for recreation activity, and several other turnouts would continue to be available for motorists along Highway 1.

Construction Impacts: Beach and Bay Recreation Access

The pipeline across Stinson Beach Spit would be in place for three months per year for up to nine years. Actual installation and removal of the pipeline each year would be of limited duration, and the pipeline would be constructed so as not to block access to beachgoers, probably by use of a bridge or walkway installed over the pipeline. The presence of the pipeline could be considered an interference with the public's right of access to the sea, but the pipeline would occupy an area where the public's right of access is already somewhat limited (the property it crosses belongs to the Seadrift Homeowners' Association to the high tide line), and where the public's activities are restricted to passage rather than in-place recreation. Therefore, this impact is not considered a significant impact.

The presence of the pipeline in Bolinas Bay during project construction would be mitigated by submerging the pipeline, rather than floating it on the surface of the water.

This should result in minimal interference with boaters, kayakers, swimmers, and surfers during the project period.

The disposal scow in Bolinas Bay may interfere to a limited extent with boating, but it is expected to be anchored well outside the surf range and would be present only during construction periods. Boaters, kayakers, and surfers would be able to navigate around the scow with minimal difficulty.

Long-Term Impacts: Lagoon Recreation Access

Excavation of the Highway 1 fills would prevent their future use by motorists to turn off the highway and observe birds and seals along the eastern side of the lagoon. However, not all turnouts would be removed under this alternative, and wildlife-watchers would still be able to access the lagoon from the remaining turnouts, including Winnebago point, and via the MCOSD property on Olema-Bolinas Road.

Removing the PGC Delta upland would have long-term impacts on wildlife viewing in PGC Delta, but, as noted above, there are other locations to access Bolinas Lagoon for wildlife viewing.

There would be no long-term impacts to recreational activities in Bolinas Bay, unless the increased tidal prism were to be reflected in stronger currents flowing through the lagoon inlet. This might increase surf disturbance at the mouth of the lagoon.

Consistency with Local Plans

The project does not conflict with any recreation-related policies within the Marin Countywide Plan or Local Coastal Program. This alternative furthers Marin County Plan Policy EQ-4.7a, which provides for protection of the lagoon's fragile resources while preserving recreation access to the lagoon for recreation.

Beneficial Impacts

While habitat restoration is the primary goal of this alternative, recreational uses would benefit from it as well. Maintaining the relative proportions of upland, intertidal, and subtidal habitat would allow kayakers and wildlife-viewers to continue to enjoy recreational opportunities in the lagoon, to a greater extent than would be possible under the No Action Alternative. More areas of the lagoon would be open to kayaking, and the increased volume of intertidal and subtidal habitat could result in greater numbers and variations of fish available for recreational capture.

It is possible (but difficult to predict with certainty) that surfers and surf-kayakers in Bolinas Bay may benefit long-term from the project. An increase in the tidal volume in Bolinas Lagoon would likely result in a greater volume and velocity of water leaving the lagoon through the inlet and probably a wider deeper inlet. This could result in greater velocity or magnitude of standing waves at the mouth of the inlet and could affect the relative position or depth of sand bars farther out in the bay, thus changing surf patterns.

4.6.3 Estuarine Alternative

Recreation impacts as a result of the Estuarine Alternative include all the impacts identified above for the Riparian Alternative, as well as one additional impact specific to the Estuarine Alternative.

Significant but Mitigable Impacts

Impact 4.6.2: Lagoon Recreation Access

The removal of seventeen additional acres of delta and upland habitat along Pine Gulch Creek under this alternative would substantially prevent year-round use of that area for hiking, walking, or wildlife viewing. Alternate locations for these activities include wildlife viewing along the shores of the lagoon and the beaches and hiking along trails in the watershed and along the beaches, but this is one of few areas along the lagoon where this type of habitat is open to the public. Additionally, County Policy PR-2.3 requires replacing closed or inaccessible trails if the demand for such trails still exists; failure to replace the lost trail would constitute a significant impact.

Mitigation 4.6.2: MCOSD would develop more trails to improve public access to lagoon frontage property after construction is complete. While seventeen acres of the delta and upland habitat would be removed, much of the reserve would be left in place, and MCOSD would build new trails or would provide educational materials to discuss the project and its projected benefits. This would mitigate the impact on recreation resources to less than significant.

4.6.4 No Action Alternative

Significant Impacts

Impact 4.6.3: Long-Term Impacts: Lagoon Recreation Access

Failure to address sedimentation in Bolinas Lagoon is likely to have impacts on a variety of recreational uses in the lagoon. Fishing in the lagoon would be affected by the significant reductions in intertidal and subtidal habitat predicted by the Corps to result from taking no action to address sedimentation. According to local anglers, lagoon fishing has declined over the past 20 years, and this decline is attributed to the habitat loss in the lagoon. A continuation of this decline would be likely to result in reduced catch for anglers. The potential intermittent closures of the lagoon, predicted to begin in 2038, would have severe and long-term effects on recreational fishing in the lagoon.

Similarly, kayaking would be adversely affected by a reduction in subtidal and intertidal habitat and an expansion of upland habitat. Fewer areas of the lagoon would be available for kayaking, and fewer species of birds or wildlife would inhabit the lagoon for the kayakers to observe. Wildlife viewers would be affected by the lessened quantity and diversity of wildlife in the lagoon.

Beneficial Impacts

The Corps has predicted that under the No Action Alternative, the lagoon would acquire significantly more upland acreage at the expense of subtidal and intertidal habitat. While the Corps has not identified precisely where these habitat changes would take place, it is probable that the upland area in PGC Delta would continue to expand. This could result in limited beneficial impacts for wildlife viewers, hikers, and others recreationists who would be able to access the delta from the MCOSD property on the west side of the lagoon.

4.7 LAND USE

4.7.1 Impact Criteria and Methodology

Impacts to land use were assessed by determining the types of land uses in the project area, then evaluating these uses to determine their sensitivity to the short-term and long-term project effects. Consistency of project activities with the objectives and policies of the Marin Countywide Plan and the relevant LCP and other community and land management plans, as summarized in Section 3.7, was also considered. Additional information pertaining to land use was obtained from Marin County and GFNMS staff and from site visits.

The following criteria have been developed based on significance criteria regarding impacts to land use adopted by Marin County. The project is considered to have a significant impact to land use resources if it were to result in any of the following:

- Converts prime agricultural land to nonagricultural use or impair the productivity of prime agricultural land;
- Conflicts with county land use goals or policies;
- Conflicts with existing or proposed uses at the periphery of the project area or with other local land use plans;
- Results in open space being converted to urban or suburban scale development;
- Conflicts with local zoning; or
- Results in nuisance impacts as a result of incompatible land uses.

4.7.2 Riparian Alternative

Significant but Mitigable Impacts

Impact 4.7.1: Compatibility with Uses at the Project Site

Project measures include the installation of a slurry pipeline in the lagoon, the presence of which would have an additional impact on recreational use of the lagoon. During the three-month construction period for each of the nine years the project is ongoing, the pipeline would run from the dredge to the end of the Stinson Beach spit east of the inlet, and then out to the disposal scow. During high tide the pipeline would float, and during low tide it would likely rest on the mudflats. Current uses of the lagoon for recreation, therefore, would be interrupted at certain times of the year.

Mitigation 4.7.1: This impact on kayakers and Seadrift recreational boaters would be mitigated by submerging the pipeline at one or two places along its length within the lagoon. Kayaks draw only five inches, but motorboats draw no less than two feet. The pipeline would be anchored to the bottom of the lagoon as it crosses the Main Channel, and this location would be clearly flagged for boaters to allow them to cross the pipeline at high tide. In this way kayakers putting in along Highway 1 would be able to cross to Bolinas, and Seadrift motorboats would be able to exit the lagoon.

Less than Significant Impacts

Consistency with Countywide Plan and LCP

Stream Protection Policies II-1 and II-2 of the LCP allow stream diversions "where the primary function is the improvement of fish and wildlife habitat." This policy is directed at protecting habitat for migrating steelhead trout and coho salmon. The Riparian Alternative proposes limited construction activities and vegetation removal in the PGC Delta, where 8.6 acres of upland delta habitat will be removed. There would be no upland riparian habitat removed under the Riparian Alternative, and impacts to the delta upland habitat are expected to be temporary. Schedules have not been defined at this stage, but excavation in PGC Delta is expected to last no more than three months over two seasons.

Also, sediment would be deposited continuously in the riparian and delta areas of Pine Gulch Creek. This deposition would provide for the natural regeneration of PGC Delta upland, and delta riparian habitat is expected to steadily reassert itself over the life of the project (Romanoski 2002). Further, the proposed action would improve long-term access to spawning grounds in PGC Delta. The project would have significant short-term impacts, but overall impacts to delta riparian habitat would be positive for the fish species that Policy II intends to protect.

Consistency with GFNMS Regulations and Management Plan

GFNMS regulations and the GFNMS Management Plan prohibit dredging in the seabed except for, among other activities, ecological maintenance. The purpose of the proposed action and the Riparian Alternative is to prevent the loss of intertidal and subtidal habitat and to prevent the creation of unnatural hydrological conditions in Bolinas Lagoon. The dredging, therefore, would maintain the ecological characteristics of the lagoon and is consistent with the GFNMS regulations and management plan. Further, GFNMS will be considering the environmental impacts of the plan through its authority to grant or withhold a permit under National Marine Sanctuary regulations (15 CFR 922.48).

Consistency with Countywide Plan and LCP

The Bolinas Lagoon Plan states that "Dredging should be permitted only after documentation of need is established and the absence or mitigation of the adverse environmental impacts is established." The proposed project is consistent with this provision because the need to restore the lagoon is well documented and this project provides for measures that mitigate the project impacts. Therefore, the Riparian Alternative, with mitigation measures identified in this chapter, complies with the Bolinas Lagoon Plan limitations on dredging. The activities and mitigation proposed under the Riparian Alternative that would preserve the intertidal and subtidal marine environment of the lagoon are described in Section 2.2.1 and in sections 4.2 and 4.3 regarding hydrology and biological resources.

Compatibility with Uses at the Project Site

Bolinas Lagoon is used to both protect and study natural resources. The Riparian Alternative would ensure and enhance these uses in the long term but would have short-term impacts on preserving habitat and research and education. As discussed in the project description and as analyzed in Section 4.3, these short-term impacts to habitat would be scheduled to avoid sensitive times of year, such as those when breeding, spawning, or nesting take place. Also, local government and nonprofit groups, such as Point Reyes Bird Observatory and the Audubon Canyon Ranch, use Bolinas Lagoon and the lagoon watershed for research. During construction, researchers may need to alter their wildlife observation schedules, but the construction should not substantially reduce the access or opportunity to study these species. There would be no long-term impacts to these activities because restoration of the lagoon would not alter its scientific uses.

Compatibility with Adjacent Uses

Under the Riparian Alternative, facilities that would be incompatible with adjacent residential use would not be developed. Also, implementing any of the alternatives would not affect range management or ranching or agriculture in the Bolinas watershed.

Construction Impacts: Beach and Bay Recreation Access at Stinson Beach Spit

The pipeline across Stinson Beach Spit would be in place for three months per year for up to nine years. Actual installation and removal of the pipeline each year would be of limited duration, and the pipeline would be constructed so as not to block access to beachgoers, probably by use of a bridge or walkway that would be installed over the pipeline. The presence of the pipeline could be considered an interference with the public's right of access to the sea, but the pipeline would occupy an area where the public's right of access is already limited (the property it crosses belongs to the Seadrift Homeowners' Association) and where the public's activities are restricted to passage rather than in-place recreation. Therefore, this impact is not considered a significant impact.

The presence of the pipeline in Bolinas Bay during project construction would have minimal impact because it would run along the ocean bottom, rather than along the surface of the water. This should result in minimal interference with kayakers, surfers, and swimmers during the project period.

Beneficial Impacts

Consistency with General and Community Plans, LCP and Bolinas Lagoon Management Plan

The project would be consistent with and, in many cases, would implement specific policies in Chapter 2, Natural Resource Protection, of the LCP, and the California

Coastal Act, as outlined in Section 3.8 of this EIS/EIR. The project sponsors would restore and preserve the intertidal marine environment, would maintain and improve the educational and research functions of the lagoon, and would maintain the recreational priority use for the site. The Riparian Alternative would have a long-term beneficial impact on the fulfillment of objectives and policies of the General Plan and LCP.

Goal 1 of the Bolinas Lagoon Management Plan is “to preserve and restore the ecological values of Bolinas Lagoon,” and methods for achieving this goal, include “Objective 3) Restore water quality and hydraulic functions that will decrease sedimentation and prevent the loss of rich estuarine habitats.” Under Parks, Recreation and Open Space, the Bolinas Community Plan states that, “11. ... We urge the county to begin studies to determine the possibility of dredging the mouth of the channel, to improve the flushing capabilities of the lagoon, and to allow Bolinas fisherman better access to the sea.” The proposed project would accomplish the goals of the Bolinas Lagoon Management Plan and the Bolinas Community Plan by restoring Bolinas Lagoon’s tidal, riparian, and flushing capabilities.

4.7.3 Estuarine Alternative

Significant Impacts

Impact 4.7.2: Consistency with Countywide Plan and LCP

Stream Protection Policy II-4 of the Marin County LCP states that “No construction, alteration of land forms or vegetation removal, shall be permitted within the riparian protection area.” While Policy II-4 is aimed at developing and constructing structures within riparian areas, it is does not limit its reach to such projects. The Estuarine Alternative proposes limited construction activities in the Pine Gulch Creek and Delta, where 11 acres of upland habitat will be removed, including 7 of the 17 acres of riparian habitat in the delta. Because the Estuarine Alternative necessitates removing vegetation in the riparian protection area of Pine Gulch Creek, there would be a significant impact due to the conflict with Policy II-4.

(Stream protection policies II-1 and II-2 allow stream diversions “where the primary function is the improvement of fish and wildlife habitat” One of the proposed project’s underlying purposes is protecting habitat for migrating steelhead trout and coho salmon, so policies II-1 and II-2 contemplate the disturbance of streams for projects such as this, but these policies do not allow for the removal of vegetation.)

This vegetation removal and the impacts to biological resources of the riparian habitat of Pine Gulch Creek and Delta are addressed in section 4.3. It states that while there would be biological impacts due to loss of riparian vegetation, the proposed action would improve long-term access to spawning grounds in Pine Gulch Creek. Therefore, the project would have significant short-term impacts due to the removal of vegetation in the riparian area. However, overall impacts to riparian habitat would be positive for the fish species the project and Policy II intend to protect.

