South Bay Salt Ponds Initial Stewardship Plan
Final Environmental Impact Report/Environmental Impact Statement

March 2004

Submitted by:

California Department of
Fish and Game

United States Fish and
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Final
South Bay Salt Pond Initial Stewardship Project

Environmental Impact Report / Environmental Impact Statement

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EXECUTIVE SUMMARY

Introduction

On March 16, 2003, the State of California and the Federal government acquired 16,500 acres of commercial salt ponds in San Francisco Bay from Cargill, Inc. This acquisition set the stage for the development of the largest tidal wetland restoration project on the West Coast. Specifically, the purpose of this acquisition was to protect, restore and enhance the property for fish and wildlife, as well as to provide opportunities for wildlife-oriented recreation and education. Of the acquired lands, 15,100 acres are located in South San Francisco Bay and the remaining lands are in the North Bay in Napa County. This Environmental Impact Report/Environmental Impact Statement (EIR/EIS) only addresses the 15,100 acres acquired in South San Francisco Bay (12,900 acres salt production ponds, 1,300 acres of associated levees and uplands, 700 acres of marsh and tidal wetlands, 200 acres of seasonal ponds).

Under commercial salt production, Cargill managed the South Bay salt ponds as shallow water ponds at various salinity levels. The salinity levels varied both geographically, based on the location of the pond within the system (for example, the highest salinities occurred in ponds closest to the production plant sites) and temporally, based on seasonal and climatic conditions (for example, salinities decreased during the winter rainy season and during wet years). Although these ponds were managed for commercial salt production, they provided habitat for many water bird species including waterfowl and shorebirds. Ponds that were owned by Cargill in fee title were closed to public access. Other ponds, for which Cargill only held salt-making rights and which were parts of the Don Edwards San Francisco Bay National Wildlife Refuge, were open to several types of public use.

The restoration of the salt ponds is taking place in three independent stages. First, Cargill is reducing the salinity levels in the ponds by moving the saltiest brines to its plant site in Newark. After they reduce the salinities to levels that are permitted to be discharged to the Bay, Cargill will no longer manage the ponds for salt production. Management of the Baumberg ponds will be turned over to the California Department of Fish and Game and management of the Alviso ponds and West Bay ponds will be turned over to the U.S. Fish and Wildlife Service.

In the second stage of restoration, the ponds will be managed by the agencies in a manner that provides habitat values while the long-term restoration plan is being developed and implemented. The South Bay Salt Pont Initial Stewardship Plan (ISP), dated June 2003, addresses management of the ponds at this stage. Under the ISP, Bay waters will be circulated through the ponds following installation of water control structures and the existing levees will be maintained for minimum flood protection. This EIR/EIS covers only the second stage of restoration, i.e., management under the ISP .

The third stage of restoration is the actual long-term restoration of the salt ponds to a mix of tidal marshes, managed ponds and other habitats. The planning process for this long-term restoration is just beginning and will include a substantial amount of data collection, studies, modeling efforts, and public involvement. The long-term planning process will include development of a separate EIR/EIS and therefore long-term activities are not discussed further in this document.

Purpose and Need

The purpose of the project is to maintain and enhance, to the extent possible, the biological and physical conditions within the South Bay salt ponds, in the interim period between the cessation of salt-making activities, and the implementation of a long term restoration plan. The saline ponds currently support populations of fish and wildlife, including special status species, migratory waterfowl, shorebirds, other water associated birds, resident fish and invertebrates.

The project is needed because:

- The saline ponds will soon be disconnected from ongoing salt making operations.
- Without initial stewardship the ponds will be subject to increasing salinity and declining ecological value.
- Deterioration of levees could lead to levee breaches and uncontrolled high-salinity discharges, resulting in potential adverse effects on aquatic populations in the adjacent open bay and potential flooding of adjacent properties.
- Restoration costs would be increased with site deterioration.
- Water levels would become unmanageable and, especially during the summer months, would result in increased salinity, acidic conditions, and drying of most of the ponds.

Implementing the project will benefit the environment by:

- Maintaining and enhancing to the maximum extent possible the ecological and physical health of the salt ponds until a long term restoration plan is completed and implemented.
- Improving water circulation within the ponds to maintain and enhance existing fish and wildlife populations.

As part of normal salt making operations, bay water is brought in to the pond systems at several locations around the bay. After entering the system, it is moved through the concentrator ponds over five years until the salinities are ready for the precipitation of salt for harvest at the Newark Plant site. The salt making process is a closed system with water being taken with no discharge to the bay. End products of the process are (1) salt, which is harvested as a crop and (2) bittern, a byproduct which cannot be discharged back to the bay and is stored and used for commercial applications.

The salt making system included an array of ponds of varying salinities (low to high) and water levels (shallow to deep). Pond salinities and depths varied during the seasons depending on water movements within the system to optimize the salt concentration process. The ponds incidentally provided habitat for many species of fish and wildlife. Fish and wildlife values were not a management objective of the salt making process.

With acquisition of the South Bay Salt Ponds by the Department of Fish and Game and the U. S. Fish and Wildlife Service, the ponds will no longer be part of the salt making process. Consequently they must be managed as separate systems to assure that they provide fish and wildlife habitat value while minimizing future restoration costs. This management must continue through the planning and implementation of the long-term restoration plan. Implementation of the long-term restoration plan is expected to be conducted in phases beginning in about 5 years, but with subsequent phases extending to 20+ years. Therefore, some ponds may be managed under an initial stewardship plan for as little as 5 years, while others may require such management for 20+ years.

To achieve the purpose of the project, the two agencies need to have the ability to establish a water circulation system which allows the bay water to discharge back into San Francisco Bay. Without the ability to discharge, bay water brought into the pond system will evaporate resulting in elevated salinities which will ultimately reduce fish and wildlife values as seen in the North Bay salt ponds. If the agencies are not able to circulate water through the system, they will not be able to bring bay water into the system due to the potential for increasing pond salinities to unmanageable levels. This will change the character of the pond system from what is currently shallow open water pond habitat of varying salinities, to seasonal pond habitat filled primarily by rain water during the winter and dry the remainder of the year. This change could significantly reduce the value of the ponds to fish and wildlife.

Project Objectives

The ISP Team sought to develop a reasonable range of alternatives to be considered in this EIR/EIS that meet this general goal and a number of specific objectives of the ISP. The specific objectives of the ISP include:

A. Cease salt concentrating process.
B. Circulate bay water through the ponds and introduce tidal hydrology to Island Ponds, if feasible.
C. Maintain existing open water and wetland habitat for the benefit of wildlife, including habitat for migratory shorebirds and waterfowl and resident breeding species.
D. Maintain ponds in a restorable condition to facilitate future long-term restoration.
E. Meet all regulatory requirements, especially discharge requirements to maintain water quality standards in the South Bay.
F. Work within existing funding constraints.
G. Maintain existing levels of flood control

Project Alternatives

The purpose of this project is to provide a biologically sound interim management program for the ponds during planning and implementation of the long-term salt pond restoration. One No Action and three action alternatives were analyzed in detail in the EIR/EIS. A summary of the alternatives is shown on Table S-1, which shows the differences of the alternatives with respect to levee maintenance, Initial Release Period (IRP), Continous Circulation Period (CCP), and Public Access. The IRP is the start up period for the circulation of Bay water through the pond systems. This period is expected to last approximately two months and involves release of higher salinity water to the Bay. The CCP is the management period following the IRP during which Bay waters will be continuously circulated through the ponds and which may last from five to twenty or more years. A comparison of alternatives in meeting project need is shown on Table S-2, and a comparison of project impacts of project alternatives is shown on S-3.

Table S-1: Summary of Alternatives

Alternative	Levee Maintenance	Initial Release Period (~2 months)	Continuous Circulation Period (5+ years)	Public Access
No Project/ No Action	No	N/A	N/A	No new access; existing access at risk
1. Seasonal Ponds	Yes	N/A	N/A	No new access; existing access maintained.
2. Simultaneous March/April Release	Yes	Low to mid-salinity brines released from most ponds at same time in spring	Ponds managed as combination of continuous flow through ponds, batch ponds and seasonal ponds, with options for changing management based on monitoring.	New docent-led tours/limited hunting; existing access maintained
3. Phased Initial Discharge	Yes	Low to mid-salinity brines released from different ponds over several years in July and March/April	Ponds managed as combination of continuous flow through ponds, batch ponds and seasonal ponds, with options for changing management based on monitoring.	New docent-led tours/limited hunting; existing access maintained

Under the No Action alternative, the pond waters/brines remaining in the ponds would be allowed to evaporate. The ponds would then fill seasonally with rainwater in winter and dry through the evaporation process in summer. No new public access would be available. No action would be conducted by the agencies, including levee maintenance, and some levees would likely fail during this period. Existing public access would be lost in areas of levee failure.

In Action Alternative 1 (Seasonal Pond Alternative), the pond waters/brines remaining in the ponds would be allowed to evaporate. The ponds would then fill seasonally with rainwater in winter and dry through the evaporation process in summer. No new public access would be available. The only action taken by the agencies would be to maintain the levees at their current standard of maintenance (i.e., salt pond maintenance, not for flood control).

Under the two action alternatives which include circulation of bay waters through the ponds, the pond levees would continue to be maintained at the current level and the ponds previously kept closed by Cargill would be open to some public access, including docent led tours and limited hunting activities. These two action alternatives differ in the timing of the initial release of the existing low to mid salinity brines in the ponds.

In Action Alternative 2 (Simultaneous March/April Initial Release), the contents of most of the Alviso and Baumberg Ponds would be released simultaneously in March and April. The ponds would then be managed as a mix of continuous circulation ponds, seasonal ponds and batch ponds, though management of some ponds could be altered through adaptive management during the continuous circulation period. Higher salinity ponds in Alviso and in the West Bay would be discharged in March and April in a later year when salinities in the ponds have been reduced to appropriate levels. The Island Ponds (A-19, 20, and 21) would be breached and open to tidal waters.

In Action Alternative 3 (Phased Initial Release), many of the lower salinity ponds in Alviso and Baumberg would be discharged in July, and the medium salinity ponds would be discharged the following March and April. These ponds would then be managed in the same manner as in Alternative 2 during the continuous circulation period. The higher salinity ponds would also be managed as in Alternative 2.

Table S-2 provides a subjective evaluation of the degree to which each of the alternatives meets the project objectives listed above. Plus (+) and minus (-) signs are used, with more plus signs signaling greater achievement of the project goals, and more minus signs signaling failure to achieve those goals.

Table S-2. Comparison of Alternatives in Meeting Project Objectives

Project Objective	No Project/ No Action	Seasonal Ponds (Alternative 1)	Simultaneous Discharge March/April Release (Alternative 2)	Phased Initial Release (Alternative 3)
Cease Salt Making Process[1]	+	+	++	+++
Circulate Bay waters through ponds/ Introduce tidal waters to Island Ponds[1]	- - -	- - -	++	+++

Project Objective	No Project/ No Action	Seasonal Ponds (Alternative 1)	Simultaneous Discharge March/April Release (Alternative 2)	Phased Initial Release (Alternative 3)
Maintain existing open water and wetland habitat	- - -	- - -	+++	+++
Maintain ponds in restorable condition	-	+	+++	+++
Meet all regulatory requirements, including discharge[2]	-	+	+++	+++
Work within existing funding constraints	+++	+++	++	++
Maintain existing levels of flood control	- - -	+++	+++	+++

[1] Includes time required before salt-making ceases and circulation begins

[2] Includes compliance with regulatory policies and air quality requirements

Environmental Impacts and Mitigation Measures

The major environmental impacts of the project and alternatives are summarized on Table S-3 and are briefly described by topic below.

Hydrology

Implementation of Alternatives 2 and 3 could lead to increased tidal prism within the ponds and subsequent suspension and deposition of sediments in receiving waters. Additionally, breaching of the Island Ponds could potentially lead to erosion of mud flats and impacts to the Southern Pacific railroad bridge pier. These impacts are potentially significant but would be mitigated to less than significant levels by implementation of mitigation measures identified in this EIR/EIS.

Water Quality

Under Alternative 1 (Seasonal Ponds), most of the existing open water habitats currently used by wildlife in the South Bay would be lost. This alternative minimizes all impacts from discharge of pond contents to sloughs, creeks and the bay.

In general, Alternatives 2 and 3 could have potentially significant and significant short-term (24 hours to 8 weeks) impacts from elevated salinity in discharges to several of the creeks and sloughs in the project area during the initial release period. These short term impacts would be mitigated to less than significant levels by implementation of mitigation measures identified in this EIR/EIS. Long term impacts would be less than significant during continuous circulation period .

In some circumstances discharges under Alternatives 2 and 3 could lead to excursions from the Basin Plan Water Quality Objectives and have potentially significant impacts (total mercury, dissolved oxygen, turbidity, temperature, and pH) These excursions are dependent on a number of environmental factors (including temperature, rainfall, and water level in the ponds) and may occur both during initial release and continuous circulation. These impacts would be mitigated to less than significant levels by implementation of mitigation measures identified in this EIR/EIS.

Sediments
Changes in pond management under all the alternatives could lead to increased mobility and bioavailability of inorganic contaminants and increased exposure of wildlife to contaminants. Implementation of Alternative 1 does not allow for water level management which would mitigate these impacts. Adaptive management strategies described under Alternatives 2 and 3 allow these impacts to be mitigated to less than significant.

Biological Resources
Benthic Organisms- Under Alternative 1, benthic invertebrates in the existing ponds would be impacted by seasonal water fluctuations. In general, Alternatives 2 and 3 could have potentially significant and significant short-term (24 hours to 8 weeks) impacts from elevated salinity in discharges to benthic organisms in several of the creeks and sloughs in the project area during the initial release period. These short term impacts would be mitigated to less than significant levels by implementation of mitigation measures identified in this EIR/EIS. The long-term impacts would be less than significant during continuous circulation period.

Vegetation- Disturbance form construction of water control structures or creation of new suitable habitat under Alternatives 2 and 3 could lead to the spread of invasive cordgrass. These impacts could be mitigated to less than significant levels by implementation of mitigation measures identified in this EIR/EIS. Under these alternatives, breaching of the Island Ponds would lead to the establishment of transitional salt marsh and brackish marsh habitat; this would be a beneficial impact.

Wildlife- Changes in pond management under all the alternatives would result in wildlife habitat changes with positive or negative impacts for some wildlife species. For example conversion of project area salt ponds to seasonal ponds would result in a substantial loss of open water foraging habitat for water birds. This conversion would be beneficial to snowy plovers. Reduction in medium and high salinity ponds will substantially reduce the available foraging habitat for waterbirds which favor this habitat. These impacts would likely remain at potentially significant levels following implementation of mitigation measures identified in this EIR/EIS (i.e., this is a significant, unavoidable project impact).

Fish- Alternative 1 would have impacts to fishing living in the existing salt ponds by seasonally drying their habitat. In general, Alternatives 2 and 3 could have potentially significant and significant short-term (24 hours to 8 weeks) impacts from elevated salinity in discharges to fish in several of the creeks and sloughs in the project area during the Initial Release Period. There is also a potential for impacts to juvenile fish by entrainment by the water control structures. These short-term impacts would be mitigated to less than significant levels by implementation of mitigation measures identified in this

EIR/EIS. Long-term impacts would be less than significant during the continuous circulation period.

Cultural Resources
Implementation of Alternatives 2 and 3 could result in potentially significant impacts to unmapped surface archeological sites. These impacts could be mitigated to less than significant levels by implementation of mitigation measures identified in this EIR/EIS.

Recreation, Public Access, Visual Resources, and Public Health
Changes in pond management under all the alternatives could lead to increased mosquito production. Implementation of Alternative 1 does not allow for water level management which could mitigate these impacts. Under Alternatives 2 and 3, these impacts could be mitigated to less than significant levels by implementation of mitigation measures identified in this EIR/EIS.

Air Quality
Changes in pond management under all the alternatives could expose the public to objectionable odors. Implementation of Alternative 1 does not allow for water level management which could mitigate these impacts. Under Alternatives 2 and 3, these impacts could be mitigated to less than significant levels by implementation of mitigation measures identified in this EIR/EIS.

Socio-Economic Resources
All impacts were considered to be less than significant.

Land Use Planning
Impacts to land use are possible due to potential changes in air quality; impacts and mitigation are the same.

Unavoidable Significant Impacts

The impact to waterbirds from the loss of medium- and high-salinity ponds under the project alternatives is a significant impact. Measures are proposed to mitigate this impact (see Section 6.3.5), but the impact remains potentially significant even with these measures. All other impacts identified in this EIR/EIS are expected to be less than significant with the implementation of proposed mitigation measures.

Comparison of the Alternatives

There is a strong contrast in the comparisons of the NO Project/No Action Alternative and Seasonal Ponds and the Pond Management Alternatives (2 and 3) from the perspectives of long-term versus short-term environmental consequences. Normally, with private development or public works projects, the “no action” alternative is associated with more environmentally benign protection of existing natural resources. In this case, the existing natural resources will undergo long-term degradation, if salinity and water levels are not managed.

The contrast between Alternatives 2 and 3 is more subtle. Under Alternative 2, circulation of bay waters through the low salinity ponds would be delayed for another year. This could push back the project for the medium and high salinity ponds and delay the restoration of the Island ponds several more years depending on future weather conditions. During the initial release period, short-term impacts (24 hour to 8 weeks) to juvenile bay shrimp may be somewhat less under Alternative 2 and potential for bioaccumulation of mercury by early stage benthic organisms may be somewhat less under Alternative 3.

Environmentally Superior (CEQA) and Preferred (NEPA) Alternative

The No-Project No-Action Alternative is not considered the environmentally superior alternative because of the continued deterioration of the site and potential for long-term impacts to wildlife and the physical environment.

Because the project is, in effect, the first stage of the long-term environmental restoration project, its primary adverse impacts are short-term, during the initial release of the pond contents. As described above, Alternatives 2 and 3 are very similar in their environmental impacts. However, Alternative 3 offers the added protection that monitoring of the impacts of the first releases can provide data to adaptively manage subsequent releases and thus reduce overall impacts. In addition, Alternative 3 will allow circulation of bay waters to occur at an earlier time for a substantial number of ponds resulting in more rapid restoration of the ponds and thus Alternative 3 is the environmentally superior under CEQA and the preferred alternative under NEPA.

TABLE S-3. COMPARISON OF IMPACTS OF PROJECT ALTERNATIVES

Impacts	No Project/No Action	Alternative 1 Seasonal Ponds	Alternative 2 (Simultaneous March/April Initial Discharge)	Alternative 3 (Phased Initial Discharge)
Hydrology				
H-1: Increased flooding of adjacent properties may result from erosion of salt pond levees that offer some flood control benefit.	PS	LTS	LTS	LTS
H-2: Increased tidal prism within the ponds would re-suspend sediments, resulting in deposition in receiving waters.	PS	LTS	LTS	LTS
H-3: Breaching of Island Ponds could result in erosion of mud flats and damage to the Southern Pacific railroad bridge piers.	NI	NI	PS	PS
Post Mitigation Significance	**--**	**--**	**LTS (Hydro MM-1A and 1B)**	**LTS (Hydro MM-1A and 1B)**
H-4: Flow into the ponds may result in excessive sediment deposition near inlet/outlet structures that could impact operation of water control structures.	NI	NI	NI – Island Ponds PS – other ponds	NI – Island Ponds PS – other ponds
Post Mitigation Significance	**--**	**--**	**LTS (Hydro MM-2A and 2B)**	**LTS (Hydro MM-2A and 2B)**

Impacts:
B = Beneficial Impact
S = Significant Impact
PS= Potentially Significant Impact
LTS = Less than Significant Impact
NI = No Impact

Other abbreviations/symbols:
IRP = Initial Release Period
CCRP = Continuous Circulation Period
MM = Mitigation Measure
-- = No mitigation proposed

Impacts	No Project/No Action	Alternative 1 Seasonal Ponds	Alternative 2 (Simultaneous March/April Initial Discharge)	Alternative 3 (Phased Initial Discharge)
Water Quality				
WQ (S)-1 Salinity in ponds could be concentrated by evaporation. Unplanned breaches of ponds could result in increased salinity in receiving waters.	PS	NI	NI	NI
WQ-(CONSTRUCTION) 2-: Impacts from contaminants and/or suspended sediments could result from the mobilization of construction equipment to repair breached levee sites or install water control structures.	NI	PS	PS	PS
Post Mitigation Significance	--	**LTS (WQ [Con] MM-2A)**	**LTS (WQ [Con] MM-2A)**	**LTS (WQ [Con] MM-2A)**
WQ (S)-3: Discharges from ISP ponds could result in increased salinity inputs to the South Bay	NI	NI	IRP-LTS CCP-LTS	IRP-LTS CCP-LTS
WQ (S) -4: Discharges from ISP ponds could result in increased salinity inputs to Coyote Creek (Alviso Complex)	NI	NI	IRP-LTS CCP-LTS	IRP-LTS CCP-LTS
BENEFICIAL WQ (S) -1: Discharges from ISP ponds could result in beneficial water quality impacts from increased salinity inputs to Coyote Creek, mitigating releases of fresh water from the San Jose WTP	NI	NI	B	B
WQ (S) -5: Discharges from ISP ponds could result in increased salinity inputs to Alviso Slough (Alviso Complex)	NI	NI	IRP-PS (~1 wk) CCP-LTS	IRP-PS (~1 wk) CCP-LTS

Impacts	No Project/No Action	Alternative 1 Seasonal Ponds	Alternative 2 (Simultaneous March/April Initial Discharge)	Alternative 3 (Phased Initial Discharge)
Post Mitigation Significance	**--**	**--**	**LTS (WQ [S] MM-1A, -1B)**	**LTS (WQ [S] MM-1A, -1B)**
WQ (S) -6: Discharges from ISP ponds could result in increased salinity inputs to Guadalupe Slough (Alviso Complex)	NI	NI	IRP-LTS CCP-LTS	IRP-LTS CCP-LTS
WQ (S) -7: Discharges from ISP ponds could result in increased salinity inputs to Alameda Flood Control Channel (AFCC) (Baumberg Complex)	NI	NI	IRP-S (~1 day) CCP-LTS	IRP-S (~1 day) CCP-LTS
Post Mitigation Significance	**--**	**--**	**LTS (WQ [S] MM-2A, -2B)**	**LTS (WQ [S] MM-2A, -2B)**
WQ (S) -8: Discharges from ISP ponds could result in increased salinity inputs to Old Alameda Creek (Baumberg Complex)	NI	NI	IRP-S CCP-LTS	IRP-S CCP-LTS
Post-Mitigation Significance	**--**	**--**	**LTS (WQ [S] MM-2A, -2B)**	**LTS (WQ [S] MM-2A, -2B)**
WQ (S)-9: Discharges from ISP ponds could result in water quality impacts from increased salinity inputs to Ravenswood Slough (West Bay Complex).	NI	NI	IRP-PS CCP-PS	IRP-PS CCP-PS
Post-Mitigation Significance	**NI**	**NI**	**LTS**	**LTS**
WQ(S)-10: Discharges from West Bay Pond SF2 could result in water quality impacts from increased salinity inputs South San Francisco Bay south of Dumbarton Bridge (West Bay Complex)	NI	NI	IRP-PS CCP-PS	IRP-PS CCP-PS
Post-Mitigation Significance	**NI**	**NI**	**LTS**	**LTS**
WQ (M) -3: Under some circumstances total mercury in discharged water and receiving water will exceed total mercury WQOs and may have short-term impacts on water quality.	NI	NI	PS	PS