The Estuarine Alternative has more impacts to Pine Gulch Creek upland riparian habitat than the Riparian Alternative, and acreage and volume of upland habitat would be lower with both action alternatives than it would be with the No Action Plan. Also, sediment would be deposited continuously in the riparian and delta areas of Pine Gulch Creek. This deposition would provide for long term natural regeneration of Pine Gulch Creek upland areas and upland habitat and is expected to steadily reassert itself over the life of the project (Romanoski 2002). Therefore, the project would have significant short-term impacts, but overall impacts to riparian habitat would be positive for the fish species.

Mitigation 4.7.2: Apply best management practices to control erosion and runoff and provide restoration of disturbed areas by replanting with plant species naturally found on the site. While this would lessen the long-term biological impacts, such a mitigation measure would not remove the conflict with Stream Protection Policy II-4.

Less than Significant Impacts

Long-term impacts under the Estuarine Alternative would be similar to those described for the Riparian Alternative. The Estuarine Alternative would have more impacts to biological resources in Pine Gulch Creek and therefore more impacts on land uses for habitat, but the Estuarine Alternative would have greater long-term benefits for tidal processes. The Estuarine Alternative would have slightly more positive impacts on the fulfillment of objectives and policies of the Countywide Plan and LCP for restoration of the lagoon.

Compatibility with Uses at Project Site

Impacts under the Estuarine Alternative would be similar to those described for the Riparian Alternative.

Compatibility with Adjacent Uses

Impacts under the Estuarine Alternative would be similar to those described for the Riparian Alternative.

4.7.4 No Action Alternative

Less than Significant Impacts

Long-Term Impacts: Lagoon Recreation Access

Without a restoration program and the dredging of the lagoon, the sediment in Bolinas Lagoon would be allowed to continue to build up and fill in open water areas within the lagoon. This sedimentation would degrade habitat values and would result in navigation problems in the lagoon for small boats that use the lagoon. With no project, open water areas would evolve into mudflats and marshland areas.

Allowing the continued sedimentation of Bolinas Lagoon would not directly conflict with county land use zoning and goals or policies because the area currently complies with the County General Plan and the Marin County LCP. No changes would be made to agricultural land in the project or peripheral areas. However, the current status of the lagoon as intertidal and subtidal marine environment would probably change without dredging. The elimination of this environment would conflict with the goals of the Bolinas Lagoon Plan identified in the LCP for “restoration and preservation of the intertidal and subtidal marine environment.” (MCCDA 1980). There are currently no plans to restore tidal habitat, but the county is managing the lagoon to preserve tidal habitats by restricting uses that may negatively affect such habitat in the short term. Therefore, tidal habitat would still be preserved under the No Action alternative, and there would be no significant impact to land use. No changes would be made to land use designations or local zoning, nor would any agricultural land in the project or peripheral areas be converted or impaired.

In addition, sedimentation of the lagoon and the expansion of upland land forms could change the public’s perception of the area as an open water area with marshland. This visual change could have indirect effects on the shoreline land uses, including recreation and tourism. For instance, the Bolinas County Community Plan includes the goal of maintaining the aesthetic value of the spatial and visual landforms. As the area silts in and tends to degrade, this effect could affect community goals or carry over to adjacent land uses. These uses, such as recreation or commercial tourism, may change over time.

Failure to address sedimentation in Bolinas Lagoon is likely to have impacts on other recreational land uses in the lagoon. As mentioned in Section 4.6, fishing and kayaking in the lagoon would be adversely affected by the significant reductions in intertidal and subtidal habitat. These impacts on recreation land uses would be permanent. All of the impacts of the No Action Alternative assume the absence of seismic activity or some other occurrence that would change the morphology of the lagoon and restore intertidal and subtidal habitat.

Beneficial Impacts

Long-Term Impacts: Lagoon Recreation Access

The Corps has predicted that under the No Action Alternative, the lagoon would acquire significantly more upland acreage at the expense of subtidal and intertidal habitat. While the Corps has not identified precisely where these habitat changes would take place, it is probable that the upland area in PGC Delta would continue to expand. This could result in limited beneficial impacts for some recreational users, such as birdwatchers and hikers, who would be able to access the delta from the MCOSD property on the west side of the lagoon.

4.8 AIR QUALITY

4.8.1 Impact Criteria and Methodology

Air quality impacts related to the proposed project are primarily associated with dredging and excavating. The Bay Area Air Quality Management District CEQA guidelines (BAAQMD 1996) treat most construction emissions as being addressed at a regional scale by state and federal air quality management plans. The BAAQMD guidelines emphasize implementing fugitive dust control measures for construction rather than quantifying emissions in detail.

Federal Clean Air Act conformity requirements set emissions thresholds for nonattainment and maintenance pollutants as a basis for determining the significance of direct and indirect emissions resulting from federal agency actions. The emissions thresholds applicable to the San Francisco Bay Area are 100 tons per year for reactive organic compounds (an ozone precursor), 100 tons per year for nitrogen oxides (an ozone precursor), and 100 tons per year for carbon monoxide. The San Francisco Bay Area is an attainment area for the federal PM_{10} standards; consequently, Clean Air Act conformity requirements do not apply to PM_{10} emissions. Although not directly applicable from a legal standpoint, the Clean Air Act conformity threshold of 100 tons per year provides a convenient criterion for evaluating the significance of PM_{10} emissions.

Emissions from dredging and excavating have been estimated based on assumed equipment requirements, quantities of material to be removed, and the duration of dredging or excavating for different portions of Bolinas Lagoon. Dredging operations would require a hydraulic dredge and tugboats to move barges from Bolinas Bay to the disposal site. Removing vegetation on land and excavating would require typical construction equipment, such as bulldozers, power shovels, front-end loaders, chippers, and heavy trucks. Emissions from dredging and wet sediment disposal have been estimated using emissions rate data for appropriate vessel types. Emissions from excavating and clearing vegetation on land have been estimated using data for typical construction equipment types (US EPA 1991). Emissions from heavy trucks hauling material to the Redwood Landfill have been estimated using vehicle emissions rates from the California Air Resources Board EMFAC vehicle emission rate model.

4.8.2 Riparian Alternative

Less Than Significant Impacts

Emissions from Dredging and Excavating

Emissions from dredging and excavation have been estimated in terms of equipment engine emissions and fugitive dust emissions from excavating and clearing vegetation on land. Emissions also have been estimated for truck traffic hauling chipped or mulched vegetation and excavated sediments to the Redwood Landfill. The Riparian Alternative would require transporting approximately 4,730 truck loads of material to the Redwood Landfill over the course of the project. Dredging and associated barge towing are assumed to occur on a seven-day, 24-hour work cycle, for between one and two months each year over nine years. The Riparian Alternative also would require transporting approximately 1,900 barge loads of sediment to the SFDODS over the course of the project. The assumption is that land will be excavated and associated material will be hauled to the Redwood Landfill in the daytime, for between one and two months each year over four years. The phasing of land excavation could be extended to achieve better coordination with dredging.

Table 4.8-1 summarizes the results of these emissions analyses for the Riparian Alternative. Total dredging emissions have been averaged over nine years, and total land-based activity emissions have been averaged over four years. Average yearly emissions associated with implementing the Riparian Alternative would be 3.3 tons per year of reactive organic compounds, 58.9 tons per year of nitrogen oxides, 13.4 tons per year of carbon monoxide, 14.3 tons per year of sulfur oxides, and 3.5 tons per year of PM_{10}. These emissions quantities are well below the Clean Air Act conformity threshold of 100 tons per year per pollutant. Consequently, the Riparian Alternative would have a less than significant air quality impact. A draft record of nonapplicability (RONA) is included in the Technical Appendices.

Table 4.8-1
Summary of Emissions From the Riparian Alternative

Activity Component	Years of Activity	Annual Average Emissions, Tons per Year				
		ROG	NOx	CO	SOx	PM_{10}
Dredging and Ocean Disposal	9	2.83	55.47	11.38	14.00	2.71
Land-Based Excavation	4	0.28	2.72	1.18	0.23	0.42
Landfill Truck Traffic	4	0.18	0.74	0.85	0.05	0.39
Maximum Annual Emissions		**3.29**	**58.93**	**13.41**	**14.28**	**3.52**

Notes: Dredging operations are expected to be limited to one to two months per year over nine years. Land-based excavation operations and associated landfill truck traffic are expected to be limited to one to two months per year overfour years.

Source: Tetra Tech analysis 2002

4.8.3 Estuarine Alternative

Less Than Significant Impacts

Emissions from Dredging and Excavating

Emissions from dredging and excavating have been estimated in terms of equipment engine emissions and fugitive dust emissions from excavating and clearing vegetation on land. Emissions also have been estimated for truck traffic hauling chipped or mulched vegetation and excavated sediments to the Redwood Landfill. The Estuarine Alternative would require transporting approximately 7,700 truck loads of material to the Redwood Landfill over the course of the project. Dredging and associated barge towing are assumed to occur on a seven-day, 24-hour work cycle, for between one and two months each year over nine years. The Estuarine Alternative also would require transporting approximately 1,909 barge loads of sediment to the SFDODS over the course of the project. The assumption is that land will be excavated and associated material will be hauled to the Redwood Landfill in the daytime, for between one and two months each year over four years. The phasing of land-based excavation could be extended to achieve better coordination with dredging operations.

Table 4.8-2 summarizes the results of these emissions analyses for the Estuarine Alternative. Total dredging emissions have been averaged over nine years, and total land-based activity emissions have been averaged over four years. Average yearly emissions associated with implementing the Estuarine Alternative would be 3.6 tons per year of reactive organic compounds, 61.1 tons per year of nitrogen oxides, 14.6 tons per year of carbon monoxide, 14.5 tons per year of sulfur oxides, and 4.0 tons per year of PM_{10}. These emissions quantities are well below the Clean Air Act conformity threshold of 100 tons per year per pollutant. Consequently, the Estuarine Alternative would have a less than significant air quality impact. A draft RONA is included in the Technical Appendices.

Table 4.8-2
Summary of Emissions From the Estuarine Alternative

Activity Component	Years of Activity	Annual Average Emissions, Tons per Year				
		ROG	NOx	CO	SOx	PM10
Dredging and Ocean Disposal	9	2.85	55.73	11.43	14.06	2.73
Land-based Excavation	4	0.42	4.16	1.77	0.36	0.62
Landfill Truck Traffic	4	0.29	1.20	1.38	0.07	0.63
Maximum Annual Emissions		**3.56**	**61.10**	**14.59**	**14.50**	**3.99**

Notes: Dredging operations are expected to be limited to one to two months per year over nine years. Land-based excavation operations and associated landfill truck traffic are expected to be limited to one to two months per year over four years.

Source: Tetra Tech analysis 2002.

4.8.4 No Action Alternative

Under the No Action Alternative, there would be no lagoon dredging or land-based excavations. Existing management plans and policies would remain in place. The only emissions-generating activities associated with the No Action Alternative would be the annual gravel removal by MCOSD along the lower end of Pine Gulch Creek. This program removes about 1,000 cy of gravel each year. Existing annual equipment and truck emissions associated with this program would continue, but emissions quantities would be much smaller than those associated with either the Riparian Alternative or the Estuarine Alternative.

4.9 ONSHORE TRAFFIC AND TRANSPORTATION

4.9.1 Impact Criteria and Methodology

Under CEQA, a significant effect is defined as a substantial, or potentially substantial, adverse change in the environment (Pub. Res. Code § 21068). The guidelines implementing CEQA direct that this determination be based on scientific and factual data. Marin County's significant criteria for traffic and circulation are as follows:

- Does the project traffic significantly affect intersection level of service (LOS), resulting in an unacceptable service level (i.e., below LOS D)?
- Does the project have adequate parking and internal circulation capacity to accommodate projected traffic so that off-site areas are not adversely affected?
- Does the project include provisions for pedestrian and bicycle circulation and bicycle and motorcycle parking and security?

Given the special characteristics of this project, the above criteria do not appear to be appropriate for this EIS/EIR. The truck traffic generated by the project is not significant enough to cause intersections to degrade below LOS D. However, the truck activity would exacerbate any substandard condition that may exist along the disposal route. Therefore, the project would affect traffic within the Tamalpais Valley, along Highway 101, between Corte Madera and northern Novato. Should the trucks travel north of Highway 1, through Point Reyes Station to Nicasio and eastward to Novato, the effects of the traffic would be less severe because this route is not subject to the same substandard peak hour or peak period congestion. However, given the low volumes of traffic on the northern route, the presence of trucks may be more noticeable.

To address the environmental impacts of this project, several issues should be addressed in the EIS/EIR. The impacts associated with these issues may not be quantifiable, but they present the types of effects that the project would produce within the local environmental and along the disposal routes. These issues include the following:

- Does the project's traffic adversely affect the roadway pavement near the site and along the disposal routes, between the site and Redwood Landfill?
- Does the project have an adequate staging area?
- How will the project's construction staff and management team access the project area and evacuation locations?
- Will the project produce the need to provide traffic control and other roadway construction management techniques during construction?

Traffic along the Highway 1/Tamalpais Valley/Highway 101 route is very congested during the morning and evening peak hours. The congestion periods occur between 6:30 AM and 9:00 AM in the southbound direction and from 3:00 PM to 6:00 PM in the northbound direction. The congestion areas include the following:

- Morning peak period—Highway 101 southbound, from the Rowland Boulevard interchange in Novato, south to central San Rafael, and sometime south of San Rafael near Richardson Bay;
- Evening peak period—Highway 101 northbound, from Corte Madera through San Rafael, and again near the Rowland Boulevard interchange north of Novato, past the Redwood Landfill (the so-called 101 Narrows); and
- Local roadways near Stinson Beach, Mt. Tamalpais, Muir Woods, and other recreational destinations during the summer. While travel to west Marin occurs throughout the entire west Marin area (south near the site and north within the Point Reyes National Seashore), the congestion occurs along Panoramic Highway and near Stinson Beach.

Because of these conditions, truck traffic between Bolinas and the Redwood Landfill should be limited to the non-peak congestion periods from 9:00 AM to 2:00 PM on Highway 101, between Tamalpais Valley (Mill Valley area) and Novato. Alternatively, a modified program for truck routing could be used; for example, loaded trucks could travel from Bolinas to the Redwood Landfill using Highway 101 in the morning off-peak period and then return to Bolinas using San Marin Drive to reach Highway 1 in Point Reyes Station. During the evening peak period, trucks could use Highway 1 and San Marin Drive to reach Highway 101 at the north end of Novato and return to Bolinas via Highway 101 southbound through San Rafael and the Tamalpais Valley. In other words, trucks should be routed in the uncongested directions between Bolinas and the Redwood Landfill.