Impacts	No Project/No Action	Alternative 1 Seasonal Ponds	Alternative 2 (Simultaneous March/April Initial Discharge)	Alternative 3 (Phased Initial Discharge)
Post Mitigation Significance	**--**	**--**	**LTS (WQ [M] MM-1A, -1B)**	**LTS (WQ [M] MM-1A, -1B)**
WQ (DO) 1- Increased algal activity in ponds leads to decreased dissolved oxygen in the ponds relative to receiving waters. The potential for excursion from the basin plan standards are most likely to occur during the warmer summer and fall months, especially on windless days.	PS	LTS	PS	PS
Post Mitigation Significance	**PS**	**--**	**LTS (WQ [DO] MM-1A, -1B)**	**LTS (WQ [DO] MM-1A, -1B)**
WQ (TURBIDITY) 1 - Unplanned breaches of ponds could result in significant water quality and wildlife impacts from increased turbidity.	PS	NI	NI	NI
WQ (TURBIDITY) 2 - Discharge of pond water could lead to a greater than 10% increase in turbidity of receiving water and may adversely affect water quality and biota in adjacent waterways	NI	NI	PS	PS
Post Mitigation Significance	**--**	**--**	**LTS (WQ [Turb] MM-1A, -1B)**	**LTS (WQ [Turb] MM-1A, -1B)**
WQ (T^o) -1: Unplanned breaches of ponds could result in significant water quality and wildlife impacts from increased temperature	PS	NI	NI	NI
WQ (T^o) -2: Discharge of pond water at temperatures more than 20^o degrees Fahrenheit above the temperature of the receiving water may adversely affect water quality and biota in adjacent waterways.	NI	NI	PS	PS
Post Mitigation Significance	**--**	**--**	**LTS (WQ [T^o] MM-1A, -1B)**	**LTS (WQ [T^o] MM-1A, -1B)**
WQ (PH) -1: Unplanned breaches of ponds could result in	PS	NI	NI	NI

Impacts	**No Project/No Action**	**Alternative 1 Seasonal Ponds**	**Alternative 2 (Simultaneous March/April Initial Discharge)**	**Alternative 3 (Phased Initial Discharge)**
significant water quality and wildlife impacts from pH changes in receiving waters.				
WQ (pH) – 2: Discharge of pond water could lead to excursions from the Basin Plan Water Quality Objectives.	NI	NI	PS	PS
Post Mitigation Significance	**--**	**--**	**LTS (WQ [pH] MM-1A, -1B)**	**LTS (WQ [pH] MM-1A, -1B)**
Sediments				
SED-1: The mobility and bioavailability of inorganic contaminants may increase within project ponds.	PS	PS	PS	PS
Post Mitigation Significance	**--**	**PS**	**LTS (Seds MM-1A to -1D)**	**LTS (Seds MM-1A to -1D)**
SED-2: Long-term pond drying may result in the formation and exposure of gypsum/salt-affected soils, limiting future restoration options.	PS	PS	NI	PS
Post Mitigation Significance	**--**	**PS**	**--**	**LTS**
SED-3: Changes in pond water levels may alter exposure of wildlife to contaminants in sediments.	PS	PS	PS	PS
Post Mitigation Significance	**--**	**PS**	**LTS (Seds MM-1A to -1C)**	**LTS (Seds MM-1A to -1C)**
SED-4: Unplanned breaches of ponds could result in significant water quality and wildlife impacts from contaminants in sediments.	PS	LTS	LTS	LTS
BENEFICIAL SED-1: Higher average water levels in some ponds could decrease the mobility and bioavailability of contaminants and the potential for wildlife exposure to contaminants in those ponds.	NI	NI	B	B

Impacts	No Project/No Action	Alternative 1 Seasonal Ponds	Alternative 2 (Simultaneous March/April Initial Discharge)	Alternative 3 (Phased Initial Discharge)
BENEFICIAL SED-2: In the CCP, freshening of salt/gypsum affected sediments will produce sediment and water conditions that can promote habitats more endemic to the South Bay ecosystem.	NI	NI	B	B
Biological Resources				
BENTHIC-1 If levee failure occurs, existing benthic communities located near the breach will be impacted.	PS	NI	NI	NI
BENTHIC-2: The project would cause a reduction in aquatic habitat suitability because of deterioration of water quality	NI	NI	IRP-S CCP-LTS	IRP-S CCP-LTS
Post Mitigation Significance	--	--	**LTS (Benthic MM-1 plus WQ Mitigation)**	**LTS (Benthic MM-1 plus WQ Mitigation)**
VEG-1**:** If levee failure occurs, existing vegetation, possibly including rare plant species, would be impacted.	PS	NI	NI	NI
VEG-2: Disturbance of existing vegetation could promote the spread of invasive cordgrasses.	PS	NI	PS	PS
Post Mitigation Significance	--	--	**LTS (Veg MM-1)**	**LTS (Veg MM-1)**
BENEFICIAL VEG -1: Breaching of the Island Ponds would allow the establishment of transitional salt marsh and brackish marsh communities.	NI	NI	B	B
VEG-3: Installation or replacement of water control structures would remove or disturb existing areas of vegetation	NI	NI	LTS	LTS
VEG-4: Installation or replacement of water control structures would cause changes in pond parameters, which would have permanent indirect impacts on vegetation in the project area.	NI	NI	LTS	LTS
VEG-6: Seasonal wetting and drying cycles in ponds will create saline soil conditions that will inhibit vegetation growth within the	LTS	LTS	LTS	LTS

Impacts	No Project/No Action	Alternative 1 Seasonal Ponds	Alternative 2 (Simultaneous March/April Initial Discharge)	Alternative 3 (Phased Initial Discharge)
ponds and at the pond margins.				
VEG-7: Increase in pond water salinity in high salinity batch ponds will result in loss of vegetation along the shoreline.	NI	NI	LTS	LTS
VEG-8: Differences in seasonal management of ponds would cause a decrease in average pond depth and decreased fluctuations in salinity in some of the ponds, which could result in indirect impacts to vegetation, including elevation and type shifts of plant communities.	LTS/B	LTS/B	LTS/B	LTS/B
VEG-9: Muted tidal influence in the summertime in Baumberg Ponds 8A and 8X would create conditions favorable to invasive cordgrass.	NI	NI	PS	PS
Post Mitigation Significance	**--**	**--**	**LTS (Veg MM-2A to 2C)**	**LTS (Veg MM-2A to 2C)**
BENEFICIAL WL -1: An increase in the area of seasonal ponds would benefit western snowy plovers that could use these ponds for nesting and foraging.	B	B	B	B
BENEFICIAL WL-2: The increase in low salinity ponds and intake ponds will result in an increase in high-quality foraging habitat for dabbling ducks and piscivorous (fish-eating) waterbirds.	NI	NI	B	B
WL-1: Changes in pond hydrology would result in wildlife habitat changes with positive impacts for some wildlife species and negative impacts for some wildlife species.	S	S	S	S
WL-1A: Conversion of project area ponds to seasonal ponds would result in a substantial loss of open water foraging habitat for water birds, including special status birds.	S	S	S	S

Impacts	No Project/No Action	Alternative 1 Seasonal Ponds	Alternative 2 (Simultaneous March/April Initial Discharge)	Alternative 3 (Phased Initial Discharge)
WL-1B: Eventually, conversion to open-water lagoons and tidal marsh would result in habitat impacts (both positive and negative) for various species, including special status species.	S	NI	NI	NI
Post Mitigation Significance	**S**	**S**	**PS (WL MM-1A to -1C)**	**PS (WL MM-1A to -1C)**
WL-2: Changes in water levels in some ponds would result in impacts to nesting bird colonies from increased predator access and/or flooding, thereby substantially reducing the breeding habitat for certain waterbird species in the South Bay.	S	S	PS	PS
WL-2A: Drying of project area ponds would result in "land-bridging" of existing nesting colonies on islands and isolated interior levees, exposing special status species and other birds to increased predation.	S	S	PS	PS
WL-2B: Eventually, conversion to tidal marsh would further increase predator access to islands.	S	NI	NI	NI
WL-2C: Collapse of pond levees would result in the loss of nesting habitat on levees for special status species and other bird species.	S	NI	NI	NI

Impacts	No Project/No Action	Alternative 1 Seasonal Ponds	Alternative 2 (Simultaneous March/April Initial Discharge)	Alternative 3 (Phased Initial Discharge)
Post Mitigation Significance	**S**	**S**	**LTS (WL MM-2A to -2C)**	**LTS (WL MM-2A to -2C)**
WL-3: Lower average water levels in project ponds could increase the exposure of some foraging water birds to contaminated sediments on the bottoms of ponds, potentially resulting in a reduction in foraging habitat for some species.	S	S	S	S
WL-3A: Drying of project ponds would increase the exposure of western snowy plover as well as other foraging birds to contaminated sediments on pond bottoms.	S	S	S	S
WL-3B: Eventually, conversion to open-water lagoon and tidal marsh would cause additional special status wildlife species to be exposed to contaminated sediments.	S	NI	NI	NI
Post Mitigation Significance	**S**	**S**	**LTS (WL MM-3 [Seds MM-1A to -1D])**	**LTS (WL MM-3 [Seds MM-1A to -1D])**
WL-4: The overall reduction in pond salinities and water depths may create conditions suitable for avian botulism, and could substantially reduce the populations of special status bird species and other waterbird species.	NI	NI	PS	PS
Post Mitigation Significance	**--**	**--**	**LTS (WL MM-4A to -4C)**	**LTS (WL MM-4A to -4C)**
WL-5: Construction could impact existing tidal salt marsh habitat for the California clapper rail.	NI	NI	PS	PS

Impacts	No Project/No Action	Alternative 1 Seasonal Ponds	Alternative 2 (Simultaneous March/April Initial Discharge)	Alternative 3 (Phased Initial Discharge)
Post Mitigation Significance	--	--	**LTS (WL MM-5A to -5C)**	**LTS (WL MM-5A to -5C)**
WL-6: Construction could impact existing tidal or non-tidal salt marsh habitat for the salt marsh harvest mouse and salt marsh wandering shrew.	NI	NI	PS	PS
Post Mitigation Significance	**--**	**--**	**LTS (WL MM-6A to -6F)**	**LTS (WL MM-6A to -6F)**
WL-7: Construction could impact burrowing owls and/or nesting northern harriers on the levees within the project area.	NI	NI	PS	PS
Post Mitigation Significance	**--**	**--**	**LTS (WL MM-7A to -7D and -8A to -8C)**	**LTS (WL MM-7A to -7D and -8A to -8C)**
WL-8: Construction could result in disturbance to breeding activity of salt marsh common yellowthroat, Alameda song sparrow, and/or several nesting waterbird species.	NI	NI	PS	PS
Post Mitigation Significance	**--**	**--**	**LTS (WL MM-9A to -9C and -10A to -10C)**	**LTS (WL MM-9A to -9C and -10A to -10C)**
WL-9: Construction for implementation of the ISP, and various maintenance operations, may impact harbor seals in the area.	NI	NI	PS	PS

Impacts	No Project/No Action	Alternative 1 Seasonal Ponds	Alternative 2 (Simultaneous March/April Initial Discharge)	Alternative 3 (Phased Initial Discharge)
Post Mitigation Significance	--	--	**LTS (WL MM-11A to -11D)**	**LTS (WL MM-11A to -11D)**
F-1: Discharge of pond contents would increase salinity levels in the receiving waters in the immediate vicinity of discharges beyond normal tolerance ranges for fish and macroinvertebrates, resulting in direct impacts to these aquatic organisms and indirect impacts to fish impacts to their food source (macroinvertebrates).	PS	NI	IRP - S CCP - LTS	IRP - S CCP - LTS
Post Mitigation Significance	--	--	**LTS (Fish MM-1 and Water Quality MMs)**	**LTS (Fish MM-1 and Water Quality MMs)**
F-2: Discharge of pond contents may impact other water quality variables (i.e., it may raise temperatures, decrease DO, and increase BOD) in the receiving waters in the immediate vicinity of discharges beyond normal tolerance ranges for fish.	PS	NI	LTS	LTS
F-3: Impacts from contaminants and/or suspended sediments could result from the mobilization of construction equipment to repair breached levee sites.	NI	LTS	LTS	LTS
BENEFICIAL F–1: Breach Island ponds resulting in tidal exchange and access for fish and macroinvertebrates to suitable habitat.	NI	NI	B	B
F-4: Changes in water quality during the Continuous Circulation Phase of the ISP could disrupt adult salmonid migration though dilution of “natal stream” signal and/or imprinting by juvenile salmonids.	NI	NI	CCP-LTS	CCP-LTS
F-5: Changes in water quality could disrupt fish migration though creation of salinity gradient reversals.	NI	NI	IRP - LTS CCP - LTS	IRP - LTS CCP - LTS
F-6: Installation of water control structures could lead to juvenile	NI	NI	IRP - PS	IRP - PS

Impacts	No Project/No Action	Alternative 1 Seasonal Ponds	Alternative 2 (Simultaneous March/April Initial Discharge)	Alternative 3 (Phased Initial Discharge)
fish entrainment.			CCP - PS	CCP – PS
Post Mitigation Significance	--	--	**LTS (Fish MM-2)**	**LTS (Fish MM-2)**
Cultural Resources				
C-1. Potentially significant archeological sites or human remains could be exposed through erosion and evaporation	PS	NI	NI	NI
C-2. Accidental breaches of levees could result in impacts to surface archeological sites and features of the built environment.	PS	NI	NI	NI
C-3. Ground-disturbing activities and use of heavy vehicles and machinery could damage known and unknown archaeological sites that meet the criteria for listing on the NRHP or CRHR.	NI	NI	PS	PS
Post Mitigation Significance	--	--	**LTS (Cult Res MM-1A, -1B)**	**LTS (Cult Res MM-1A, -1B)**
C-4. Ground-disturbing activities and use of heavy vehicles and machinery could disturb or damage buried human remains not identified during field surveys.	NI	NI	PS	PS
Post Mitigation Significance	--	--	**LTS (Cult Res MM-2)**	**LTS (Cult Res MM-2)**
C–5. Project construction and elevated water levels resulting from implementing the ISP could affect potentially significant features of the built environment	NI	NI	PS	PS
Post Mitigation Significance	--	--	**LTS (Cult Res MM-3)**	**LTS (Cult Res MM-3)**
C–6. Planned breaches of the Island Ponds could result in impacts to surface archeological sites and features of the built environment	NI	NI	PS	PS

Impacts	No Project/No Action	Alternative 1 Seasonal Ponds	Alternative 2 (Simultaneous March/April Initial Discharge)	Alternative 3 (Phased Initial Discharge)
Post Mitigation Significance	--	--	**LTS (Cult Res MM-4)**	**LTS (Cult Res MM-4)**
Recreation, Public Access, Visual Resources, and Public Health				
R-1. Recreational use and views of the project areas may be impacted by the loss of levee trail access.	PS	LTS	LTS	LTS
R-2. Recreational use and views of the project areas may be impacted a consequence of changes in wildlife populations.	LTS	LTS	LTS	LTS
R-3. Recreational use and views of the project area may be impacted as a consequence of changes in wildlife populations.	NI	NI	LTS	LTS
BENEFICIAL R -1. Additional public access will be available on previously closed private lands.	NI	NI	B	B
R-4. Construction of proposed water control structures would have temporary effects on public access to and recreational use of the project areas.	NI	NI	LTS	LTS
Post Mitigation Significance	--	--	**LTS (Impact reduced further by Rec MM-1)**	**LTS (Impact reduced further by Rec MM-1)**
VIS-1. The quality of views of the project areas may be impacted as a consequence of changes in wildlife populations.	LTS	LTS	LTS	LTS
VIS-2. Construction of proposed water control structures would have temporary effects on the quality of views of the project areas.	NI	NI	LTS	LTS

Impacts	No Project/No Action	Alternative 1 Seasonal Ponds	Alternative 2 (Simultaneous March/April Initial Discharge)	Alternative 3 (Phased Initial Discharge)
PH-1. As seasonal ponds dry down increased mosquito production may result from deterioration of pond water quality, requiring the MADs to undertake additional mosquito control and abatement.	S	S	PS	PS
Post Mitigation Significance	--	**PS (Public Health MM-1)**	**LTS (Public Health MM-1)**	**LTS (Public Health MM-1)**
Air Quality				
AQ-1. Increased dust generation due to exposed dry pond bottoms in seasonal ponds	PS	PS (no mitigation)	LTS	LTS
BENEFICIAL AQ-1: Decreased dust generation due to elimination of driving on unpaved roads and levee maintenance.	B	B	NI	NI
BENEFICIAL AQ-2: Decrease in combustion emissions due to elimination of vehicle and equipment for levee inspections and maintenance.	B	B	NI	NI
AQ-2. Eutrophication of salt ponds has the potential to expose the public to objectionable odors.	PS	PS	PS	PS
Post Mitigation Significance	--	**LTS (Air Quality MM-1A, 1B)**	**LTS (Air Quality MM-1A, 1B)**	**LTS (Air Quality MM-1A, 1B)**
AQ-3. Increased combustion emissions. The construction of structures required by Alternative 2 and 3, may result in a temporary increase in combustion emissions from construction equipment.	NI	NI	LTS	LTS

Impacts	No Project/No Action	Alternative 1 Seasonal Ponds	Alternative 2 (Simultaneous March/April Initial Discharge)	Alternative 3 (Phased Initial Discharge)
Socio-Economic Resources				
All impacts considered less than significant				
Land Use Planning				
LU -1. Lack of management of the ponds has the potential to produce objectionable odors. These odors would be incompatible with nearby residential and commercial land uses.	PS	PS (not mitigated)	NI	NI
LU -2 .Management of the ponds has the potential to produce objectionable odors incompatible with nearby residential and commercial land uses.	NI	NI	PS	PS
Post Mitigation Significance	**--**	**--**	**LTS (Air Quality MM-1A, -1B)**	**LTS (Air Quality MM-1A, -1B)**

1.0 INTRODUCTION

The U.S. Fish and Wildlife Service (USFWS) and the California Department of Fish and Game (CDFG) have prepared this joint Environmental Impact Statement/ Environmental Impact Report (EIS/EIR) to address the potential impacts of the Initial Stewardship Project (ISP) for the South Bay Salt Ponds in South San Francisco Bay, California. The ISP may be found in Appendix A.

The ISP identifies how the approximately 15,100 acres land in the South Bay (12,900 acres salt production ponds, 1,300 acres of associated levees and uplands, 700 acres of marsh and tidal wetlands, 200 acres of seasonal ponds) acquired by the USFWS and CDFG from Cargill Corporation will be managed over an interim period while a long-term plan is developed for restoration of the project ponds. Prior to agency management, Cargill will phase out operation of the ponds for salt production and move much of the remaining salts in the ponds back to its salt production plant sites. The project proposes to use existing and new water control structures to release any remaining saline pond waters to the Bay, and to prevent further salt concentration by circulating Bay waters through the ponds. During the interim period, salinity and water levels will be managed to maintain existing high quality open water and wetland wildlife habitat.

The joint EIS/EIR addresses the design, implementation, and maintenance of the proposed ISP to comply with the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA), and all necessary permits and approvals from other local, state, and federal agencies.

1.1 PROJECT LOCATION

In March 2003, the USFWS and CDFG acquired 16,500 acres of industrial salt ponds and/or associated salt-making rights from Cargill Salt. Of these, 15,100 acres are located in south San Francisco Bay, California. Under terms of the acquisition, the USFWS owns and will manage 8,000 acres of “Alviso Ponds” and 1,600 acres of “West Bay Ponds.” The CDFG owns and will manage 5,500 acres of “Baumberg Ponds” (see Figures 1-1, 1-2, 1-3, and 1-4).

1.1.1 Alviso Pond Complex

The Alviso Ponds (Figure 1-2) consist of an 8,000-acre complex of 25 ponds on the shores of the South Bay in Fremont, San Jose, Sunnyvale and Mountain View, in Santa Clara and Alameda Counties. Palo Alto Baylands Nature Preserve and Charleston Slough border the acquisition area on the west, Moffet Naval Air Station and Sunnyvale Baylands Park border the area on the south, and Coyote Creek and Cushing Parkway in Fremont border the east side of the area. Major drainages which discharge into San Francisco Bay within the complex area include Charleston Slough, Mountain View Slough, Stevens Creek, Guadalupe Slough, Alviso Slough (Guadalupe River), Artesian Slough, Mud Slough, and Coyote Creek.

The Project does not include Ponds A18 and A4. Pond A4 will be used by the Santa Clara Valley Water District to restore wetland and riparian habitats to mitigate for losses resulting from (1) construction of the Lower Guadalupe River Flood Protection Project, and (2) ongoing maintenance of stream channels under the District’s multi-year Stream Maintenance Program. The City of San Jose recently purchased Pond A18 from Cargill. The USFWS acquired fee title to Ponds A1 to A8 (with the exception of Pond A4) and portions of A22 and A23. Cargill Salt gave up its reserved salt-making rights on Ponds A9 to A17, Ponds A19 to A21 and portions of Ponds A22 and A23. The FWS previously held fee title to these ponds.

The historic and abandoned town of Drawbridge, which still has standing hunting cabins and an active Union Pacific Railroad line (UPRR), is located between ponds A20 and A21. Ponds A19, A20 and A21 are surrounded by Mud Slough to the east and Coyote Creek to the west and are collectively known as the "Island Ponds."

The bottom elevations of the Alviso ponds are generally lower than other complexes due to subsidence from historic groundwater withdrawals. Broad expanses of mudflats exposed at low tide are found at the confluence of Coyote and Alviso creeks, outboard of pond levees.

1.1.2 West Bay Pond Complex

The West Bay Ponds (Figure 1-3) consist of a 1,600-acre complex of 7 ponds on both sides of Highway 84, west of the Dumbarton Bridge, and bayward of the developed areas of the City of Menlo Park in San Mateo County. Bayfront Park is located to the west, and the Dumbarton Bridge approach and the UPRR are located at its southern border. Ravenswood Slough discharges to the Bay through the complex.

1.1.3 Baumberg Pond Complex

The Baumberg Ponds (Figure 1-4) consist of a 5,500-acre complex of 23 ponds on the shores of the East Bay, west of Hayward and Union City in Alameda County. The approach to the San Mateo Bridge and the CDFG Eden Landing Ecological Reserve, form the northern boundary of the acquisition area. Alameda Creek Flood Control Channel and the Coyote Hills form the southern boundary. Major drainages that discharge into the San Francisco Bay within the complex include Old Alameda Creek and Alameda Creek Flood Control Channel.

1.2 PROJECT PURPOSE AND NEED

The purpose of the project is to maintain and enhance, to the extent possible, the biological and physical conditions within the south bay salt ponds in the interim period between the cessation of salt-making activities and the implementation of a long term restoration plan. The ponds currently support populations of fish and wildlife, including endangered species, migratory waterfowl, shorebirds, other water associated birds, resident fish and invertebrates.

The project is needed because:

- The ponds will be disconnected from ongoing salt making operations.
- Without initial stewardship the ponds will be subject to increasing salinity and declining ecological value.
- Deterioration of levees could lead to levee breaches and uncontrolled high-salinity discharges, resulting in potential adverse effects on aquatic populations in the adjacent open bay.
- Restoration costs would be increased with site deterioration.

- Water levels would become unmanageable and, especially during the summer months, would result in increased salinity, acidic conditions, and drying of most of the ponds.

Implementing the project will benefit the environment by

- Maintaining and enhancing to the maximum extent possible the ecological and physical health of the salt ponds until a long term restoration plan is completed and implemented
- Improving water circulation within the ponds to maintain and enhance existing fish and wildlife populations.

As part of normal salt making operations bay water is brought in to the pond systems at several locations around the bay. After entering the system, it is moved through the concentrator ponds over five years until the salinities are ready for the precipitation of salt for harvest at the Newark Plant site. The salt making process is a closed system with water being taken with no discharge to the bay. End products of the process are (1) salt, which is harvested as a crop and (2) bittern, a byproduct which cannot be discharged back to the bay and is stored and used for commercial applications.

The salt making system included an array of ponds of varying salinities (low to high) and water levels (shallow to deep). Pond salinities and depths varied during the seasons depending on water movements within the system to optimize the salt concentration process. The ponds incidentally provided habitat for many species of fish and wildlife. Fish and wildlife values were not a management objective in the salt making process.

With acquisition of the South Bay Salt Ponds by the Department of Fish and Game and the U. S. Fish and Wildlife Service, the ponds will no longer be part of the salt making process. Consequently they must be managed as separate systems to assure that they provide fish and wildlife habitat value while minimizing future restoration costs. This management must continue through the planning and implementation of the long-term restoration plan. Implementation of the long-term restoration plan is expected to be conducted in phases beginning in about 5 years, but with subsequent phases extending to 20+ years. Therefore, some ponds may be managed under an initial stewardship plan for as little as 5 years, while others may require such management for 20+ years.