As part of the environmental setting information, two routes between Bolinas and Highway 101 were examined. One route uses Highway 1 through Tamalpais Valley to Highway 101 near Richardson Bay, while the other uses Highway 1, Point Reyes-Petaluma Road, Novato Boulevard, and San Marin Drive to reach Highway 101 at the north end of Novato. The route through Tamalpais Valley has many switchbacks and a Caltrans restriction limiting truck length to 35 feet. The changes in elevation are severe and frequent. The route through west Marin is less difficult to manage. This route would proceed north along Highway 1, through Point Reyes Station into Hicks Valley, and then east, using Novato Boulevard to Novato near San Marin High School, where Novato Boulevard and San Marin Drive intersect. San Marin Drive from this point east to Highway 101 is a designated truck route and provides direct access to Highway 101. The Redwood Landfill is a few miles north of the Highway 101/San Marin Drive interchange.

4.9.2 Riparian Alternative

The route through west Marin is about 28 miles long but terminates in Novato, about 2.7 miles west of the Highway 101/San Marin Drive interchange. The distance along Highway 101, between the Tamalpais Valley and the Highway 101/San Marin Drive interchange, is 17.8 miles. Therefore, the west Marin route and Highway 101 route between Bolinas and the Highway 101/San Marin Drive interchange would be almost exactly the same length, at 31 miles. Because of traffic conditions through Tamalpais Valley, the preferred disposal route is the west Marin route.

Less Than Significant Impacts

Impact on Traffic Volumes

Estimates of truck-related traffic were made for each of the project alternatives. A total of 4,714 truckloads were calculated for the Riparian Alternative. These truckloads convert into 9,428 one-way trips. On average, the daily number of truck trips is estimated at 116 (58 average truck loads per day times two one-way trips between Bolinas Lagoon and the Redwood Landfill and the return trip). Based on the peak hour traffic volumes cited in Section 3.1.3, the project could contribute up to a one percent increase in daily traffic near Fairfax Bolinas Road and a 2.1 percent increase near Bolinas Road. Along the Highway 101 corridor, the project would generate a very small increase in peak hour traffic; however, the introduction of trucks into the existing congestion during peak hours along Highway 101 would result in greater impacts than the same contribution of traffic along the Highway 1 corridor.

Mitigation: The project sponsor should include truck routes that include the Highway 1/San Marin Drive route for travel between Bolinas Lagoon and the Redwood Landfill. This would keep the trucks from getting caught in the heavy traffic on the Highway 101 route. Alternatively, routing that takes advantage of non-peak traffic flows could be adopted.

Mitigation: With the final determination of the travel routes between the various extraction points, Winnebago Point and the Redwood Landfill, the sponsor would develop a traffic control plan for each route to define the hours of operation, numbers of trucks accessing each route, the exact travel path between the site and the landfill (including the return route), and any other details concerning the overall operation. The project would be directed to limit travel times to off-peak hour periods and to off-peak recreation travel times. Given these constraints, the adopted travel routes between the local extraction sites and the Redwood Landfill may vary, based on the time of year and time of day.

Impact on Local Conditions

There are two major issues for local impacts: First, construction vehicle staging, encroachment, and roadway disruptions, and second, employee parking and site access. During each construction period, trucks would be moved from the staging area at Winnebago Point to the actual extraction points, disposal debris would be loaded, and then the trucks would proceed to the Redwood Landfill. Potential environmental impacts would occur between Winnebago Point and the extraction points and along the travel route to the Redwood Landfill. These impacts could be reduced to less than significant levels if measures are taken to ensure minor impacts are mitigated back to pre-project conditions.

Mitigation: Before any construction, the project sponsor should retain an independent firm to survey the roadway conditions between Winnebago Point and the various extraction points and along the selected route for travel to and from the Redwood Landfill. Once the project or specific extraction phase has been completed, the project proponents would be responsible for reconstructing all roadways, pullouts, and other roadway facilities that might have been damaged during the course of the extraction to pre-construction conditions.

Mitigation: The project sponsor should develop a management program to address employee parking and travel to and from the various work sites. The program should include candidate locations for employee parking, staging, and other short-term travel disruptions.

Mitigation: Once the final locations for actual material extraction locations are identified, the sponsor should develop a traffic control plan, which should include details on potential roadway disruptions for normal traffic operations. This plan should keep traffic control devices, flag persons, traffic diversions, and other disruptions in normal traffic patterns to as low a level of disruption as possible.

4.9.3 Estuarine Alternative

Traffic impacts from the Estuarine Alternative would be nearly identical to those from the Riparian Alternative, but there would be a greater volume of traffic generated by the greater excavation in the PGC Delta. The Estuarine Alternative would create about 7,684 truckloads of material for disposal. These truckloads convert into 15,368 one-way trips. These volumes would not exceed the level of service, and therefore the impacts from the Estuarine Alternative would be less than significant, as described above under the Riparian Alternative.

4.9.4 No Action Alternative

There would be no traffic impacts from the No Action Alternative.

4.10 MARINE TRAFFIC AND TRANSPORTATION

4.10.1 Impact Criteria and Methodology

Marine transportation resulting from the project have been compared to ongoing marine activity in the San Francisco Bay Area, including recreational, fishing, and commercial shipping traffic.

Marin County does not have established significance criteria for impacts to marine transportation. The project would result in a significant impact on marine transportation if its implementation would result in:

- Injury or death;
- Property damage;
- Spillage of oil;
- Displacement of vessels in local harbors; or
- Interference with recreational or commercial traffic sufficient to cause a delay of over one hour.

The number of barge trips per year is calculated in Table 4.10-1.

Table 4.10-1
Dredging Volumes & Barge Activity

Alternative	Wet Sediment Barge Loads	Years to Accomplish	Average Barge Trips per Year
Riparian Alternative	1,897	9	210
Estuarine Alternative	1,906	9	212

4.10.2 Riparian Alternative

Under this Alternative, there would be 1,420,700 cubic yards of wet sediment disposed by barge. Assuming that each barge holds approximately 3,000 cubic yards of sediment in a slurry of 1:3 ratio of sediment to water, this would require approximately 1,900 barge operations. Because it would take an estimated 9 years to accomplish dredging for this alternative, there would be an average of 210 barge trips per year. It is possible that barge traffic would vary from year to year, depending on which project elements are being excavated, but no more detailed scheduling information is available at this point.

Less than Significant Impacts

Impact on Commercial Navigation

The additional number of tug barge operations represents an increase of approximately 0.98 percent over the existing number of annual tug/tow operations in and through San Francisco Bay (i.e., there were 21,478 tug/tow operations in 2000).

However, the dredging operation would likely occur in the period from July through October. During this period, there were 6,879 tug/tow operations in San Francisco Bay (US Coast Guard 2001) in 2000. The dredge operations associated with Bolinas Lagoon would represent an increase of approximately 3.0 percent during this period.

Annual operations have grown at approximately 3.4 percent per year between 1990 and 2000 in San Francisco Bay, which is slightly greater than the increase represented by the Bolinas Lagoon dredging operations.

The operations from the proposed dredging operation represent a minimal increase in the number of operations during this period and, thus, is likely to have little impact on commercial navigation.

Impact on Recreational and Commercial Boating

The impact on recreational and commercial boating is also minimal due to the small increase in the number of operations. In addition, dredging operations will occur 24 hours per day. Night operations will have no affect on recreational boating activities and most commercial fishing activity.

Since most recreational boating takes place on weekends (63% of all activity), scheduling maintenance during Saturday or Sunday could further mitigate any impact on recreational boating.

4.10.3 Estuarine Alternative

Impacts from the Estuarine Alternative would be approximately the same as those from the Riparian Alternative. There would be a minimal increase in barge traffic over the course of the project, which would still be less than the annual expected increase in regional traffic volumes.

4.10.4 No Action

There would be no marine transportation impacts from the No Action Alternative.

4.11 NOISE

4.11.1 Impact Criteria and Methodology

Noise impacts related to the proposed project are primarily associated with dredging and excavation activities. Marin County does not have a noise ordinance that addresses noise from construction type projects, nor are there any numerical criteria for construction type activities in the noise element of the countywide plan. The land use compatibility criteria in the noise element of the Marin countywide plan does, however, provide a general basis for evaluating the significance of project-related noise impacts. The existing noise element of the countywide plan sets a CNEL of 60 dBA as the upper end of the normally acceptable range for noise-sensitive land uses (residential, educational, health care, and neighborhood park land uses). In addition, the countywide plan has general policies stating that measures should be taken to minimize excessive noise from construction-related activities and temporary land uses. There is also a policy of coordinating with other public agencies to address noise impacts from public agency activities. If a county permit is required for a proposed use or activity, the Community Development Agency can set time-of-day limits on construction activities. Noise impacts have been assessed using the existing elements and plans described above as well as from the guidelines of the CEQA checklist.

Because the land use compatibility guidelines in the countywide plan assume relatively continuous noise exposure, some interpretation is required to relate the CNEL criteria to temporary activities, especially when those activities are limited to daytime hours. For purposes of this document, an average daytime noise level of 70 dBA or higher would indicate a significant noise impact on sensitive land uses when the noise source would not operate at night. When both daytime and nighttime operation of a noise source is anticipated, then a CNEL level of 60 dBA or more would indicate a significant noise impact.

Noise impacts associated with dredging, site clearing, and excavating on land have been evaluated by modeling anticipated noise levels as a function of distance from the noise-generating equipment. Noise from tugboats hauling barges to and from the ocean disposal site have not been modeled because the tugboats would be too far from shore to have any meaningful noise impact on noise-sensitive land uses.

4.11.2 Riparian Alternative

Significant but Mitigable Impacts

Impact 4.11.1: Noise from Dredging

Noise levels from the hydraulic dredge equipment have been estimated using data from dredging operations at the Port of Oakland (Corps and Port of Oakland 1998). Dredging equipment that would be used in Bolinas Lagoon probably would be smaller and less noisy than the equipment used at the Port of Oakland. Nevertheless, the noise levels monitored at the Port of Oakland have been used to provide a conservative analysis.

Figure 4.11-1 illustrates estimated noise levels produced by a cutter head (suction) dredging system. Assuming that dredging occurs on a 24-hour basis, noise levels could exceed a CNEL of 60 dBA for locations within 2,000 feet of the dredge. The eastern end of Bolinas and portions of the Seadrift development would be within 2,000 feet of dredging operations for the Bolinas Channel, Main Channel, and South Arm Channel. There also would be some dredging in the Kent Island area, within 2,000 feet of the Seadrift residential development and housing and businesses in downtown Bolinas.

Because noise levels from dredging operations in the southern part of Bolinas Lagoon might produce CNEL levels above 60 dBA in the Seadrift development and in portions of Bolinas, this impact is considered potentially significant.

Mitigation 4.11.1: Noise mitigation opportunities should be reasonably available by selecting quieter running equipment and by providing supplemental noise shielding around engines and pumps. Noise level reductions of 10 dBA or more (compared to noise levels illustrated in Figure 4.11-1) should be possible by selecting dredging equipment that produces noise levels below 80 dBA at 50 feet or by installing acoustical shielding panels around the sides of engine and pump equipment on the dredge. Noise level specifications could be included in the project bid requests, and noise level testing could be required to determine the necessity for supplemental noise shielding when the dredge operates close to residential areas. If quieter equipment and supplemental noise shielding do not suppress noise in residential areas, then dredging operations could be limited to daytime for work that occurs close to noise-sensitive areas. Implementing measures such as these should reduce dredging noise impacts to a less than significant level but would increase dredging time and cost significantly.

Establishing equipment specifications and noise testing requirements would rest with MCOSD and the Corps. Implementing noise complaint monitoring procedures and follow-up actions would be the responsibility of MCOSD but could include cooperative arrangements with other local agencies.

Impact 4.11.2: Noise From Vegetation Clearing Activity.

Vegetation would be cleared at the Pine Creek Gulch delta and on Kent Island. Under the Riparian Alternative, most of the riparian vegetation areas along Pine Gulch Creek would be left in place. Somewhat more significant quantities of vegetation would be removed at Kent Island, the western side of which is as close as 150 feet from the buildings and residences of downtown Bolinas, although most of the Kent Island activities would be at least 500 feet from the shore of the lagoon. Figure 4.11-2 illustrates typical noise levels from vegetation clearing under the Riparian Alternative. This figure presents noise levels from vegetation clearing and vegetation mulching or