To achieve the purpose of the project, the two agencies must have the ability to manage a water circulation system that allows the bay water to discharge back into San Francisco Bay. Without the ability to discharge, bay water brought into the pond system will evaporate resulting in elevated salinities which will ultimately reduce fish and wildlife values as seen in the North Bay salt ponds. If the agencies are not able to circulate water through the system, they will not be able to bring bay water into the system due to the potential for increasing pond salinities to unmanageable levels. This will change the character of the pond system from what is currently shallow open water pond habitat of varying salinities, to seasonal pond habitat filled primarily by rain water during the winter and dry the remainder of the year. This change may significantly reduce the value of the ponds to fish and wildlife.

1.3 PROJECT BACKGROUND

1.3.1 Salt Production in the South San Francisco Bay

Solar evaporation is the simplest and perhaps most ancient method of producing salt. The Ohlone tribe—indigenous inhabitants of the San Francisco Bay area—are believed to have gathered salt deposited naturally through evaporation along the shallow edges of the bay, and commercial production using essentially the same process as that employed today began in 1854.

The commercial solar salt industry in San Francisco Bay began in the mid 1850s. Cargill has been the sole solar salt producer in San Francisco Bay since the late 1970s. Salt production involves a sequence of ponds through which seawater is progressively cycled to concentrate and ultimately precipitate salt. Salt production takes approximately five years from the time that the water enters the system from San Francisco Bay until the salt is harvested.

The salt production process begins as high tide brings bay water into an intake pond, the first in a series of ponds called evaporator or concentrator ponds. Evaporator ponds range in size from less than 100 acres to more than 850 acres. The ponds are separated by earthen levees and are interconnected with siphons and gates.

The increasingly saline brine is pumped or allowed to flow by gravity from one pond to the next around the southern edge of the bay. When siphons or gates are open, differences of less than a few inches in surface elevation or “hydraulic head” between two ponds will result in a net flow of brine from one pond to the next until the water surfaces are equal in elevation. At each step, more of the water evaporates under the influence of summer sunshine and steady coastal wind and as the brine flows from one evaporator pond to the next, it becomes increasingly concentrated with salt.

When fully saturated with salt, the brine is pumped into the “pickle ponds” for storage before it is crystallized and harvested. For final evaporation, the pickle pond solution is pumped into crystallizer beds at Cargill’s salt production plants. The beds are shallow ponds with clay bottoms that have been carefully compacted and leveled. In the crystallizer beds, evaporation continues, and a layer of salt approximately 5 to 8 inches thick eventually accumulates on the bottom of the crystallizer bed. The remaining solution, called bittern is pumped into the desalting pond where additional sodium chloride is removed and then to the bittern pond for storage. Bittern contains highly concentrated magnesium, potassium, bromine and sulfate. It is toxic to marine life and cannot be discharged to the Bay. Before winter rains set in, salts are mechanically harvested from the crystallizer beds and transported to the wash house by truck and then by conveyer to the salt stack.

In the final stage of production, the raw salt is sent to the refinery at Newark for further processing, packaging and shipping to customers. The Newark plant produces about 650,000 tons of salt per year. Cargill will maintain production of 600,000 tons of salt a year and will continue to employ approximately 200 workers on 11,000 acres it has retained, including its plants in Newark and Redwood City.

About 200 miles of pond levees isolate salt production facilities from the Bay. In addition to the pond levees, on the Bay side of some of the salt ponds are salt pond dredge locks.

Dredge locks are donut-shaped levees that intersect the salt pond levees and allow dredging equipment and other large equipment to enter the salt ponds without releasing higher saline pond water to the Bay. A dredger, for example, can enter one of these locks by removing a section of the lock levee, creating a “door” on the Bay side. Once inside the lock, the Bay side door is closed (the dredger “locks in”) and a section of the salt pond levee is removed, creating a “door” into the pond. The existing salt ponds were created by constructing levees out of bay mud. Bay mud was also used to construct the dredge locks.

Levees and other water control structures require periodic maintenance. Currently, maintenance work is performed on approximately 10 miles of levees each year. Levee maintenance consists of excavating mud from salt pond borrow ditches and placing it on levees using a floating dredge. Operation and maintenance of existing levees, salt pond dredge locks, and water control structures is covered under Cargill’s existing Operations and Maintenance Permit.

1.3.2 History of the Project

Restoration has long been a vision for local resource agencies, conservationists, and planners. The Cargill salt ponds restoration project will be one of the largest tidal restoration projects on the west coast of the United States and the largest of several similar projects that are being undertaken throughout the San Francisco Bay area. Similar projects in the Bay Area include the Napa River Salt Marsh Restoration Project and Bair Island Restoration Project.

Bay-wide restoration planning was conducted as part of the Baylands Ecosystem Habitat Goals Project (Goals Project), which provides a regional framework for this project. The Goals Project began in 1995 and involved more than 100 participants representing local, state, and federal agencies, academia, and the private sector. The process for developing the goals involved the selection of key species and key habitats, assembling and evaluating information, preparing recommendations, and integrating recommendations into the goals.

In March 2003, a consortium of state and federal agencies, along with private foundations, bought 16,500 acres of salt ponds from Cargill Salt, including 15,100 acres in the South Bay. The long-term planning process for the Cargill acquisition lands in the South Bay is expected to take at least five years and will include setting restoration priorities, determining how to best accomplish the restoration goals, and drafting an EIR/EIS for long-term habitat restoration. This process involves representatives of USFWS, CDFG, technical advisors from around the country, and public participants; coordinated by the California State Coastal Conservancy, a state agency based in Oakland.

In the interim period, Cargill, USFWS, and CDFG are working together with the San Francisco Bay Regional Water Quality Control Board (RWQCB), the U.S. Army Corps of Engineers (Corps), and Bay Conservation and Development Commission (BCDC) to secure permits that would allow the ponds to be reopened to the Bay. As noted above, Cargill will manage the ponds and reduce their salinity until they reach a level set by the RWQCB; at which point, Cargill will transfer management of the ponds to USFWS and CDFG. The ISP for the South Bay Salt Ponds addresses how this will be accomplished.

1.4 PROJECT DESCRIPTION

The ISP proposes the following changes to existing operations:

1. Circulate bay waters through reconfigured pond systems and release pond contents into the Bay. The plan will require installing new water control features, consisting of intake structures, outlet structures and additional pumps to maintain existing shallow open water habitat. In addition, existing levees, dredge locks, and water control structures will be maintained and modified, as needed. The three complexes (Alviso, Baumberg, and West Bay) that are currently managed as one system will each be subdivided into several systems within which water will circulate. Some of the systems will be further divided into two or more subsystems. Smaller systems allow circulating water to have a shorter residence time, with less time for evaporation and salt concentration. Prior to implementation of the ISP, Cargill will shut the flow of water from other ponds into Pond A4 (owned by SCVWD) and A18 (owned by CSJ); however this shut off action is not part of the ISP.
2. Manage a limited number of ponds as seasonal ponds (ponds allowed to fill with rainwater in the winter and to dry down in the summer), to reduce management costs and optimize habitat for migratory shorebirds, including the threatened western snowy plover.
3. Manage different summer and winter water levels in a limited number of ponds to reduce management costs and optimize habitat for migratory shorebirds and waterfowl.
4. Restore a limited number of ponds to muted tidal or full tidal influence.
5. Manage several ponds in the Alviso system as higher salinity batch ponds, where salinity levels would be allowed to rise in order to support specific wildlife populations.

Installation of all proposed water control structures is anticipated to require several years to complete. Intake of Bay water into ponds and initial release of pond contents into the Bay will begin after water control structures are installed for individual pond systems. During the initial release period, the discharge salinity from the pond system may be significantly higher than normal Bay salinity.

For Alviso systems, expected water depths in most of the ponds will be 1 to 2 feet on average, similar to their existing condition. Average water depths in the Baumberg systems will range from zero (exposed muds) to about 2.5 feet in summer, and about 1 to 2.5 feet in winter. To save on pumping costs, water surface levels in the Baumberg systems will be operated at levels lower than existing conditions. Eliminating pumping in winter will result in different operating water levels between summer and winter. The West Bay Ponds will be managed in a similar manner to current salt making operations for at least five years. During this period, high salinity brines will be moved to the Cargill Newark Plant Site.

1.5 OVERVIEW OF CEQA AND NEPA COMPLIANCE

The California Environmental Quality Act (CEQA) (Public Resources Code Section 21000 et seq.) and the National Environmental Policy Act (NEPA) (42 United States Code [USC] 4321; 40 code of Federal Regulations [CFR] 1500.1) are the state and federal laws that govern the disclosure and analysis of the environmental effects of agency actions. These regulations are described briefly below.

1.5.1 CEQA Compliance

CEQA is regarded as the foundation of environmental law and policy in California. CEQA's primary objectives are to:

- Disclose to decision makers and the public the significant environmental effects of proposed activities
- Identify ways to avoid or reduce environmental damage
- Prevent environmental damage by requiring implementation of feasible alternatives or mitigation measures
- Disclose the public reasons for agency approval of projects with significant environmental effects
- Foster interagency coordination in the review of projects and
- Enhance public participation in the planning process

CEQA applies to all discretionary activities proposed to be carried out or approved by California public agencies, including state, regional, county, and local agencies, unless an exemption applies. It requires that public agencies comply with both procedural and substantive requirements. Procedural requirements include the preparation of the appropriate public notices (including notices of preparation), scoping documents, alternatives, environmental documents (including mitigation measures, mitigation monitoring plans, responses to comments, findings, and statements of overriding considerations); completion of agency consultation and State Clearinghouse review; and provisions for legal enforcement and citizen access to the courts.

CEQA's substantive provisions require agencies to address environmental impacts disclosed in an appropriate document. CEQA requires agencies to prepare a written statement of overriding considerations when they decide to approve a project that will cause one or more significant effects on the environment that can not be mitigated. CEQA establishes a series of action-forcing procedures to ensure that agencies accomplish the purposes of the law. In addition, under the direction of CEQA, the California Resources Agency has adopted regulations, known as the State CEQA Guidelines, which provide detailed procedures that agencies must follow to implement the law.

CDFG is the state lead agency for the ISP and would use the environmental impact report/ environmental impact statement (EIR/EIS) to comply with the State CEQA Guidelines and to document CEQA compliance.

Similarly, other agencies having involvement in this project, such as regulatory agencies (e.g., RWQCB), land owning agencies for which rights-of-way are needed (e.g. Alameda Flood Control District and Santa Clara Valley Water District), and funding agencies (e.g., the Wildlife Conservation Board, SCVWD) may utilize this document to fulfill CEQA requirements.

1.5.2 NEPA Compliance

NEPA is the nation's broadest environmental law, applying to all federal agencies and most of the activities they manage, regulate, or fund that affect the environment. It requires federal agencies to disclose and consider the environmental implications of their proposed actions. NEPA provides an interdisciplinary framework for federal agencies to prevent environmental damage, and contains action-forcing procedures to ensure that federal agency decision-makers take environmental factors into account.

NEPA requires the preparation of an appropriate document to ensure that federal agencies accomplish the law's purposes. The President's Council on Environmental Quality (CEQ) has adopted regulations and other guidance that provide detailed procedures that federal agencies must follow to implement NEPA.

USFWS is the federal lead agency for the ISP and would use this EIR/EIS to comply with CEQ's regulations and document NEPA compliance.

1.6 SCOPE AND INTENT OF THE EIR/EIS

CDFG and USFWS, as the lead agencies for compliance with CEQA and NEPA, respectively, have determined that the ISP may have significant environmental impacts. CEQA and NEPA encourage the preparation of combined planning documents. Preparation of a combined EIR/EIS is intended to reduce the amount of paperwork produced and to facilitate the review and comment process for participating agencies and the public. Therefore, the agencies have opted to pursue a combined CEQA/NEPA review process to fulfill the statutory obligations of both CEQA and NEPA and to provide opportunity for public disclosure and participation in the planning and decision making process. Because the requirements for CEQA and NEPA are somewhat different, the EIR/EIS must be prepared to comply with whichever requirements are more stringent. The lead agencies have responsibility for the scope, content and legal adequacy of the EIR/EIS. All aspects of the EIR/EIS scope and process will be fully coordinated between these two agencies.