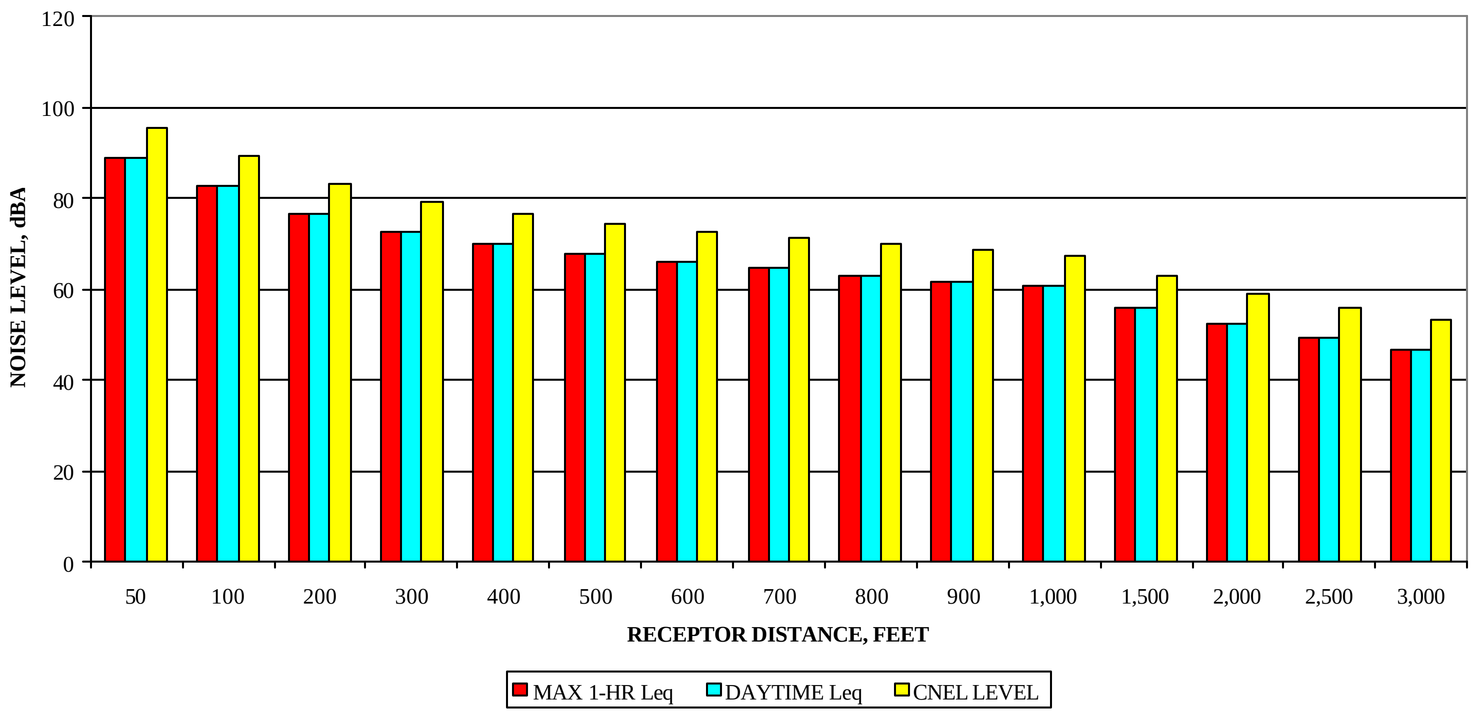


Figure 4.11-1 Suction Dredge Noise Impacts

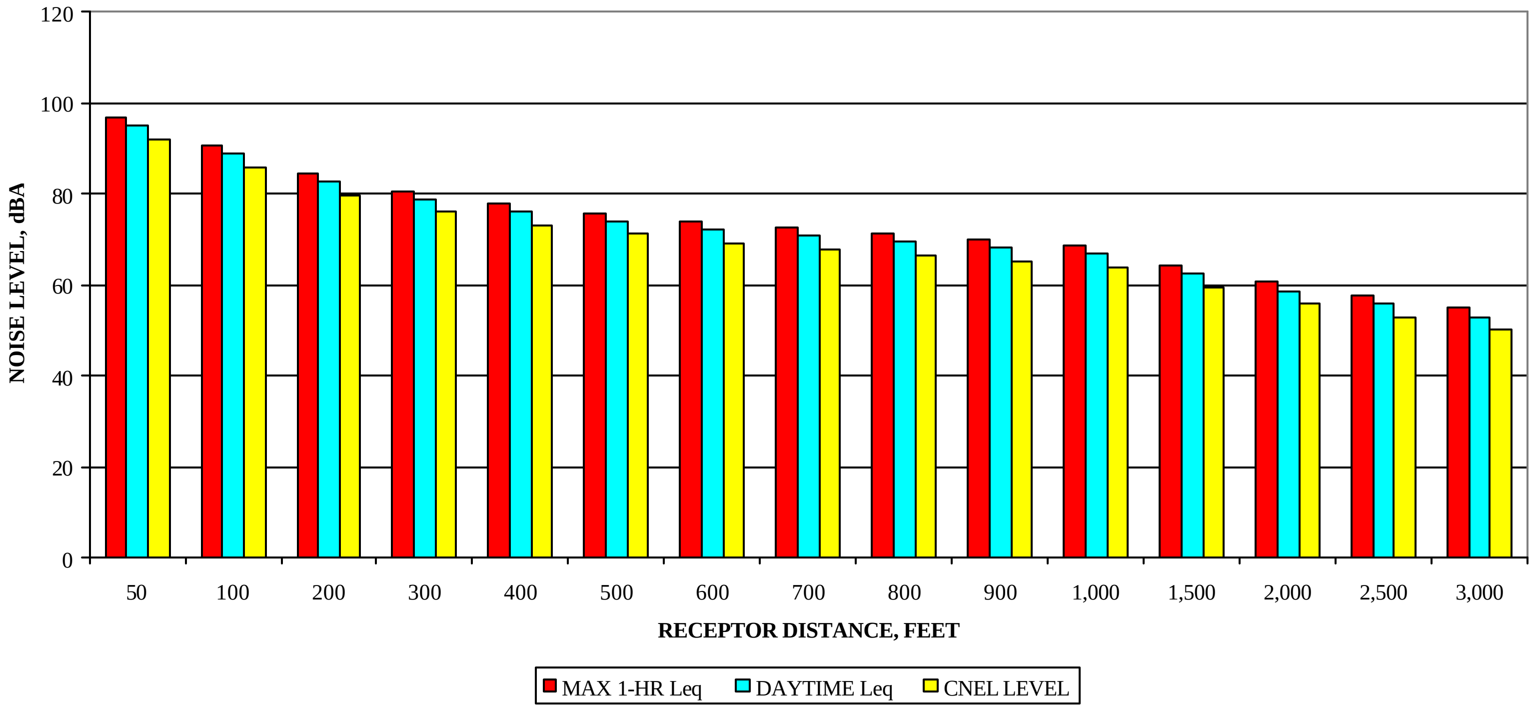


Figure 4.11-2 Vegetation Clearing Noise Impacts

chipping at Kent Island. Noise levels from vegetation clearing and mulching at the PGC Delta would be very similar. Noise levels would drop below the impact significance level of 70 dBA as an average daytime noise level at a distance of about 700 feet from the area of equipment operations. Few residential areas would be this close to the areas affected by vegetation clearing; consequently, this impact is considered less than significant.

Mitigation 4.11.2: In order to limit the impact on Bolinas of noise from vegetation clearing and mulching on Kent Island, such activities would be limited to daytime. Additionally the chipping equipment would be on the side of the island farthest from residences in Bolinas and Seadrift, in order to increase this distance from sensitive receptors. If at some point the chipping equipment were within 700 feet of noise-sensitive areas, the lead agencies would erect temporary noise shielding around the equipment. A three-sided configuration of noise shielding would probably be adequate, thus allowing access to the equipment while providing shielding in three directions.

Less Than Significant Impacts

Noise from Land-Based Excavation. Land-based excavation would occur at the Pine Creek Gulch Delta, various Highway 1 fill areas, and the Dipsea Road area under the Riparian Alternative. The most extensive excavation would occur at the PGC Delta. Figure 4.11-3 illustrates typical noise levels from land-based excavation at PGC Delta under the Riparian Alternative. Noise levels from excavation at the Highway 1 fill removal locations and at Dipsea Road would be similar. Noise levels would drop below the impact significance level of 70 dBA as an average daytime noise level at a distance of about 500 feet from the area of equipment operations. Few residential areas would be this close to the areas affected by vegetation clearing; consequently, this impact is considered less than significant.

4.11.3 Estuarine Alternative

The expected noise impacts from the Estuarine Alternative would be the same as those from the Riparian Alternative, although the construction period for PGC Delta would be longer as a result of the greater amount of vegetation and sediment to be removed.

4.11.4 No Action Alternative

The No Action Alternative would not involve any lagoon dredging or land-based excavations. Existing management plans and policies would remain in place. The only noise-generating activities associated with the No Action Alternative would be a continuation of annual gravel removal by MCOSD along the lower end of Pine Gulch Creek. This program involves the removal of about 1,000 cubic yards of gravel each year. Equipment and truck noise associated with this program would continue, but the scale of activities would be much smaller than those associated with either the Riparian Alternative or the Estuarine Alternative.

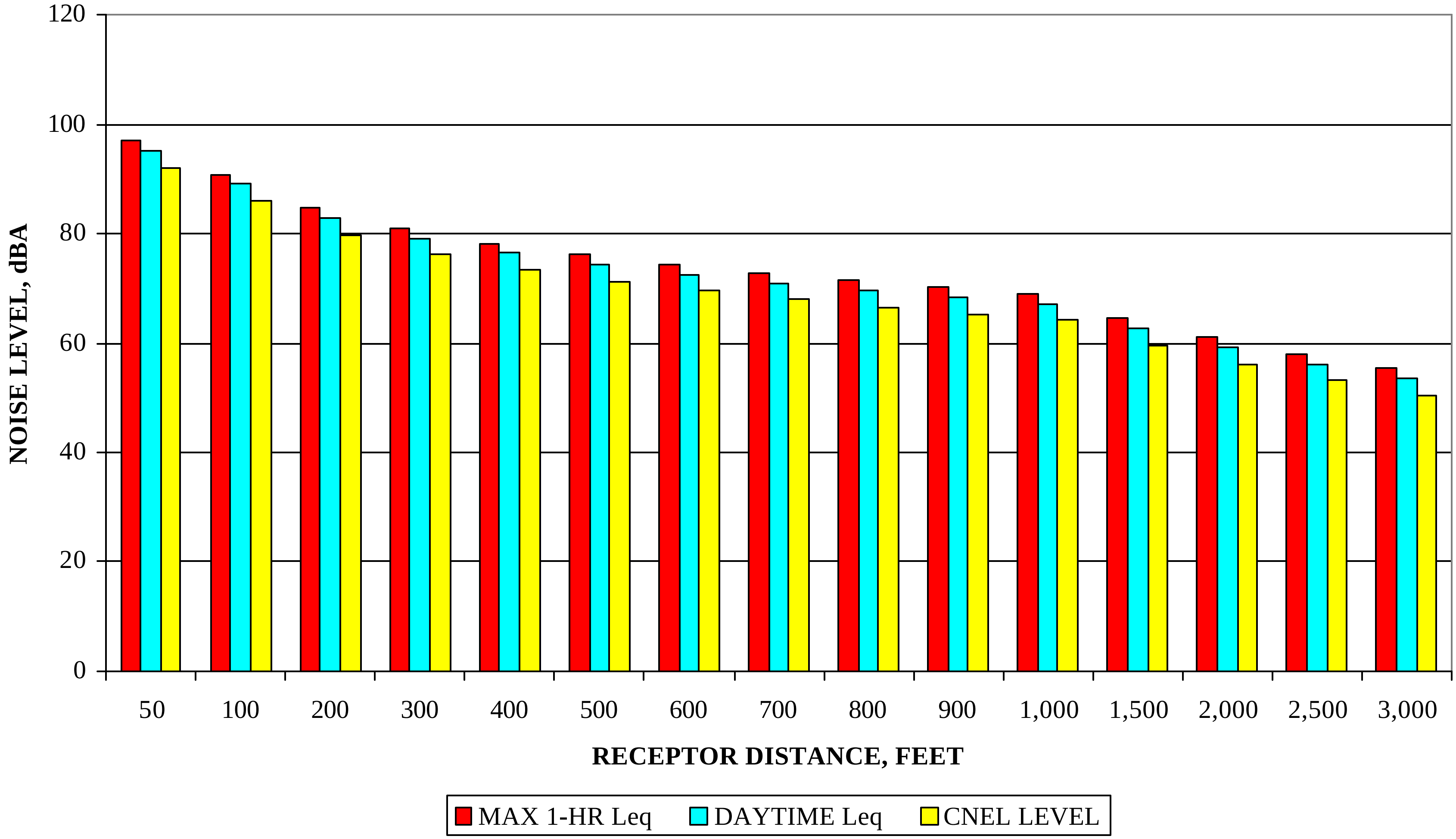


Figure 4.11-3 **Upland Excavation Noise Impacts**

4.12 AESTHETICS AND VISUAL RESOURCES

4.12.1 Impact Criteria and Methodology

Marin County has established significance criteria for visual impacts. Using these criteria, this analysis evaluates the project's potential to alter the visual character of the project area. An alternative would have a significant impact on visual resources if its implementation would result in the following:

- Be out of compliance with county goals and policies related to visual quality;
- Significantly alter the existing natural viewsheds, including the natural terrain or vegetation;
- Significantly change the existing visual quality of the region or eliminate significant visual resources;
- Significantly increase light and glare in the project vicinity; or
- Significantly reduce sunlight or introduce shadows in areas used extensively by the public.

Visual impacts were assessed by estimating the amount of visual changes introduced by project components, the degree to which visual changes could be visible to surrounding viewers, and the general sensitivity of the viewers to landscape alterations. Visual changes are typically measured using three factors: The amount of visual contrast that a particular project component may create (e.g., changes to form, line, color, texture, and scale in the landscape); the amount of view obstruction (i.e., loss of view); and degradation of a specific scenic resource (e.g., construction of a facility that blocks views of the ocean).

4.12.2 Riparian Alternative

Significant Impacts

Impact 4.12.1: Alteration of Terrain and Water

During and after project construction, immediate impacts would include significantly altering the terrain of the lagoon by changing the lagoon shoreline at Pine Gulch Creek Delta and Dipsea Road and along Highway 1; immediate impacts would also include changes in water flow, volume, location, and possibly color all through the lagoon. No mitigation has been identified for this impact.

Mitigation 4.12.1: no feasible mitigation has been identified for this impact.

Impact 4.12.2: Short-Term Changes in Vegetation

The Riparian Alternative would remove over 100 acres of upland habitat, including all the vegetation on Kent Island, but would retain the mature trees in the PGC Delta. This would significantly change the view from the eastern and northern shores of the lagoon, as well as from viewing locations along Highway 1 and along the hiking trails on Bolinas Ridge. While the impact would be less than that under the Estuarine Alternative because the mature trees in the PGC Delta would be left in place, this would be a significant impact under Marin County Guidelines. No mitigation has been identified for this impact.

Mitigation 4.12.2: no feasible mitigation has been identified for this impact.

Impact 4. 12.3: Long-Term Changes in Vegetation

Compared to the No Action Alternative in 2058, the Riparian Alternative in 2058 would result in there being 100 fewer acres of upland, 34 acres more of intertidal habitat, and 82 acres more of subtidal habitat. The long-term effects of the changes in vegetation under the Riparian Alternative would be less than from the Estuarine Alternative because the riparian vegetation in the PGC Delta would be left in place and would continue to mature. No mitigation has been identified for this impact.

Mitigation 4.12.3: no feasible mitigation has been identified for this impact.

Significant but Mitigable Impacts

Impact 4.12.4: Light and Glare

Because lagoon sediment is scheduled to be excavated around the clock, the dredge would require night-time lighting. The project area has very little artificial light, and thus the light or glare may constitute a significant impact.

Mitigation 4.12.4: This impact would be mitigated by the use of shielding, which would direct the light downward to the work area. Implementing this measure should reduce light and glare impacts to a less than significant level.

Impact 4.12.5: Changes to Existing Visual Quality of Water

The excavation in the lagoon would be likely to produce turbid water in the area of excavation and around the disposal scow in Bolinas Bay.

Mitigation 4.12.5: This impact would be mitigated by the use of a hydraulic suction dredge and siltation screens at the dredging site and dredge scow. Implementing this measure would reduce visual quality impacts to a less than significant level.

Impact 4.12.6: Changes in Terrain

As discussed in Section 4.4, potential significant impacts on the lagoon include bluff erosion on the west bank of the inlet channel from increased tidal prism and increased water velocity through the inlet. Additionally, increased velocity of water through the lagoon inlet could have a detrimental effect on Bolinas Beach and Stinson Beach on either side of the inlet. Such changes would constitute a substantial and permanent change to existing terrain.

Mitigation 4.12.6: As discussed in Section 4.4, the impact on the bluffs would be mitigated by placing protection structures at the base of the bluff. The rate of erosion would be monitored to determine whether mitigation is warranted. Impacts to the beaches could be mitigated by replacing any lost sand.

Less than Significant Impacts

Changes to Existing Visual Quality

The presence of powered machinery, even the relatively small dredge being considered for the project, would interfere with the visual environment of Bolinas Lagoon. However the dredge is likely to be no more than 30 feet long and in certain locations may not be noticeable from the shore of the lagoon. Stinson Beach residents are unlikely to see the dredge while it is operating at the north end of the lagoon, while Bolinas residents may not see the dredge when it is operating at the far southeast end of Bolinas Lagoon. Dredging the South Lagoon Channel would have the most impact on Stinson Beach residents, and that period is estimated to last only 30 days in total. Residents with views overlooking the lagoon from Bolinas Ridge may see the dredge but at such a distance it would not have a significant impact on their enjoyment of the lagoon's viewshed. In addition, dredging would take place for a total of 290-300 days over nine years, for no more than three months out of any given year.

Visual impacts on recreation from the dredge are similarly not significant. Passersby along Highway 1 may find the dredge an interesting sight rather than a negative impact. Kayakers may find their enjoyment of the lagoon environment disrupted by the presence of the dredge, but as noted above, the dredge would not always be visible from all areas of the lagoon, and its presence would be limited to no more than three months of the year.

Standard land-based machinery would be used to remove vegetation and excavate upland areas at Kent Island, PGC Delta, the Highway 1 fills, and the Dipsea Road fills. Although a great quantity of material would be removed, the volume is less than would be taken out by dredge, and the land-based machinery is not expected to be in use for long, compared to the rest of the project. As the machinery's presence would be only temporary, any visual impacts would be insignificant.

The presence of the black, green, or red disposal pipeline across the natural environment of the Stinson Beach sand spit may be an impact on recreational users of the beachfront along the spit. As the pipeline would be in place for up to three months of the year for nine years, this could be considered a significant impact. This impact could be minimized by burying the pipeline in the sand or by using a pipeline that is a less obtrusive color in a beach environment.

While watercraft are frequent in Bolinas Bay, these are usually small recreational boats or fishing craft. The scow and tugboat might be perceived as out of keeping with the recreational/natural feel of the oceanside viewshed, but the scow would be anchored well out of the surf zone and would be in place for only three months of the year. It would not be a prominent element of the viewshed from the beach because it would be in the background of swimmers, surfers, and kayakers. Travelers on Highway 1 above Stinson Beach may find the scow a disruptive element in the ocean scenery. Boaters and surfers in Bolinas Bay, who would approach the scow and tugboat more closely than viewers on the shore, might find the scow an unwelcome element in their recreational activities.

Compared to the projected length of the project period, these impacts are temporary, would be experienced only during a certain period of the year, and would not dominate the viewshed. These temporary changes would not significantly change the quality of the views or eliminate any significant visual resources.

Changes in Vegetation and Terrain

Long-term conditions of the project area are difficult to predict with accuracy, but the Corps has prepared estimates of long-term changes in the lagoon as a result of each alternative. According to the Corps, the Riparian Alternative would remove 116 acres of upland habitat, but by 2058 the lagoon would contain only 24 fewer acres of upland than in 1998. Much of the upland habitat to be removed is on Kent Island and in the PGC Delta, and vegetation is expected to reestablish itself relatively quickly in those locations, although it is not possible to identify exactly where. This alternative would increase intertidal habitat by eight acres by 2058 and subtidal habitat by 19 acres. Given the overall size of the lagoon (1,100 acres), these changes are not significant impacts to the viewshed, compared with 1998.

Consistency with Countywide Plan

Under the Marin Countywide Plan, Environmental Quality Policy EQ-2.24 requires that views of stream conservation areas (SCAs) be preserved and that "the integrity of the streamside environment should be protected." The removal of upland habitat in the PGC Delta under the Estuarine Option could be considered a violation of this county policy. However, EQ-2.26 states that "Damaged portions of SCAs should, wherever possible, be restored to their natural state." In addition, SCAs are designated along "natural watercourses" under Policy EQ-2.3, and the section of Pine Gulch Creek that would be affected by the project is not natural, in the sense that it was built up by intentional filling of the delta in the early 1900s and by sediment deposition from timber-related erosion in the upper watershed. The removal of upland habitat in the PGC Delta would further the purposes of EQ-2.26 by restoring the delta, inasmuch as possible, to its natural state; therefore, this would not be a significant impact.

Beneficial Impacts

Compared to the No Action Alternative, this alternative in the long term would maintain the diversity of vegetation, color, and form that are aesthetic qualities of the lagoon as it currently exists.

4.12.3 Estuarine Alternative

Project impacts resulting from the Estuarine Alternative would be roughly the same as the impacts identified under the Riparian Alternative, although the intensity of impact may be slightly greater in some instances because of the greater amount of excavation and vegetation removal in the PGC Delta.

Significant Impacts

The impacts of the changes in vegetation under the Estuarine Alternative would be somewhat greater than those under the Riparian Alternative because the riparian vegetation in the PGC Delta would be taken out, and there would be a delay while new vegetation filled in. Habitat acreages under the Estuarine Alternative in 2058 are expected to be roughly the same as those under the Riparian Alternative, so the expected impacts resulting from changes in vegetation in comparison to the No Action Alternative or current conditions are the same.

Less than Significant Impacts

Construction impacts unrelated to vegetation would be identical to those from the Riparian Alternative, except that there would be greater amounts of land-based machinery in the PGC Delta, which would temporarily interfere with the visual appreciation of the lagoon by kayakers and other recreationists.

Beneficial Impacts

Compared to the No Action Alternative, this alternative in the long term would maintain the diversity of vegetation, color, and form that are aesthetic qualities of the lagoon.

4.12.4 No Action/No Project Alternative

With no removal of sediment, the lagoon would begin to suffer seasonal closures within the next 50 years. This would degrade wildlife habitat and would result in open water and wetland areas evolving into mudflats and upland. Indirect changes resulting from this alternative include changes in wildlife behavior in the lagoon.

The No Action/No Project Alternative would result in the expansion of upland habitat and the reduction of intertidal and subtidal habitat throughout the lagoon, which would significantly change the aspect and the vegetation in the lagoon. The lagoon would contain 80 acres more upland by 2058 and 60 acres fewer of subtidal habitat, and as a result the visual character of the lagoon would change. Instead of broad expanses of mudflat and water, there would be more vegetation, both wetland and upland. There would be significant long-term impacts on the visual quality of Bolinas Lagoon as a result of the projected changes in lagoon habitats during the next 50 years. While the conversion of open water to mudflat or wetland to upland might not necessarily be an adverse impact on a viewer, this would be a significant change to the Bolinas Lagoon viewshed. The natural quality of the lagoon area could be significantly changed as substantial portions of the lagoon evolve into upland and wetland. Wildlife viewers would experience changes in types and numbers of wildlife active in the lagoon as a result of the changes in habitats.

Less than Significant Impacts

Temporary closures of the lagoon would have a visual impact on the appearance of the lagoon, but these would not be significant if they were only seasonal.

4.13 PUBLIC SERVICES AND UTILITIES

4.13.1 Impact Criteria and Methodology

Impacts to public services and utilities were assessed by determining the potential effects of the proposed action on existing public service levels and the potential for interference with utilities in the project area. Marin County has identified significance criteria specific to impacts associated with public services, utilities, and energy. The following criteria have been developed using the Marin County significance criteria and the CEQA checklist, and were used to assess the level of significance of potential impacts associated with the proposed project. The project is considered to have a potentially significant impact to public services and utilities under the following circumstances:

- It were to require additional police/sheriff staffing, facilities, or equipment to maintain acceptable service ratios;
- It were to require additional fire staff, facilities, or equipment to maintain an acceptable level of service (e.g., response time, rating, or other);
- It were to require designation of additional parkland to remain in conformance with locally acceptable or adopted park standard;
- It were to require substantial expanding water supply, treatment, or distribution facilities;
- It were to require expanding wastewater treatment or distribution facilities;
- It were to result in demand for landfill disposal that would exceed the capacity of the landfill to accommodate the proposed project;
- It were to require the development of new energy resources;
- It were to use energy, oil, or natural gas in an inefficient manner;
- It were to encourage activities that would result in the use of large amounts of energy, oil, or natural gas; or
- It were to result in energy demand in excess of energy supplier's existing or planned supplies.

4.13.2 Riparian Alternative

Less Than Significant Impacts

The proposed action is not expected to increase demand for public services, such as law enforcement or fire protection, that would exceed current service capacities. Redwood Landfill is expected to remain open for the next forty years and would have adequate capacity to accept the volumes of excavation materials associated with the proposed action. This assumes that the Corps would coordinate regularly with the landfill operators to determine the tonnage the landfill could accept during any given period (King 2002).

Interference with Utilities

During construction, the upland removal of fill from some areas between Highway 1 and the lagoon could interfere with operations and maintenance of the Stinson Beach County Water District. As discussed in Section 3-13, a six-inch water main crosses under Highway 1 close to one of the Highway 1 fills slated for excavation. The pipe brings freshwater to the community of Seadrift and is exposed at the surface in some locations. The exact location of the water line is unclear, based on drawings currently available from the district, but its approximate location is near the most southern site proposed for excavation between Highway 1 and the lagoon (Black 2002). Maps obtained from the water district show the water line running just south of this excavation site.

The district is upgrading the water lines in this area, and more accurate detailed drawings of pipeline locations will become available as these lines are upgraded. Excavation equipment could hit the water line, depending on how close excavation is to the buried water line. Due to the uncertainty associated with the exact location of the water line in relation to the proposed excavation site, this is considered to be a potential impact from the proposed action.

The Corps intends to consult closely with the Stinson Beach County Water District to obtain the most current information, including updated maps of water line locations, as they become available from and before excavation begins in the project area. Through coordination with the water district, this potential impact is considered to be less than significant.

4.13.3 Estuarine Alternative

Less Than Significant Impacts

Potential impacts associated the Estuarine Alternative are identical to those discussed above for the Riparian Alternative.

4.13.4 No Action Alternative

Less than Significant Impacts

Interference with Utilities

As discussed in Section 4.2, Water Resources, under the No Action Alternative, it is possible that the lake level would rise and quickly become too high relative to Highway 1. If this were to occur, the sand spit would need to be artificially breached to protect the road and other development. Increased lake levels and increased risk of flooding of Highway 1 could interfere with the Stinson Beach County Water District maintaining water pipes within or adjacent to the lagoon. Flooding of Highway 1 may also result in increased demand for police and emergency vehicles to protect people and properties in the area. As discussed in Section 4.3, Geology, the flooding that would result from closure of the inlet channel would not be acceptable, and a method would have to be identified to release the excess water from the area. Potential mitigation measures to control the water level in the lagoon below flood levels are described in Section 4.3. Any resulting increase in demand for police or utility services from the No Action Alternative is not expected to exceed current service capacities. The potential impact to public services and utilities from the No Action Alternative is assumed to be temporary and less than significant.

4.14 Socioeconomics

4.14.1 Impact Criteria and Methodology

NEPA provides no specific thresholds of significance for socioeconomic impact assessment. Significance varies, depending on the setting of the proposed action (40 CFR 1508.27[a]), but 40 CFR 1508.8 states that indirect effects may include those that are growth inducing and others related to induced changes in the pattern of land use, population density, or growth rate. CEQA guidelines exclude discussion of significance criteria for economic impacts, which in themselves are not considered effects on the environment, and thus no significance criteria are established. Addressed in this section are socioeconomic impacts, with respect to CEQA, that could be considered direct effects on the environment, such as changes to population and housing, and that are separate from strictly economic impacts, such as a loss of revenue.

As set forth in the Marin County environmental guidelines, factors considered in determining whether an alternative would have significant adverse socioeconomic impacts include the extent or degree to which its implementation would result in the following:

- Induce growth or concentrations of population that exceed official regional population projections or that conflict with population projections in the Marin Countywide Plan;
- Induce substantial growth in an area, either directly or indirectly (e.g., through projects in an undeveloped area or extension or major infrastructure);
- Conflict with housing projections and policies set forth in the Marin Countywide Plan;
- Generate student enrollment that exceeds the capability of responsible authorities to accommodate;
- Displace existing housing, especially affordable housing;
- Disrupt or divide the physical arrangement of an established community; or
- Cause a decrease in local or ROI employment.

Adverse environmental justice effects would result if minority or low-income populations were disproportionately affected by the project.

To estimate potential socioeconomic effects, the baseline conditions for the factors described above were compared qualitatively to the anticipated changes that would result from the proposed project alternatives.

4.14.2 Riparian Alternative

Less than Significant Impacts

For the Riparian Alternative, dredging/construction is considered to be a temporary action. Dredging and disposal would occur for approximately three months per year over nine years. A large number of construction workers are not expected to be required for this project, and those required would be hired locally. Therefore, dredging activities would not constrain the immediate area's housing availability or demand. Because these workers would be local and would commute to work, no socioeconomic effects on the area would result from this aspect of the Riparian Alternative.

The Riparian Alternative would not result in construction that would increase population or induce growth. Excavation along Highway 1 would result in lane closures potentially for three months during the fall and summer. Due to periodically high traffic volumes, the flow of traffic and, consequently, access to businesses along Highway 1 could be disrupted over this time. Over an extended period, a decline in economic activity could result in employment reductions at these businesses or closing of some business with further employment reductions. To avoid these potential adverse effects, excavation would be timed to minimize traffic delays and disruption. Because excavation along Highway 1 would be temporary, no long-term adverse impacts are expected.

Excavation along Dipsea Road would not inhibit access to Seadrift community housing or divide the Seadrift community because Dipsea Road is a loop, providing access from either end of the road. Access would be maintained throughout the excavation/construction period.