This joint EIR/EIS addresses the design, implementation, and maintenance of the proposed ISP to comply with CEQA and NEPA, and all necessary permits and approvals from the lead agencies, as well as other local, state, and federal agencies. As noted above, long-term management planning for the Cargill South Bay salt ponds is expected to take place during the next five years. The scope of this EIR/EIS is limited to the interim period during which USFWS and CDFG, in consultation with other agencies, technical advisors, and the public, will develop and implement a long-term management plan for the Cargill South Bay salt pond acquisition. This EIR/EIS does not address the environmental impacts of long-term habitat restoration; although, in some cases, impacts of habitat restoration may be considered indirect impacts of implementing the ISP (i.e., if such impacts would not occur but for implementation of the ISP). A separate CEQA/NEPA process will be undertaken for long-term restoration of these lands.

1.6.1 Resources Evaluated and Eliminated from Further Consideration

This EIR/EIS focuses on key issues that were identified through the scoping and public involvement process (see Sections 1.7 and 1.8, below). Early in the CEQA/NEPA process, CDFG and USFWS identified a number of areas of interest that are not relevant to the project and that were therefore eliminated from the scope of the EIR/EIS and from further CEQA/NEPA consideration. The following resources were evaluated and eliminated from further consideration because the project will not impact these resources:

Agriculture	The project sites are not suitable for agricultural use and are more beneficial to nearby agricultural resources by providing habitat for bird species that control agricultural pests.
Indian Trust Assets	There are no tribal assets proximal to the project sites nor are there nearby tribal holdings that are used for economic development.
Navigation and Navigation Safety	The project sites are predominantly between mud flats and dry land and do not include the adjacent creeks and sloughs. On some project boundaries, the levee structures provide the essential limits to navigation and delineate these waterways from the project sites. Current US Coast Guard marking buoys and channel markers are all at least 0.25-mile distant from the project sites. The closest navigation marker is the Marker 6 at Ravenswood Point, 0.3 miles distant from the project. However, the waterways between the pond system levees and the South Bay proper which typically have depths of less than one meter (NOAA, 2003), are used by both recreational boaters and commercial shrimpers and fishermen. The salt pond areas within the levees include former slough channels that were previously navigable and, if the levees were breached, the former channels could again become navigable.
Noise	Project activities involve equipment that produces noise at no more than 85 dBA (A-weighted decibels) at a 50-foot distance (trucks, cranes, small and medium-sized bulldozers long-reach excavators). Thus, project noise will be similar to or below the levels allowed under Cargill Salt's existing Operation and Maintenance permit. Only two proposed culvert sites are within 0.5 mile of human habitation. All other activity sites are either a mile or more from human habitation or are within the range of an existing noise source (airport) that already exists and produces noise levels above that of the project activities.
Population and Housing	The project sites are not populated and are not considered viable resources for housing development. Nor are the project sites included in the housing elements of any county General Plan.
Soils, Geology, and Geologic Hazards	Project activities do not involve any modification of the geology of the area and there are no geologic hazards that would be increased by project activities. If unplanned breaching of pond levees occurred (e.g., during an earthquake), flooding impacts could result, but the proposed project neither increases nor decreases the likelihood of such an occurrence. Impacts to pond sediments are addressed in the EIR/EIS.

Transportation, Traffic and Roadway Safety	Existing transportation, traffic, and roadway systems will remain unaltered by this project. A very small amount of traffic will result from moving project equipment into and out of the project area and culvert material into the project site. However, this will be similar to traffic under existing Cargill operations and will not result in new project impacts.

1.7 KEY ISSUES ADDRESSED IN THE EIR/EIS

Key issues addressed in the EIR/EIS include: hydrologic and hydraulic conditions, water quality, contaminated sediments, biological resources (including benthic aquatic organisms, vegetation and wetlands, wildlife, fish, and special status species), cultural resources, recreation and public access, air quality, utilities (including railroads), public services (including mosquito abatement services), socio-economic resources, and land use planning.

1.8 PUBLIC INVOLVEMENT AND SCOPING

1.8.1 Scoping

The public involvement process was initiated when CDFG issued a Notice of Preparation (NOP) for the project on March 13, 2003 and the USFWS issued a Notice of Intent (NOI) for the project on March 13,2003 (68 FR 13721). Scoping is the first step in the CEQA/NEPA process, after filing a NOP/NOI. Scoping is the process of identifying the issues to be addressed in the analysis and documentation. Often, the public and federal, state, and local agency personnel have considerable information about a project's potential impacts at the beginning of the CEQA/NEPA analysis. For this reason, public and agency participation are solicited as early as possible to identify key issues.

A public scoping meeting to solicit comment on the environmental effects of the ISP and the scope and significant issues to be analyzed in the EIS/EIR was held on March 27, 2003 from 7:00 pm to 9:00 pm at the Visitor Center, Don Edwards San Francisco Bay NWR, #1 Marshlands Road, Fremont, California.

The public was asked to address comments and questions regarding the NEPA process to:

Margaret Kolar
Refuge Manager
U.S. Fish and Wildlife Service
San Francisco Bay NWR Complex
P.O. Box 524
Newark, California 94560
FAX (510) 792-5828

The public was asked to address concerns regarding the CEQA process to:

Carl Wilcox
Habitat Conservation Manager
California Department of Fish and Game
Region 3 Headquarters
P.O. Box 47
Yountville, CA 94599
FAX (707) 944-5563

The deadline for receipt of written comments to be considered in the Draft EIR/EIS was April 20, 2003. All comments received, including names and addresses are part of the Administrative Record for the project and may be made available to the public.

The NEPA/CEQA process is outlined below. Additional opportunities for public involvement are identified at each step in the process.

1.8.2 Involvement with Draft FEIS

This document constitutes the FEIS. It discusses the project purpose, need, and background; describes the project alternatives (including a No Project/No Action Alternative); and identifies the affected environment, project effects, and mitigation measures for significant adverse effects. A Notice of Availability (NOA) for the Draft EIR/EIS was published in the Federal Register on January 23, 2004 (69 FR 3387)and in local newspapers. USFWS/CDFG sent notices to all who provided scoping comments or expressed interest in this project and furnished a copy of the Draft EIR/EIS to all who request copies. USFWS/CDFG also placed copies of the Draft EIR/EIS in the Visitor Center, Don Edwards San Francisco Bay NWR, Fremont, California, the Environmental Education Center in Alviso, at the CDFG office in Yountville, and at seven local libraries.

The Draft EIR/EIS was circulated for a 45-day public and agency review period.. Copies of the document were made available to applicable local, state, and federal agencies and to interested organizations and individuals wishing to review and comment on the report. Written comments were received by:

DFG at the following address:

Carl Wilcox
Habitat Conservation Manager
California Department of Fish and Game
Region 3 Headquarters
P.O. Box 47
Yountville, CA 94599
FAX (707) 944-5563

USFWS at the following address:

Margaret Kolar
Refuge Manager
U.S. Fish and Wildlife Service
San Francisco Bay NWR Complex
P.O. Box 524
Newark, California 94560
FAX (510) 792-5828

1.8.3 Final EIR/EIS

Written and oral comments received in response to the Draft EIR/EIS are addressed in the Final EIR/EIS (See Chapter 13). The Final EIR/EIS incorporates changes suggested by comments on the Draft EIR/EIS, as appropriate, and responses to all substantive comments received during the Draft EIR/EIS review period. The Final EIR/EIS is intended to (1) provide a full and fair discussion of the proposed action's significant environmental impacts, and (2) inform the decision-makers and the public of reasonable measures and alternatives that would avoid or minimize adverse impacts or enhance the quality of the human environment. An NOA for the Final EIS will be published in the *Federal*. USFWS/CDFG will provid notices of the Final EIR to all who commented on the Draft EIR/EIS and others, and will provide copies of the Final EIR to those who request copies. USFWS/CDFG will also place copies of the Final EIR/EIS in the local public information repositories identified above.

1.8.4 Thirty-Day Waiting Period/Public Comment Period

USFWS will accept and consider comments on the Final EIS received within 30 days of publication of the NOA and will not proceed with implementing the ISP during this time period.

1.8.5 Record of Decision (ROD)/EIR Certification

The final step in the NEPA process is the preparation of a Record of Decision (ROD), a concise summary of the decision(s) made by the USFWS. The ROD can be published immediately after the Final EIR/EIS comment period has ended. At the conclusion of the 30-day waiting period on the Final EIR/EIS, the USFWS will prepare and sign a ROD regarding the ISP. The ROD will summarize the proposed action and alternatives considered in the EIR/EIS; identify and discuss factors considered in the USFWS' decision; and state how these considerations entered into the final decision. The ROD will state how the ISP will be implemented should the project be approved and describe any associated mitigation measures.

The final step in the CEQA process is certification of the EIR, which includes preparation of a Mitigation Monitoring and Reporting Plan and adoption of its findings, should the project be approved. A certified EIR indicates the following: (1) The document complies with CEQA; (2) the decision-making body of the lead agency reviewed and considered the Final EIR prior to approving the project; and (3) the Final EIR reflects the lead agency's independent judgment and analysis.

1.8.6 Mitigation Monitoring and Reporting Program (CEQA)

CEQA Section 21081.6(a) requires lead agencies to "adopt a reporting and mitigation monitoring program for the changes to the project which it has adopted or made a conditions of project approval in order to mitigate or avoid significant effects on the environment." The Mitigation Monitoring and Reporting Program (MMRP) required by CEQA need not be included in an EIR. However, throughout this EIR/EIS, measures have been clearly identified in order to facilitate establishment of an MMRP. Any mitigation measures adopted as a condition of approval of the project will be included in CDFG's project MMRP to verify compliance.

1.9 ISSUES AND CONCERNS

The public and resource agencies are largely supportive of the project; however, several areas of known controversy exist, particularly related to water quality and ecosystem effects. Most of the controversy concerning the project relates to long-term management decisions. Water quality concerns relate to environmental effects on aquatic resources, including those effects resulting from the potential project discharges. Some water quality impacts are anticipated in the short-term during the ISP phase; additional impacts are anticipated in the long term. The ecosystem concerns relate to the short-term impacts and the long-term evolution and use of the site by various fish and wildlife species (i.e., controversy over whether endangered species habitat [marsh] should take priority over migratory waterfowl habitat [ponds]). Two other potential areas of controversy, which are particularly relevant to long-term management impacts, relate to how quickly the levees are likely to deteriorate, thereby necessitating quick salinity reduction, and the potential interim loss of accreted marsh habitat.

An ISP Technical Team meeting was held April 17, 2003 to identify major issues of concern regarding implementation of the ISP to be considered in the ISP EIR/EIS. Based on discussions at this meeting, public scoping input from the March 27, 2003 public scoping meeting, and additional consultation with government agencies and Cargill Corporation, several key issues were identified. These issues, discussed below, were used to assist in the development of alternatives, to focus the effects analysis, and to develop mitigation measures.

1.9.1 Issue 1: Hydrologic and Hydraulic Resources, including Flood Protection

There is concern regarding effects of the project on levees that provide an incidental flood protection benefit and concern regarding changes in the risk of flooding in neighboring developments caused by changes in water circulation, particularly at the Alviso ponds. There is concern that delta formation resulting from ISP implementation may interfere with water control structures. There is concern regarding the scouring effect of increased water flows, in particular the effect of breaching the Island Ponds on Coyote Creek, including potential impacts to levee stability, the railroad bridge, and mudflat and marsh habitat at this location.

Chapter 3 of the EIR/EIS evaluates project-induced changes in erosion and deposition that would significantly affect channel stability and estuarine habitat. It evaluates potential scouring effects, including impacts to a South Pacific Railroad bridge and mudflats in the vicinity of several ponds that may be breached under the proposed project (the three “Island Ponds”). The EIR/EIS also evaluates the increase in risk or severity of flooding caused by the project and considers whether the project would expose people or property to significant damage, loss, injury or death resulting from flooding.