Dredging could disrupt recreational activities around Bolinas Lagoon, and the presence of the pipeline and barge, as well as tugboat and barge movements, could limit recreation, recreational fishing, and possibly commercial fishing in Bolinas Bay for the duration of the dredging activities. Stinson Beach derives much of its income from recreation and tourism. Businesses that rely heavily on these visitors include two kayak shops that provide boat rentals and guided tours of the lagoon, a theater, motels and hotels, gift shops, and restaurants. Several businesses within Bolinas also rely on recreation and tourism. The pipeline would cross the beach but would not block access; however, temporary impacts could occur while it is being placed. Those using Bolinas Bay for recreation and commercial fishing would have to avoid the barge and tugboat, but use of the bay would continue throughout dredging and disposal activities. In addition, many parks and other recreational resources (discussed in Section 3.6) draw tourists and locals to these areas. Because these activities would be limited to approximately three months of each of four to seven years, these effects would be temporary.

As described in the recreation analysis, the location of the disposal pipeline in Bolinas Lagoon might have an impact on commercial kayaking in the lagoon, but this impact would be mitigated by submerging the pipeline as it crosses the Main Channel to allow free access to other areas of the lagoon.

The potential effects identified in the previous paragraphs would occur during the dredging/construction phase of the proposed project and would not constitute long-term impacts once dredging/construction was completed.

4.14.3 Estuarine Alternative

The potential effects on socioeconomics from the Estuarine Alternative are identical to those expected from the Riparian Alternative.

4.14.4 No Action Alternative

Less than Significant Impacts

Under the No Action Alternative, the sediment would be allowed to continue building up and filling in open water areas within the lagoon. This sedimentation would decrease the extent of tidal inundation, diminish water quality, and degrade habitat values. No direct socioeconomic impacts would result, based on the significance criteria presented above; however, indirect socioeconomic impacts could result from the No Action Alternative. As the sediment accumulates in the lagoon, the diversity of wildlife would decrease, which could alter or diminish recreational uses. The primary sources of income within the areas surrounding Bolinas Lagoon are recreation and tourism. A potential decrease in recreation expenditures could be considered adverse, but not significant, because there are many parks and other recreational resources (discussed in Section 3.6) that draw tourists and locals to these areas. Additionally, the sediment buildup in the lagoon would interfere with the activities of commercial fishers who are based in Bolinas Lagoon because it would become increasingly difficult for them to enter and leave the lagoon. The eventual complete closure of the lagoon would effectively prevent the use of the lagoon as a base for commercial fishing, and these fishers would have to stop fishing altogether or relocate to another harbor or marina, such as Bodega Bay to the north.

CHAPTER 5
CUMULATIVE IMPACTS

5.1 INTRODUCTION

In addition to the analyses discussed in chapters 1 through 4, both CEQA and NEPA require the EIS/EIR to identify and analyze cumulative impacts. NEPA Section 1508.7 defines a cumulative impact to a project area as that which can occur as a result of "individually minor but collectively significant actions taking place over a period of time." This impact can occur "when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions."

5.2 CUMULATIVE PROJECTS

The activities below may produce a cumulative impact to the Bolinas Watershed.

Stream Restoration

A grass roots environmental group called Stream Matrix undertook a restoration project on Easkoot Creek in Stinson Beach in 1999. With the approval and participation of local landowners, small flood-control barriers were removed from the creek in the spring of 1999 (Lewis 1999a). Stinson Beach County Water District agreed to maintain flows in the creek to protect the fishery until further restoration work on the creek could be performed (Lewis 2000). The NPS staff at GGNRA is planning to conduct an Easkoot Creek Stream Restoration Project in September-October of 2002. SBCWD will work with GGNRA staff to maintain and restore instream flows for fish (Fong 2002).

In October and November 2001, the Audubon Canyon Ranch completed the removal of artificial berms from the creek in Volunteer Canyon to reduce the volume of sediment being deposited in the lagoon (Schwartz 2002).

Pond Fencing

Stream Matrix is also working with private property owners to fence off the pond at the head of the Bolinas Lagoon in order to protect red-legged frogs from cattle (Lewis 1999a).

Watershed Enhancement

PRNS staff are preparing a watershed enhancement program in Pine Gulch Creek that would provide for offstream irrigation storage for organic farms in the area. The program is in the planning stages, but PRNS staff hope to have an application prepared within the next few years (Ketchum 2002).

PRNS will also be issuing Watershed Management Recommendations sometime in the next two to three years focusing on the Pine Gulch Creek area (Ketchum 2002).

Fisheries Investigations

PRNS staff have been conducting fishery investigations in Pine Gulch Creek, including installing smolt traps, making sedimentation assessments, and collecting data on water volume, quality, and temperature, but does not appear to have any immediate plans for stream restoration work because only part of the creek is within the park's jurisdiction (Smith 1999). The PRNS fisheries monitoring program is ongoing (Ketchum 2002).

Gravel Removal

MCOSD for the past ten years has conducted an annual gravel removal project on the lower end of Pine Gulch Creek. This entails removing approximately 1,000 cubic yards of gravel from the creek. This process includes electrostunning and relocating resident fish from that section of the creek farther downstream, diverting the water flow for 175 feet, and excavating the gravel and sediment trapped in the pond. The gravel is then loaded into trucks and either given to private landowners or used for road base on the mesa (Sanford 1999). MCOSD removes the gravel under short-term permits from the California Coastal Commission and the CDFG. It hopes to obtain long-term permits from CDFG sometime in the future (Miska 2002).

Marine Mammal Awareness

MCOSD, in collaboration with Sanctuary Education Awareness and Long-Term Stewardship (SEALS) and the National Oceanic and Atmospheric Administration (NOAA), has initiated a project designed to protect the marine mammals in the lagoon. This includes a brochure designed to educate the public, including kayakers, on the sensitive nature of the seal population in the lagoon. In addition, seal protection signs have been installed around the lagoon (BLTAC 1999a).

GFNMS conducts routine shoreline surveys (every other month and year-round), with some of the survey lines going around Bolinas Lagoon. GFNMS also implements a weekly, year-round Seal Monitoring Program to observe how seals (primarily harbor seals) respond to human disturbances. Both are long-term continuous projects (Roletto 2002).

Public Works and Planning

Caltrans has no projects scheduled in the project area for the foreseeable future (Wu 2002), and no major public works projects are planned for the Bolinas Lagoon area. The Stinson Beach County Water District recently completed replacing an old water line that runs out into the middle of the lagoon, with a new four-inch steel pipe buried along the edge of Highway 1. No additional work is scheduled for the project area (Black 2002).

Marin County has a few small development projects either approved or undergoing environmental review for the west Marin area, although none of them are within the project area (Crawford 2002; Lai 2002). The only large development project slated for approval is the Point Reyes Affordable Homes Project, described in further detail below. The following projects are either approved or are undergoing review at either the county level or other agency level for the west Marin area:

- **Point Reyes Affordable Homes Project, Downtown Point Reyes Station.** Marin County has approved this project, and the California Coastal Commission is reviewing it. If approved, construction is expected to commence in late 2002 for 36 units, including single-family homes and apartments.
- **Expansion of Point Reyes Seashore Lodge, Olema Creek.** The proposed project would involve expanding the facility, located near the corner of Highway 1 and Bear Valley Road, by building a 13-room lodge with a two-story conference center building immediately north of the Seashore Lodge. The project would also involve new parking spaces and a mound septic system to accommodate the new facilities. This proposal is currently undergoing county environmental review and will likely involve preparation of an EIR (Lai 2002).
- **Olema Campground Expansion, Lawson's Landing.** This proposal is undergoing county environmental review and would involve legalizing some current uses and making minor improvements at the campground.
- **Trailer Park, Lawson's Landing.** This application is on file with the county, which anticipates an EIR being prepared. This trailer park is operating without permits, and the applicant seeks permits for current uses.
- **Restaurant Remodeling, Marshall, Mixed Cove Overlooking Tomales Bay.** This application is on file with the county and is undergoing environmental review. If approved, the project would involve the remodeling and renovating a restaurant off Highway 1 overlooking the ocean and renovating six or seven cottages on the opposite side of the

Highway 1. The proposed project would also include building a small number of cottages upland of Highway 1.

- **Strauss Dairy Creamery, Marshall, Mixed Cove, Tomales Bay.** This application is on file with the county and is undergoing environmental review. If approved, the project would involve expanding the facility.
- **Giacomini Cheese Processing Facility, outside Point Reyes.** This application is undergoing county environmental review. If approved it would involve adding a small cheese processing center to the facility.

PRNS staff recently completed an environmental assessment for the ranch at the north end of the lagoon, covering existing land uses at this site. Some improvements will occur at the property as a result of the completed environmental review, including installation of a new septic system on the property. No new development will take place at this site without additional environmental review (Ketchum 2002).

Ongoing Management Projects

Ongoing activities that may cumulatively affect lagoon resources include diverting water from Pine Gulch and Easkoot creeks, maintaining septic systems and water quality, and managing vegetation (Fong 2000b; Schwartz 2002). PRNS staff are updating the park's management plan. The process started in 2000 and will probably continue through 2004 or 2005. The document would provide management guidance for 20 -years following its release (Ketchum 2002).

5.3 CUMULATIVE IMPACTS

5.3.1 Cumulative Resource Impacts

As discussed above, cumulative impacts occur when the proposed project's impacts contribute to impacts from other projects or activities in the area, and, collectively, these activities result in impacts greater than those for each individual project or activity. An impact to a particular resource may be considered to be less than significant when assessed for the proposed action alone but, when considered together in the context of other activities in the area, may be considered to be significant. For each resource, potential impacts associated with other projects and activities in the project vicinity (discussed above) were assessed and considered in relation to the proposed project impacts discussed in Section 4. The potential for cumulative impacts are discussed below for each resource area.

5.3.2 Hydrology and Groundwater

Riparian Alternative

A number of projects described above address issues related to improving conditions in the watershed of the lagoon or to altering tributaries. Future watershed management actions could have an impact on the amount of water or sediment that is transported to the lagoon. Most of these projects are relatively small in scale and would probably have small beneficial effects of reducing sediment loading to the lagoon. Dredging activities for the Riparian Alternative would occur downstream of these watershed projects and would not affect stream water quality or quantity. Altering the tidal prism under the Riparian Alternative would probably have a beneficial effect on water quality and circulation in the lagoon relative to the needs of anadromous fish, which would increase the chances of success of stream restoration projects aimed at reestablishing fish migration through the lagoon. The impacts on biological resources are discussed further below.

Estuarine Alternative

The cumulative effects of the Estuarine Alternative would be similar to those of the Riparian Alternative, except that the Estuarine Alternative would shorten the Pine Gulch Creek delta, probably increasing tidal influence in Pine Gulch Creek. Such changes in delta hydraulics and water quality could affect biological resources, such as anadromous fish runs.

No Action Alternative

If no action is taken to prevent closure of the lagoon inlet channel, then tributary stream restoration projects would be affected because many of these projects have the objective of restoring anadromous fish runs and otherwise taking advantage of the estuary characteristics of the lagoon.

5.3.3 Biological Resources

Riparian Alternative

Improved watershed management would have an impact on the water quality or amount of sediment that is transported to the lagoon. This would improve spawning habitat in the streams, as well as overall conditions necessary for the survival of smolt. Most of these projects are relatively small but could have a beneficial cumulative impact on stream quality. Stream restoration and fencing of the pond near the northern end of the lagoon would have a net beneficial impact on the red-legged frog. If performed on a large enough scale, the projects mentioned above would have a significant beneficial impact on wildlife habitat in the Bolinas Lagoon watershed.

Estuarine Alternative

Because most of the proposed improvements would occur independently of the alternative that is chosen, there would be no difference in the cumulative impact of other projects between the Riparian and Estuarine alternatives.

No Action Alternative

No action would result in a closed lagoon, through which anadromous fish would not pass. Therefore, the improvements to the watershed and feeder streams would have no impact on anadromous fish because they would have no access. The improvements to the red-legged frog habitat would be the same as those under the two alternatives mentioned above.

5.3.4 Geology, Soils, and Seismicity

Riparian Alternative

The Riparian Alternative is not expected to contribute to any cumulative geologic impacts.

Estuarine Alternative

As with the Riparian Alternative, the Estuarine Alternative is not expected to contribute to any cumulative geologic impacts.

No Action Alternative

The natural geomorphic evolution of the lagoon from a tidal estuary to a freshwater-dominated marshland could have a significant impact on the viability of stream restoration projects designed to interface with a tidal estuary. The nature and rate of evolution of the lagoon is unpredictable due to the unpredictability of seismic activity and fault displacement.

5.3.5 Cultural Resources

Riparian Alternative

Cumulative Impacts for cultural and Native American resources would occur if, during ground disturbing construction for development or stream restoration on lands or submerged lands in the area, unrecorded or previously recorded cultural or Native American sites are destroyed. Implementation of mitigation measures identified in Section 4.5, and compliance with state and federal cultural resources laws on the cumulative projects, would limit these impacts to less than significant.

Estuarine Alternative

Cumulative impacts for this alternative are identical to those of the Riparian Alternative, and, consequently, if the suggested mitigation measures were used, impacts would be reduced to less than significant.

No Action Alternative

There are no anticipated cumulative impacts for the No Action Alternative.

5.3.6 Public Access and Recreation resources

Riparian Alternative

The Riparian Alternative would contribute to long-term beneficial impacts on recreation resulting from stream restoration and watershed enhancement projects. These projects, in conjunction with the Riparian Alternative, would result in enhanced recreational opportunities in the long term for fishing and wildlife viewing in the project area.

Estuarine Alternative

The Estuarine Alternative would contribute to long-term beneficial impacts on recreation resulting from stream restoration and watershed enhancement projects. These projects, in conjunction with the Riparian Alternative, would result in enhanced recreational opportunities in the long term for fishing and wildlife viewing in the project area.

No Action Alternative

Few of the cumulative projects would contribute in any significant way to recreation resources in the project area; any such cumulative impacts would be negligible in light of the significant impacts on recreation resources under the No Action Alternative.

5.3.7 Land Use

Riparian Alternative

The projects mentioned above would not conflict with existing general plan designations or land uses and would have no adverse impacts on land use resources. The Riparian Alternative's impacts, therefore, are limited to direct and indirect impacts discussed in Section 4.3.7.

Estuarine Alternative

The projects mentioned above would not conflict with existing general plan designations or land uses and would have no adverse impacts on land use resources. The Estuarine Alternative's impacts, therefore, are limited to direct and indirect impacts discussed in Section 4.3.7

No Action Alternative

The projects mentioned above would not conflict with existing general plan designations or land uses and would have no adverse impacts on land use resources. The No Action Alternative's impacts, therefore, are limited to direct and indirect impacts discussed in Section 4.7.

5.3.8 Air Quality

Riparian Alternative

Cumulative air quality impacts would occur when multiple projects affect the same geographic areas at the same time or when sequential projects extend the duration of air quality impacts on a given area over a longer period. The air quality impacts of the proposed project stem primarily from temporary dredging and excavation activities. Ozone precursor emissions from heavy equipment would contribute slightly to area-wide and regional air quality conditions. Fugitive dust emissions from land-based excavation generally would have a more localized impact, with the most noticeable impacts occurring within half a mile or so of the project site.

Most of the projects and programs identified for cumulative analysis have minimal equipment operations and limited potential for generating fugitive dust from ground disturbance. Some of the stream restoration projects have already been completed. Pond fencing, watershed enhancement, marine mammal, and fisheries investigation projects have little potential for cumulative air quality impacts. The annual MCOSD gravel removal project on Pine Gulch Creek would have minor cumulative air quality impacts during implementation of either the Riparian Alternative or the Estuarine Alternative. But gravel removal quantities are very small under the MCOSD program, resulting in minimal emissions from equipment operations and truck transport of the removed material. Most identified development projects in Marin County are far enough from Bolinas Lagoon so that cumulative air quality impacts would not be significant.

Estuarine Alternative

Cumulative impacts for this alternative are identical to those of the Riparian Alternative.

No Action Alternative

There would be no air quality impacts from the project as result of the No Action Alternative; therefore there would be no cumulative air quality impacts.

5.3.9 Onshore Traffic and Transportation

Riparian Alternative

The ongoing gravel removal project in Pine Gulch Creek might have a minor cumulative impact on transportation resources in conjunction with the Riparian Alternative because it would require trucks to carry the gravel, and these trucks would be operating on the same roadways as the trucks carrying loads of soil and vegetation removed from the lagoon.

Estuarine Alternative

The ongoing gravel removal project in Pine Gulch Creek might have a minor cumulative impact on transportation resources in conjunction with the Estuarine Alternative because it would require trucks to carry the gravel, and these trucks would be operating on the same roadways as the trucks carrying loads of soil and vegetation removed from the lagoon.

No Action Alternative

There would be no transportation impacts from the project as a result of the No Action Alternative; therefore, there would be no cumulative air quality impacts.

5.3.10 Marine Traffic and Transportation

Riparian Alternative

None of the cumulative projects listed above are expected to have any impact on marine transportation because these are all land-based projects; therefore, there would be no cumulative marine transportation impacts as a result of this alternative.

Estuarine Alternative

None of the cumulative projects listed above are expected to have any impact on marine transportation because these are all land-based projects; therefore, there would be no cumulative marine transportation impacts as a result of this alternative.

No Action Alternative

None of the cumulative projects listed above are expected to have any impact on marine transportation because these are all land-based projects; therefore, there would be no cumulative marine transportation impacts as a result of this alternative.

5.3.11 Noise

Riparian Alternative

Cumulative noise impacts would occur when multiple projects affect the same geographic areas at the same time or when sequential projects extend the duration of noise impacts on a given area over a longer period of time. The noise impacts of the proposed project stem primarily from temporary dredging and excavation activities. Noise from equipment operations generally would have a very localized area of impact, with the most noticeable impacts occurring within a quarter mile of the project site.

Most of the projects and programs identified for cumulative analysis have minimal equipment operations and limited potential for generating significant noise levels. Some of the stream restoration projects have already been completed. Pond fencing, watershed enhancement, marine mammal, and fisheries investigation projects have little potential for cumulative noise impacts. The annual MCOSD gravel removal project on Pine Gulch Creek would have minor cumulative noise impacts during implementation of either the Riparian Alternative or the Estuarine Alternative. But gravel removal quantities are very small under the MCOSD program, resulting in minimal equipment operations and truck transport of the removed material. Most identified development projects in Marin County are far enough from Bolinas Lagoon so that cumulative noise impacts would not occur.

Estuarine Alternative

Cumulative impacts for this alternative are identical to those of the Riparian Alternative.

No Action Alternative

There would be no air quality impacts from the project as result of the No Action Alternative; therefore there would be no cumulative air quality impacts.

5.3.12 Aesthetics and Visual Resources

Riparian Alternative

The stream restoration and watershed enhancement projects are likely to result in positive visual impacts on the project area because they would protect and enhance the natural environment. The pond fencing project might result in a minor permanent impact on visual resources, depending on the type and location of the fence, as well as short-term impacts from project construction. These projects would result in minor cumulative impacts on the visual environment of Bolinas Lagoon.

Estuarine Alternative

The stream restoration and watershed enhancement projects are likely to result in positive visual impacts on the project area because they would protect and enhance the natural environment. The pond fencing project might result in a minor permanent impact on visual resources, depending on the type and location of the fence, as well as short-term impacts from project construction. These projects would result in minor cumulative impacts on the visual environment of Bolinas Lagoon.

No Action Alternative

The No Action Alternative is not expected to contribute to cumulative impacts on visual resources in the project area.

5.3.13 Public Services and Utilities

Riparian Alternative

The projects most likely to result in impacts on public services and utilities are primarily planned for other areas of west Marin, particularly Point Reyes Station and areas around Tomales Bay, although the Point Reyes Seashore Lodge is not far from the project area. These small projects would expand in a minor way the need for public services in west Marin, particularly utilities (power and water) and public safety services required by new residences and businesses. Because the Riparian Alternative is expected to produce only a less than significant impact resulting from possible interference with a water line in Stinson Beach, this alternative would not result in a cumulatively significant impact on public services or utilities in the project area.

Estuarine Alternative

The projects most likely to result in impacts on public services and utilities are primarily planned for other areas of west Marin, particularly Point Reyes Station and areas around Tomales Bay, although the Point Reyes Seashore Lodge is not far from the project area. These small projects would expand in a minor way the need for public services in west Marin, particularly utilities (power and water) and public safety services required by new residences and businesses. Because the Estuarine Alternative is expected to produce only a less than significant impact resulting from possible interference with a water line in Stinson Beach, this alternative would not result in a cumulatively significant impact on public services or utilities in the project area.

No Action Alternative

Under the No Action Alternative, lake levels could increase and Highway 1 could flood. If this were to occur, this could result in increased demand for utility and public services in the area to protect human life and property. Increased flooding may necessitate increased demand for police and fire protection along Highway 1. Flooding would also likely result in increased levels of maintenance necessary for utilities to maintain water and power in the area. If inclement weather conditions resulted in increased service requirements along Highway 1 at any of the proposed developments described above, the No Action Alternative could contribute to cumulative effects to public services and utilities in the area.

5.3.14 Socioeconomics

Riparian Alternative

The cumulative projects listed above would result in minor increases in local population and local employment and would therefore result in less than significant impacts on socioeconomic conditions in west Marin. These impacts would occur independently of the less than significant socioeconomic impacts of the Riparian Alternative and would not result in cumulatively significant impacts within the project area.

Estuarine Alternative

The cumulative projects listed above would result in minor increases in local population and local employment and would therefore result in less than significant impacts on socioeconomic conditions in west Marin. These impacts would occur independently of the less than significant socioeconomic impacts of the Estuarine Alternative and would not result in cumulatively significant impacts within the project area.

No Action Alternative

The No Action Alternative is not expected to contribute to cumulative socioeconomic impacts in the project area.

CHAPTER 6
OTHER REQUIRED ANALYSES

6.1 INTRODUCTION

In addition to the analyses discussed in chapters 1 through 4, both NEPA and CEQA require additional evaluation of the project's impacts. This chapter and the previous chapter, Cumulative Impacts, satisfy those requirements. These evaluations include identifying and analyzing growth-inducing impacts (CEQA), the relationship between short-term uses and long-term productivity (NEPA), and any irreversible or irretrievable commitment of resources (NEPA) or significant irreversible environmental changes (CEQA).

Issues related to Environmental Justice are presented in accordance with federal Executive Order 12898, 3 CFR 859 (1995),; issues related to protecting children from environmental health risks are presented in accordance with EO 13045, 3 CFR 198 (1998).

6.2 RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF THE ENVIRONMENT AND LONG-TERM PRODUCTIVITY (NEPA)

NEPA requires that an EIS consider the relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity. The project would cause short-term construction impacts, described in Chapter 4, but would result in long-term enhanced ecosystem productivity in Bolinas Lagoon. The project would result in an immediate substantial adverse impact on riparian habitat and wetlands in the project area but would produce substantial long-term benefits to subtidal and intertidal habitat.

6.3 GROWTH-INDUCING IMPACT (CEQA)

An EIS/EIR must include a discussion of the ways in which the proposed action and alternatives could foster economic or population growth or the construction of additional housing, either directly or indirectly, in the surrounding area. Analysis of growth-inducing effects includes those characteristics of the action that may encourage and facilitate activities that, either individually or cumulatively, would affect the environment. Population increases, for example, may impose new burdens on existing community service facilities. Similarly, improving access routes may encourage growth in previously undeveloped areas. While growth itself may not be assumed adverse or beneficial, it may have beneficial, adverse, or significant environmental impacts, depending on its actual impacts on the environmental resources present.

Marin County has established criteria for determining growth-inducing impacts, as follows:

- Would the project extend urban services into a previously unserved area?
- Would the project remove a major obstacle to development and growth?
- Does the project in any way set a precedent for additional growth in the area?
- Would the project induce development to support the uses proposed?

The purpose of the proposed project is to correct one hundred and fifty years of increased sedimentation in Bolinas Lagoon by restoring the lagoon to historic habitat levels. The project would have no discernible impact on economic development or population growth in the surrounding area. Marin County has strictly limited development in west Marin, and there are no elements of either project alternative that are expected to increase development in the project area, to extend urban services into west Marin, to remove obstacles to development, or to set a precedent for additional growth. Any development necessary to support the project (such as traffic management protocols or staging facilities) would be purely short term and would be removed at the conclusion of the project.

6.4 Irreversible and Irretrievable Commitments of Resources

NEPA and CEQA require that an EIS/EIR analyze the extent to which the proposed project's primary and secondary effects would commit nonrenewable resources to uses that future generations would be unable to reverse. Excavation in PGC Delta, Kent Island, Dipsea Road, and the Highway 1 fills would produce a permanent change in those areas. Also, excavation of the North Basin, Main Channel, Bolinas Channel, and South Lagoon Channel would result in permanent changes to the lagoon's hydrology. This excavation would essentially be irreversible.

The project would not require a large commitment of nonrenewable resources, other than the fuels required to power the project machinery, nor would it include highway construction or other improvements that would provide access to a previously inaccessible area.

6.5 Environmental Justice

This section addresses specific topics related to Environmental Justice, as required by NEPA. Specifically, issues related to Environmental Justice are discussed in accordance with EO 12898, and issues related to protecting children from environmental health risks are discussed in accordance with EO 13045.

On February 11, 1994, President Clinton issued EO 12898, entitled Federal Actions to Address Environmental Justice in Minority and Low-Income Populations. This order requires that "each federal agency make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities, on minority populations and low-income populations" (59 FR 7629 [Section 1-101]). The following studies have been conducted to comply with the order:

- Economic, racial, and demographic information from the 2000 census has been gathered to identify areas of low-income and high minority populations in and around the project area, and
- The alternatives for disproportionate impacts resulting from on-site activities associated with the proposed action have been assessed.

6.5.1 Demographics

The racial breakdown of Marin County, Bolinas, and Stinson Beach is presented in the following tables. Although the Bolinas Lagoon study area no longer includes them, the traditional lands of the newly federally recognized Federated Indians of Graton Rancheria at one time included land within the study area.

As identified in the 1990 census, approximately 85 percent of Marin County was white, 7.8 percent was Hispanic, 3.9 percent was Asian/Pacific Islander, 3.3 percent was black, and 0.28 percent was Native American. Table 6-1 provides a comparison of racial demographic changes within Marin County from 1990 to 1997. Between 1990 and 1997, the total population of Marin County increased by 5.73 percent. Among racial groups, the largest increase, two percent, occurred among Hispanics. The white proportion of the Marin County population decreased during this period by three percent (California Department of Finance 1990, 1997). These statistics are shown in Table 6-2.

Table 6-1
Demographic Changes 1990-1997 for Marin County

	1990	1990 Percent of Total	1997	1997 Percent of Total	Percent Change 1990-1997
White	194,912	85%	198,801	82%	-3.0%
Hispanic	17,930	7.8%	23,958	9.8%	2.0%
Asian/Pacific Islander	9,064	3.9%	11,623	4.7%	0.8%
Black	7,529	3.3%	8,281	3.4%	0.1%
Native American	661	0.28%	611	.25%	-0.03%
Total	**230,096**		**243,274**		

Source: California Department of Finance 1990, 1997

According to the United States Census Bureau, in 2000, approximately 95 percent of Stinson Beach was white, 2.9 percent was "Other" (either uncategorized or two or more races), and less than one percent was Asian, Pacific Islander, black, or Native

American. In 2000, the population of Bolinas was 90 percent white, 5.1 percent "Other," 1.8 percent Asian, 1.8 percent black, 0.4 percent Asian/Pacific Islander, and less than one percent Native American or Pacific Islander (US Census 2002). These statistics are illustrated in tables 6-2 and 6-3.

Table 6-2
Demographic Information for Stinson Beach - 2000

	2000	**2000 Percent of Total**
White	720	95.9%
Asian	5	0.7%
Pacific Islander	0	0.0%
Black	2	0.3%
Native American	2	0.3%
Other	22	2.9%
Total	**751**	

Source: US Census 2002

Table 6-3
Demographic Information for Bolinas - 2000

	2000	**2000 Percent of Total**
White	1,128	90.5%
Asian	22	1.8%
Pacific Islander	5	0.4%
Black	23	1.8%
Native American	4	0.3%
Other	64	5.1%
Total	**1,246**	

Source: US Census 2002

6.5.2 Standards of Significance

To determine whether low-income and minority populations could be disproportionately affected by the action alternative or the No Action Alternative, data identified in Chapter 3 was used to identify income and population characteristics of the region.

A project alternative would have a significant impact if it were to potentially affect a community that includes minority or low-income populations and if it were to disproportionately affect the minority or low-income members of the community or tribal resources.

6.5.3 Environmental Justice Analysis

Riparian Alternative

The Riparian Alternative would have no significant effects on minority or low-income populations. While the population in the ROI does include minority and low-income residents, the impacts of this alternative would not have a disproportionate impact on those members of the community or on tribal resources.