1.9.2 Issue 2: Water Quality

There is concern regarding the potential water quality effects of pond water discharges, including changes in salinity, turbidity, dissolved oxygen, BOD, and metals. There is concern that changes in water levels could affect the acidity of the levees. A question was raised through public scoping whether the Santa Clara Valley Water District needs to install water control structures for a wetlands mitigation restoration project if FWS is installing structures. There is concern about how changes in water levels in the ponds will affect metal levels and concern about bioaccumulation and health risks to fish and wildlife.

Chapter 4 of the EIR/EIS evaluates existing water quality conditions in the salt ponds within the project area and existing water quality conditions of receiving waters and considers the potential effect of the timing of discharges as well as the specific location of discharges. The EIR/EIS considers whether implementation of the ISP would violate the San Francisco Bay Regional Water Quality Basin Plan or waste discharge requirements. The EIR/EIS also considers whether implementing the ISP would degrade water quality, resulting in harm to human health and/or wildlife.

1.9.3 Issue 3: Contaminated Sediments

There is a general concern for the remobilization of and exposure to mercury, selenium, arsenic, and other heavy metals that are currently buried in pond, Bay, creek and slough sediments as a result of excavation operations and fluctuating water levels that could expose and oxidize sediments, making them more bioavailable. There is also concern that the exposure of sediments containing mercury could promote methyl mercury production. There is also concern that increased water flows may scour channels and re-suspend contaminants which could then be deposited in the Bay. There is concern about how changes in water levels in the ponds will affect metal levels and concern about bioaccumulation and health risks to humans, fish and wildlife.

Chapter 5 of the EIR/EIS describes existing contaminant levels in sediments of the salt ponds and adjacent Bay, creek and slough waters, including levels of chromium, copper, lead, nickel, silver, zinc, arsenic, cadmium and mercury. The EIR/EIS considers potential effects of water level management in remobilization of buried contaminants. The EIR/EIS also considers whether implementing the ISP would result in sufficient levels of heavy metals to cause acute or chronic toxicity to humans and/or wildlife.

1.9.4 Issue 4: Biological Resources

Vegetation and Wetlands. Issues pertaining to vegetation and wetlands include potential direct and indirect impacts to wetland plant communities from construction of water control structures and changes in salinity. There is also a concern regarding the potential of the project to promote invasive weed establishment, including invasive species of cordgrass. The EIR/EIS addresses these concerns.

Wildlife, Fish, and Benthic Invertebrates. There is concern regarding the impact of ISP implementation on shorebirds and other species. Specifically, there is concern regarding impacts of changes in terrestrial habitat and the depth and salinity of open water habitat, impacts to migratory birds that use the salt ponds, increased predator access to nesting birds, erosion of nesting islands or land bridges, other impacts to bird breeding colonies, decreases in brine shrimp as a food source for birds, and increases in avian botulism (AB).

There is concern about effect of the timing of water discharges from the ponds on migratory fish and birds. In addition, there is concern regarding fish entrapment in water control structures. There is concern regarding changes in benthic organisms, including the growth of invasive brine-adapted invertebrate populations, as a result of changes in salinity and contaminants in pond, Bay, creek and slough waters.

Chapter 6 of the EIR/EIS evaluates the likelihood that implementing the ISP would cause substantial impacts to existing fish and wildlife habitat and a substantial decline in existing fish or wildlife populations. The EIR/EIS describes existing habitat and characterizes anticipated project-related changes in wildlife habitat and wildlife use in ponds and receiving waters, including changes in the habitat and food sources of shorebirds and waterfowl. The EIR/EIS addresses species interactions and relationships between the ponds and neighboring Bay, creeks, and sloughs and addresses possible synergistic effects upon the ecosystem. The EIR/EIS also investigates ecological pathways for the transport of contaminants.

Special Status Species. There is concern regarding potential impacts to special status species. In particular, there is concern regarding impacts of intake structures on Chinook salmon and steelhead trout; impacts of water level management, salinity control, and construction and maintenance to Western snowy plover and California least tern; and impacts of construction to salt marsh harvest mouse and California clapper rail.

The EIR/EIS identifies potential sensitive species and habitats in or near the project area and determines their abundance and the extent of sensitive habitats that may be impacted by project implementation. The EIR/EIS evaluates the potential of the project to jeopardize the continued existence of state and federally listed species or to preclude the recovery of special status species.

1.9.5 Issue 5: Cultural Resources

There is concern regarding the potential of the project to impact historic properties eligible for listing on the National Register of Historic Places (NRHP), or historic resources eligible for listing on the California Register of Historic Resources (CRHR). In particular, there is concern regarding impacts to the historic town of Drawbridge in the Alviso Pond Complex and to the Cargill salt production facilities. Neither of these resources has been formally evaluated and they both have the potential to qualify for listing on the NRHP or CRHR as individually eligible historic properties or historic districts. Chapter 7 of the EIR/EIS addresses potential impacts to historic properties and historic resources and recommends procedures to be followed for evaluating the resources and mitigating impacts, if necessary.

1.9.6 Issue 6: Recreation, Public Access, and Public Health

There is concern about impacts to recreational duck hunting and future public access to the ponds for hunting and other recreational uses. There is also concern that the project would cause lower pond levels which could create mosquito breeding grounds and that this would cause an increased risk of sickness and death due to the Mosquito Abatement District's inability to maintain acceptable levels of service or protection under this scenario. In Chapter 8 the EIR/EIS evaluates impacts to recreation, public access, and public health in the project area.

1.9.7 Issue 7: Air Quality

There is concern that changes in water quality and water elevations may cause the release of hydrogen sulfide and other odorous organic gases. Chapter 9 of the EIR/EIS considers whether this project would create objectionable odors that would affect a substantial number of people, beyond existing impacts from the Cargill salt pond operations.

1.9.8 Issue 8: Utilities and Infrastructure

There is concern regarding the effect of project implementation on transmission lines. There is also concern whether breaching several of the existing salt ponds (the "island ponds") would have a scour effect on a South Pacific Railroad bridge at those ponds. Chapter 3 (Hydrologic and Hydraulic Conditions) EIR/EIS evaluates these potential impacts.

1.9.9 Issue 9: Socio-economics

There is concern about the availability of adequate funding and labor force to actively manage water levels and salinity in the ponds under the ISP. In addition, there is concern regarding the potential of the project to entrain Bay shrimp in ponds and the effects of the project on commercial fishing of Bay shrimp, including the initial release of pond contents to sloughs and creeks where juvenile shrimp are found. There is also concern about socioeconomic impacts of the reduction in commercial salt production. The EIR/EIS (Chapter 10) evaluates substantial decreases in employment and/or income, losses in tax revenue, and loss of the availability of a locally important mineral source likely to be caused by ISP implementation.

1.9.10 Issue 10: Land Use Planning

There is concern regarding the consistency of the project with existing land use plans. The EIR/EIS (Chapter 11) evaluates the project's consistency with the goals of approved habitat management plans and land use plans, including the Comprehensive Conservation Management Plan, Baylands Ecosystem Habitat Goals Report, USFWS Endangered Species Recovery Plans, San Francisco Bay Regional Water Quality Control Board Basin Plan, Bay Conservation and Development Commission Bay Plan, and the San Francisco Bay Joint Venture Implementation Strategy.

1.9.11 Issue 11: Cumulative Impacts

There is a concern about the cumulative impacts of the ISP and past, ongoing, and probable future projects, particularly on water quality and biological resources. The EIR/EIS (Chapter 12) examines the cumulative impacts of past, ongoing, and probable future projects affecting tidal marsh and estuarine habitats in the South Bay. Projects will include other salt pond restoration projects and wetland habitat improvement projects.

1.10 AVAILABILITY OF PROJECT FILES

The Administrative Record is a comprehensive project file documenting the process of developing this EIR/EIS. The official Administrative Record will be maintained at the Visitor Center, Don Edwards San Francisco Bay NWR, #1 Marshlands Road, Fremont, California.

1.11 REPORT ORGANIZATION

This EIR/EIS is organized into the following chapters:

- Summary
- Chapter 1—Introduction
- Chapter 2—Alternatives
- Chapter 3—Hydrologic and Hydraulic Conditions
- Chapter 4—Water Quality
- Chapter 5—Sediments
- Chapter 6—Biological Resources
- Chapter 7—Cultural Resources
- Chapter 8—Recreation and Public Access
- Chapter 9—Air Quality
- Chapter 10—Socio-economic Resources
- Chapter 11 – Land Use Planning
- Chapter 12 – Cumulative Impacts and Other Required Analysis
- Chapter 13 – Comments and Responses
- Chapter 14 – References Cited
- Chapter 15 – List of Preparers
- Chapter 16 – List of Recipients
- Chapter 17 – Abbreviations and Acronyms

1.12 CONSULTATION AND OTHER REQUIREMENTS

1.12.1 Required Permits, Consultation, and Approvals

In addition to complying with CEQA and NEPA, the South Bay Salt Ponds ISP must obtain the following agency approvals:

- U.S. Army Corps of Engineers (Corps) Section 404 Clean Water Act and Section 10 Rivers and Harbors Act permits
- Federal and State Endangered Species Act Consultation
- National Historic Preservation Act Section 106 Consultation
- San Francisco Bay Conservation and Development Commission approval
- CDFG Streambed Alteration Agreements(s) Section 1601 of the CDFG Code
- California State Regional Water Quality Control Board (RWQCB) 401 Certification and/or Discharge Permit

1.12.2 Federal, State, and Local Environmental Requirements

The ISP must fulfill federal, state, and local environmental requirements as summarized in Table 1-1. Specific requirements for compliance with other environmental regulations are described in the EIR/EIS chapters, as indicated in Table 1-1. Descriptions of federal, state, regional/local requirements are provided following the table.

Table 1-1.
Federal, State, and Local Environmental Requirements

Legal statute	Status of compliance	Reference EIR/EIS chapter
Federal requirements		
NEPA	Ongoing as part of this document	
Federal Endangered Species Act (ESA)	Ongoing as part of this document	Chapter 6
Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act)	Ongoing as part of this document	Chapter 6
Fish and Wildlife Coordination Act (FWCA)	Ongoing, as part of the Corps permitting process.	Chapter 6
Clean Water Act (CWA)	Ongoing. Regional Water Resources Control Board (RWRCB) will issue water quality certification and waste discharge permits after the environmental documents are completed.	Chapter 4, 5, 6
Clean Air Act (CAA)	In compliance since conformity analysis is not required.	Chapter 9
Costal Zone Management Act	Ongoing. Concurrence on FWS consistency determination from San Francisco Bay Conservation and Development Commission has been requested.	Chapter 11
National Historic Preservation Act (NHPA)	Ongoing.No known cultural resources or historic properties will be directly affected. Construction sites will be monitored	Chapter 7
Executive Order 11988—Floodplain Management	In compliance.	Chapter 3
Executive Order 11990—Protection of Wetlands	In compliance.	Chapter 5, 6
Executive Order 12898—Federal Actions to Address Environmental Justice in Minority and Low-Income Populations	In compliance since the project will not significantly change current management practices.	N/A
State (California) requirements		
CEQA	Ongoing as part of this document	
California Endangered Species Act (CESA)	Ongoing as part of this document	Chapter 5, 6
McAteer-Petris Act	Ongoing. BCDC San Francisco Bay permit or conformity determination for minor bay fill is needed.	Chapter 3, 5
California Fish and Game Code (Section 1600 Lake or Streambed Alteration Agreement Program)	Ongoing. The project complies with Section 1600 by using this document to address expected project effects.	Chapter 6

1.12.3 Federal Requirements

Endangered Species Act (ESA) Section 7 of the federal ESA of 1973, as amended (16 USC 1531), requires federal agencies to consult with the Secretary of the Interior (USFWS) and with the Secretary of Commerce (NMFS) to ensure that agency actions do not jeopardize the continued existence of species federally listed as endangered or threatened, or destroy or adversely modify designated critical habitat that supports such species. For properties under federal ownership and management, USFWS will serve as the lead federally agency for ESA compliance. The USFWS will consult internally for certain species and will consult with NMFS for others. For properties under state ownership and management, the Corps of Engineers, through their regulatory permit authority, will serve as the lead federal agency for ESA compliance, consulting with both USFWS and NMFS.