Estuarine Alternative

The Estuarine Alternative would have no significant effects on minority or low-income populations. While the population in the ROI does include minority and low-income residents, the impacts of this alternative would not have a disproportionate impact on those members of the community or on tribal resources.

No Action Alternative

The No Action Alternative would have no significant effects on minority or low-income populations. While the population in the ROI does include minority and low-income residents, this alternative would not have a disproportionate impact on those members of the community or on tribal resources.

6.6 PROTECTION OF CHILDREN

EO 13045, Protection of Children from Environmental Health Risks and Safety Risks (April 21, 1997), recognizes a growing body of scientific knowledge demonstrating that children may suffer disproportionately from environmental health risks and safety risks. These risks arise because children's bodily systems are not fully developed, because they eat, drink, and breathe more in proportion to their body weight, because their size and weight may diminish protection from standard safety features, and because their behavior patterns may make them more susceptible to accidents. Based on these factors, the president directed each federal agency to make it a high priority to identify and assess environmental health risks and safety risks that may disproportionately affect children. The president also directed each federal agency to ensure that its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks.

To comply with EO 13045, this EIR/EIS included the following actions:

- Identified locations with potentially high concentrations of children, such as schools, day care centers, recreation areas, and residential areas, in areas potentially exposed to project impacts, and
- Assessed activities associated with the proposed project for impacts that would disproportionately affect the health and safety of children.

Marin County has 15 elementary schools, 12 middle schools, and 6 high schools. As of 1997, enrollment for both public and private schools was 35,199, community college enrollment was 16,055, and private college enrollment was 1,686 (California Department of Finance 1999).

The Bolinas-Stinson Union District is an elementary district serving the west Marin communities of Bolinas and Stinson Beach. The district has one school with two separate campuses and covers grades kindergarten through eight. As of September 20, 1999, district enrollment was 176 students (Resta 1999). The Bolinas campus, on Olema-Bolinas Road in Bolinas, serves grades three through eight. The Stinson campus, which is one mile north of Stinson Beach along Highway 1, offers elementary education for kindergarten through grade two (Bolinas School District 1999; Mace 2001).

Riparian Alternative

The Riparian Alternative would have less than significant effects on the health and safety of children. The Stinson Beach School is near the project area on Highway 1. Construction, particularly during the Highway 1 fills excavation, might interfere with school activities. Trucks and other equipment would operate along Highway 1 and would constitute a small potential risk to children's safety during construction. Additionally, road closures near the school during construction might increase the risk of car accidents involving children. These activities are expected to be of limited duration. Construction along Highway 1 would include standard traffic management and public safety protocols to reduce the potential risk to children to a less than significant level.

Estuarine Alternative

The Estuarine Alternative would have less than significant effects on the health and safety of children. The Stinson Beach School is near the project area on Highway 1. Construction, particularly during the Highway 1 Fills excavation, might interfere with school activities. Trucks and other equipment would operate along Highway 1 and would constitute a small potential risk to children's safety during construction. Additionally, road closures near the school during construction might increase the risk of car accidents involving children. These activities are expected to be of limited duration. Construction along Highway 1 would include standard traffic management and public safety protocols to reduce the potential risk to children to a less than significant level.

No Action Alternative

The No Action Alternative would have no impact on the health and safety of children. No project action would be taken, and there would be no increased potential safety risks to children.

CHAPTER 7
CONSULTATION AND COORDINATION

7.1 AGENCIES AND REPRESENTATIVES CONTACTED

The federal, state, and local agencies and private organizations that were contacted during the course of this EIR/EIS are listed below. Table 7-1 provides a brief overview of federal, state, and local agencies with whom the lead agencies must consult during the NEPA process.

Federal Agencies

US Environmental Protection Agency, Region IX, NEPA Reviewer
US Department of the Interior, Fish and Wildlife Service
US Department of the Interior, National Park Service, Golden Gate National Recreation Area
US Department of the Interior, National Park Service, Point Reyes National Seashore
United States Department of Commerce National Oceanic and Atmospheric Administration, National Marine Fisheries Service
United States Department of Commerce, National Oceanic and Atmospheric Administration, Gulf of the Farallones National Marine Sanctuary
United States Coast Guard
United States Geological Survey

State Agencies

California Coastal Commission
California Coastal Conservancy
California Department of Fish and Game
California Department of Transportation
California State Clearinghouse
California Regional Water Quality Control Board
California Department of Boating and Waterways

Regional and Local Agencies

Marin County Planning Department

Marin County Department of Parks, Open Space and Cultural Services
Marin County Department of Public Works
Marin County Community Development Agency
Marin County Open Space District
Marin/Sonoma Mosquito and Vector Control District
Marin County Sheriff (Point Reyes Substation)
Bay Area Air Quality Management District
Association of Bay Area Governments
Bolinas Fire Department
Stinson Beach County Water District
Stinson Beach Fire Department
Bolinas-Stinson Union School District

Organizations

Bolinas Lagoon Technical Advisory Committee
Stream Matrix
Audubon Canyon Ranch
Point Reyes Bird Observatory
Sierra Club, Marin County Chapter
Bolinas Rod and Boat Club

7.2 SCOPING

Pursuant to CEQA, Marin County prepared an initial study and filed a notice of preparation that an EIR was to be prepared for the proposed project with the California Office of Planning and Research on April 5, 2000 (State Clearinghouse No. 2000042055). On April 9, 1998, pursuant to NEPA, the Corps published a notice of intent to prepare an EIS for the proposed project (63 Federal Register 17392). The public scoping meeting that took place on April 16, 1998, and the ongoing informal public review during the project design phase fulfill the NEPA requirement to receive input from the public on the scope of the project, including the scope of the issues to be addressed (40 CFR 1501.7). Additionally, upon the release of the draft EIS/EIR, a formal review period of 45 days will be provided to receive additional input from the public.

Table 7-1
Required Coordination and Jurisdictional Background

Agency	Permit/Approval/Consultation	Authority	Jurisdictional Discussion
Federal Agencies			
Advisory Council on Historic Preservation (ACHP)	Opportunity to comment	National Historic Preservation Act, 16 USCA, § 470 et seq.	The ACHP must have an opportunity to comment on any federal undertaking that has an adverse effect on a historic property listed on or eligible for the National Register of Historic Places.
US Army Corps of Engineers, San Francisco District	Adopt ROD River and Harbors Appropriation Act, sections 9 and 10, permit for construction in navigable waters Section 404 of the Clean Water Act permit for filling or dredging	NEPA, 42 USCA, §§ 4321-4370d 33 USCA, §§ 401, 403; 33 CFR, Parts 320, 322, and 325 33 USCA, § 1344	The Corps is working with the MCOSD under the authority delegated to it by Section 142 of the Water Resources Development Act (WRDA) of 1976 (PL [Public Law] 94-587), as amended by Section 705 of the WRDA of 1986 (PL 99-662), to investigate the conditions in the Bolinas Lagoon and to determine the feasibility of a program to reduce the sedimentation in the lagoon. The Corps is the lead agency under NEPA for analyzing the environmental impacts of the Bolinas Lagoon Ecosystem Restoration Feasibility Study. In addition, the Corps has regulatory jurisdiction over projects in Bolinas Lagoon under the Clean Water Act and the Rivers and Harbors Act.
US Environmental Protection Agency, Office of Federal Activities	NEPA review	NEPA, 42 USCA, §§ 4321-4370d; CAA, 42 USCA 7609	EPA reviews all environmental impact statements for adequacy and environmental impacts, files EISs, and prints notices of availability of the EIS in the Federal Register.
US Fish and Wildlife Service	Interagency consultation, pursuant to Section 7 of the Endangered Species Act – nonmarine species	Endangered Species Act, 16 USCA, § 1531 - 1534; 50 CFR, Part 402	Any federal agency taking an action that might affect the habitat or health of an endangered species is required to consult with the FWS for an opinion on the action.

Table 7-1
Required Coordination and Jurisdictional Background *(continued)*

Agency	Permit/Approval/Consultation	Authority	Jurisdictional Discussion
NMFS	Interagency consultation pursuant to Section 7 of the Endangered Species Act – marine species	Endangered Species Act, 16 USCA, § 1531 - 1534; 50 CFR, Part 402	Any actions that might adversely affect sensitive marine species must be submitted to NMFS for a jeopardy opinion.

Table 7-1
Required Coordination and Jurisdictional Background *(continued)*

Agency	Permit/Approval/Consultation	Authority	Jurisdictional Discussion
NOAA, GFNMS	Permit authorizing disturbances in the sanctuary Endangered Species Act and National Marine Sanctuaries Act consultation	NOAA Administrative Order No. 216-6; 15 CFR 922.83 National Marine Sanctuaries Act, 16 USCA, §§ 1431 et seq.; 15 CFR, Part 922; Endangered Species Act, 16 USCA, § 1531 - 1534; 50 CFR, Part 402; 50 CFR, Part 402	The Gulf of the Farallones National Marine Sanctuary surrounds the Farallon Islands and extends to the California coastline, including the Bolinas Lagoon up to the mean high tide line. Activity within the lagoon is regulated by the administrator of the GFNMS. The uses affected by the sanctuary's regulations include motor vehicle operations, construction, boating, and activities involving or affecting marine mammals, birds, and cultural and historical resources.
US National Park Service (NPS), PRNS, and Golden Gate National Recreation Area	Consistency with NPS management plans, policies, and regulations	36 CFR 2.12; NPS NEPA guidance	While the NPS does not have any direct authority over Bolinas Lagoon itself, it does have jurisdiction over much of the lagoon's watershed. The superintendent of PRNS has jurisdiction over all NPS lands west of Olema Creek and south to Bolinas-Fairfax Road. This includes management authority over the part of GGNRA between Sir Francis Drake Boulevard and Bolinas-Fairfax Road. The superintendent of the GGNRA has jurisdiction over all NPS lands east of the lagoon to Bolinas-Fairfax Road (NPS 1997). GGNRA also manages three properties on the west side of the lagoon that occupy a combined area of approximately 45 acres (Fong 2000).

Table 7-1
Required Coordination and Jurisdictional Background *(continued)*

Agency	Permit/Approval/Consultation	Authority	Jurisdictional Discussion
State Agencies			
Bay Area Air Quality Management District (BAAQMD)	Permit to construct and operate	Cal. Health & Safety Code, §§ 42300 et seq.	Projects that would operate stationary emission sources or portable emission sources that are not registered with the California Air Resources Board in the Bay Area must receive a permit from BAAQMD.
California Coastal Commission	Coastal consistency determination and Permit to install pipeline below high tide line	California Coastal Act of 1976, Cal. Pub. Res. Code, §§ 30000 et seq.; Federal Coastal Zone Management Act, 16 USCA, §§ 1451-1465	Any action taken by the Corps to restore Bolinas Lagoon would require a coastal consistency determination from the Coastal Commission to ensure that the project complies with local coastal plans and state coastal protection policies. In addition, the Coastal Commission must approve any construction below the high tide line.
CDFG	Interagency consultation, streambed alteration agreement	California Endangered Species Act, Cal. Fish & Game Code, §§ 2090 et seq.; Cal. Fish & Game Code, § 1603	CDFG has authority to review permits for activity on inland waterways. It has jurisdiction over estuarine waters below the mean high tide line and has the authority to issue permits for commercial harvesting of aquatic resources.
California Department of Transportation	Encroachment permit for use of state rights-of-way	California Streets and Highways Code, § 1460	Caltrans has jurisdiction over State Route 1, which parallels the east side of Bolinas Lagoon.
California Regional Water Quality Control Board (RWQCB)	Waste discharge requirements	Porter-Cologne Water Quality Control Act, Cal. Water Code, §§ 13000-14958, Federal Clean Water Act, 33 USCA, §§ 1251-1387	The RWQCB for the San Francisco Bay Area has state jurisdiction over the discharge of any material that might affect the water quality in Bolinas Lagoon.
Mount Tamalpais State Park	Compliance with management plans	California Code of Regulations, Title 14, Division 3	Any watershed restoration project that might affect the upper section of Easkoot Creek would require the approval of the supervisor of Mount Tamalpais State Park.
State Lands Commission	Lease/Permit	Cal. Pub. Res. Code § 6301; California Code of Regulations, Title 2, §§ 2800-2803	The State Lands Commission owns all coastal property between the low and high tide lines on coastal beaches; therefore, it must grant permission to cross the beach with the pipeline carrying slurry from Bolinas Lagoon.

Table 7-1
Required Coordination and Jurisdictional Background *(continued)*

Agency	Permit/Approval/Consultation	Authority	Jurisdictional Discussion
State Historic Preservation Office (SHPO)	Consultation and memoranda of agreement (if necessary)	National Historic Preservation Act, 16 USCA, § 470 et seq.	The SHPO must concur with findings regarding the eligibility of, and effect on, any historic resources identified within the project area.
Local Agencies			
BLTAC	Consultation with MCOSD	Technical advice: no legal decision-making authority	BLTAC has no direct jurisdiction over the lagoon but advises Marin County on management issues. Members include representatives of local and state agencies, as well as all major stakeholder groups within the Bolinas Lagoon watershed.
Marin County/Marin County Open Space District	EIR certification as lead agency for CEQA	CEQA, Cal. Pub. Res. Code, §§ 21000-21178.1	Marin County owns Bolinas Lagoon. Since 1988, the lagoon has been managed by the MCOSD as an open space preserve. In addition to being the lagoon's landowner, Marin County also enforces compliance with plans and policies.
	Comply with MCOSD Code	MCOSD Code, Title 2	
	Coastal development permit	California Coastal Act of 1976, Cal. Pub. Res. Code, §§ 30000 et seq.	
	Consistency with local planning documents	Marin Countywide Plan, Stinson Beach Community Plan, Bolinas Community Plan	

CHAPTER 8
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Association of Bay Area Governments
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COUNTY AGENCIES

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Marin County Parks and Recreation Commission
County of Marin, Planning Department

OTHER INTEREST GROUPS

California Coastal Conservancy
Stream Matrix
Audubon Canyon Ranch
Point Reyes Bird Observatory
Sierra Club, Marin County Chapter
Bolinas Rod and Boat Club
Marin Audubon Society

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City of San Rafael, Planning Department
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Marin County
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Planning Commission
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Department of Public Works
Harbormaster, Bodega Bay

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Pacific Gas and Electric
Stinson Beach County Water District
Marin Municipal Water District

Numerous special interest groups, other interested individuals, and San Francisco Bay Area media representatives also are included on the mailing list for the draft EIS/EIR.

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