Magnuson-Stevens Fishery Conservation and Management Act The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) establishes a management system for national marine and estuarine fishery resources. This legislation requires that all federal agencies consult with NMFS regarding all actions or proposed actions permitted, funded, or undertaken that may adversely affect essential fish habitat (EFH). EFH is defined as "waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." The legislation states that migratory routes to and from anadromous fish spawning grounds should also be considered EFH. The phrase *adversely affect* refers to the creation of any impact that reduces the quality or quantity of EFH. Federal activities that take place outside an EFH but that may, nonetheless, have an impact on EFH waters and substrate must also be considered in the consultation process. Under the Magnuson-Stevens Act, effects on habitat managed under the Pacific Salmon Fishery Management Plan must also be considered.

The Magnuson-Stevens Act states that consultation regarding EFH should be consolidated, where appropriate, with the interagency consultation, coordination, and environmental review procedures required by other federal statutes, such as NEPA, the Fish and Wildlife Coordination Act (FWCA), the CWA, and ESA. In most cases, the environmental compliance required for federal activities will satisfy consultation requirements under the Magnuson-Stevens Act. EFH consultation requirements can be satisfied through concurrent environmental compliance requirements if the federal lead agency provides NMFS with timely notification of actions that may adversely affect EFH and if the notification meets requirements for EFH assessments.

Fish and Wildlife Coordination Act (FWCA) The FWCA (16 USC 661 *et seq.)* requires federal agencies to consult with USFWS or, in some instances, with NMFS, and with state fish and wildlife resource agencies before undertaking or approving water projects that control or modify surface water. The purpose of this consultation is to ensure that wildlife concerns receive equal consideration with water resource development project objectives and that provisions for wildlife are incorporated into the features of these projects. The consultation process is intended to promote the conservation of fish and wildlife resources by preventing their loss or damage and provide for the development and improvement of fish and wildlife resources in connection with water projects. Federal agencies undertaking water projects are required to fully consider the recommendations made by USFWS, NMFS, and state fish and wildlife resources agencies in project reports, such as documents prepared to comply with CEQA and NEPA. They must also include measures to reduce significant impacts on wildlife in project plans.

Clean Water Act (CWA) Section 404 of the CWA requires that a Corps permit be obtained for the discharge of dredged and fill material into waters of the United States, including wetlands. Fill is defined as any material used to convert an aquatic area to dry land or to change the bottom elevation of a water body. Discharges of fill material generally include permanent or temporary fills necessary for the construction of any structure.

The geographic limit of the Corps' Section 404 permit jurisdiction is as follows:

- Non-tidal waters. In the absence of adjacent wetlands, jurisdiction extends to the ordinary high-water mark; when wetlands are adjacent, jurisdiction extends beyond the ordinary high-water mark to the upper limit of the adjacent wetlands (as officially determined by the Corps). When the waters of the United States consist only of wetlands, jurisdiction extends to the limit of the wetlands. The ordinary high-water mark is defined as the line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas.
- Tidal waters. Jurisdiction extends to the high-tide line; when wetlands or non-tidal waters of the United States are adjacent, jurisdiction extends to the limit of those waters as described above. The high-tide line is defined as "the line of intersection of the land with the water's surface at the maximum height reached by a rising tide." This line can be determined by physical markings or characteristics, vegetation lines, tidal gages, or other means that determine the general height reached by the rising tide. The high-tide line includes spring high tides and other high tides that occur with periodic frequency, but it does not include storm surges caused by hurricanes or other intense storms.

Under Section 401 of the CWA, applicants for a federal license or permit to conduct activities that may result in a discharge of a pollutant into waters of the United States must obtain certification from the state in which the discharge would originate, or, if appropriate, from the interstate water pollution control agency with jurisdiction over the affected waters at the point where the discharge would originate. For the ISP, Section 401 certification must be obtained from the San Francisco Bay Regional Water Quality Control Board (SFBRWQCB). The Corps permit will not be valid until the Section 401 certification is issued.

River and Harbors Act Section 10 of the Rivers and Harbors Act of 1899 prohibits the obstruction or alteration of navigable waters of the U.S. without authorization from the Corps. Navigable waters are defined as waters that have been used in the past, are now used, or are susceptible to use as a means to transport interstate or foreign commerce up to the head of navigation. A Corps permit is required for the construction of any structure in or over any navigable water. Structures or work outside the limits defined for navigable waters of the United States would also require a Section 10 permit if the structure or work affects the course, location, or condition of the water body. The law applies to any dredging or disposal of dredged materials, excavation, filling, rechannelization, or any other modification of navigable waters of the United States, and applies to all structures.

Installation of water control structures and subsequent maintenance of levees constitute placement of dredged or fill material within waters of the United States. Work could also affect the Bay's navigable capacity. Work would be subject to regulation under Section 10 of the Rivers and Harbors Act and Section 404 of the CWA. For the ISP, the Corps will combine the requirements of both acts into a single permit process.

Clean Air Act (CAA) National ambient air quality standards (NAAQS) were established in 1970 by the federal Clean Air Act (CAA) for six pollutants: carbon monoxide, ozone, particulate matter, nitrogen dioxide, sulfur dioxide, and lead. Areas that do not meet the ambient air quality standards are called non-attainment areas. The CAA requires states to submit a state implementation plan (SIP) for non-attainment areas. The SIP, which is reviewed and approved by the U.S. Environmental Protection Agency (USEPA), must delineate how the federal standards would be met. States that fail to submit a plan or to secure approval may be denied federal funding and/or required to increase emissions offsets for industrial expansion. The 1990 amendments to the CAA established categories of air pollution severity for non-attainment areas, ranging from marginal to extreme. SIP requirements vary, depending on the degree of severity.

The conformity provisions of the CAA are designed to ensure that federal agencies contribute to efforts to achieve NAAQS. USEPA has issued two regulations implementing these provisions. The general conformity regulation addresses the actions of federal agencies other than the Federal Highway Administration and the Federal Transit Administration. General conformity applies to a wide range of actions or approvals by federal agencies. Projects are subject to general conformity if they exceed the emissions thresholds set in the rule and if they are not specifically exempted by the regulation. Such projects are required to fully offset or mitigate the emissions caused by the action, including both direct and indirect emissions over which the federal agency has some control.

A conformity analysis is not required for the ISP because emissions of reactive organic gases (ROG) and oxides of nitrogen (NO_x) would be below the conformity thresholds of 55 metric tons (50 tons) of ROG and I110 metric tons (100 tons) of NO_x, per year.

National Historic Preservation Act (NHPA) The National Historic Preservation Act (NHPA) of 1966, as amended, requires federal agencies to take into account the effects of a proposed undertaking on cultural resources listed or eligible for listing on the National Register of Historic Places (NRHP). Because historic properties could be affected by the ISP, the FWS is complying with Section 106 of the NHPA.

The Section 106 review process consists of 4 steps:

1. Identify and evaluate historic properties.
2. Assess the effects of the undertaking on properties that are eligible for listing in the NRHP.
3. Consult with the California State Historic Preservation Officer (SHPO) and appropriate agencies, and if necessary, develop an agreement addressing the treatment of historic properties.
4. Provide opportunity for the Advisory Council on Historic Preservation (ACHP) to comment on any agreement or the results of consultation.

Once these steps are completed, the ISP would proceed in accordance with the conditions of the agreement.

Executive Order 11988: Floodplain Management Executive Order 11988 requires federal agencies to recognize the significant values of floodplains and to consider the public benefits that would be realized from restoring and preserving them. Under this order, the Corps is required to provide leadership and to take action to accomplish the objectives listed below.

- Avoid development in the base floodplain, unless such development is the only practicable alternative.
- Reduce the hazard and risk associated with floods.
- Minimize the impact of floods on human safety, health, and welfare.
- Restore and preserve the natural and beneficial values of the base floodplain.

Executive Order 11990: Protection of Wetlands Executive Order 11990 directs federal agencies, in carrying out their responsibilities, to provide leadership to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance their natural and beneficial values. This policy states that federal agencies should avoid, to the extent possible, the long- and short-term adverse impacts associated with destruction or modification of wetlands. It also states that an agency should avoid undertaking and providing support for new construction in wetlands, including draining, dredging, channelizing, filling, diking, impounding, and other related activities, unless the agency finds that there are no practicable alternatives and all practical measures have been taken to minimize harm to wetlands.

Executive Order 12898: Federal Actions to Address Environmental Justice in Minority and Low-Income Populations Executive Order 12898: Federal Actions to Address Environmental Justice in Minority and Low-Income Populations requires each federal agency to identify and address any disproportionately high and adverse human-health or environmental effects of its actions on minority and low-income populations.

1.12.4 State Requirements

California Endangered Species Act (California ESA) The California ESA is similar to the federal ESA. Listing decisions are made by the California Fish and Game Commission. All state agencies are required to consult with CDFG about projects that affect state-listed species. CDFG is required to render an opinion as to whether a proposed project would jeopardize a listed species and, if so, to offer alternatives to avoid the impact. State agencies must adopt reasonable alternatives unless there are overriding social or economic conditions that make such alternatives infeasible. For projects causing incidental take of state-listed species, CDFG is required to specify reasonable and prudent measures to minimize take. Any take that results from activities that are carried out in compliance with these measures is not prohibited.

Many California species are both federally and state listed. The California ESA directs CDFG to coordinate with USFWS and NMFS in the consultation process, so that consistent and comparable opinions or findings can be adopted by both federal and state agencies.

California Fish and Game Code (Section 1600 Lake or Streambed Alteration Agreement Program) CDFG regulates work that would substantially affect resources associated with rivers, streams, and lakes in California, pursuant to Fish and Game Code Sections 1600-1607. Under Section 1601 of the Fish and Game Code, any state or local governmental agency or public utility must notify the department if it proposes to:

- Divert, obstruct, or change the natural flow or bed, channel, or bank of any river, stream, or lake designated by CDFG, in which there is at any time an existing fish or wildlife resource, or from which these resources derive benefit
- Use materials from the streambeds designated by CDFG
- Dispose or deposit debris, waste, or other materials containing crumbled, flaked, or ground pavement where it can pass into any river, stream, or lake designated by CDFG

Any person, governmental agency, or public utility that proposes any activity that would divert or obstruct the natural flow or change the bed, channel, or bank of any river, stream, or lake, or that proposes to use any material from a streambed, must first notify CDFG of such proposed activity. This notification requirement applies to any work undertaken within the 100-year floodplain of a body of water or its tributaries, including intermittent streams and desert washes. In practice, however, the notification requirement generally applies to any work in the riparian corridor of a wash, stream, or lake that contains or once contained fish and wildlife, or supports or once supported riparian vegetation.

Porter-Cologne Water Quality Control Act The Porter-Cologne Water Quality Control Act is California's comprehensive water quality control law and is a complete regulatory program designed to protect water quality and the beneficial uses of the state's waters. The act requires adoption of water quality control plans by the state's nine regional water quality control boards (RWQCBs). These plans are subject to approval from the SWRCB, and ultimately USEPA.

The primary method of implementing the plans is to require each discharger of waste that could affect the waters of the state to meet formal waste discharge requirements. Anyone discharging waste or proposing to discharge waste into the state's waters must file a "report of waste discharge" with the RWQCB. Those failing to file a report on discharges are subject to a wide variety of actions under administrative, civil, and criminal laws. After a report is filed, the RWQCB may issue waste discharge requirements that impose conditions on the discharge. The waste discharge requirements must be consistent with the water quality control plan for the body of water and protect the beneficial uses of the receiving waters. The RWQCBs also implement Section 402 of the CWA, which allows the state to issue a single discharge permit for the purposes of both federal and state law.

McAteer-Petris Act. Following passage of the McAteer-Petris Act in 1965, the California Legislature established the San Francisco Bay Conservation and Development Commission (BCDC) in response to broad public concern about the future of San Francisco Bay. The BCDC is charged with:

- Regulating all filling and dredging in San Francisco Bay (which includes San Pablo and Suisun Bays, sloughs and certain creeks and tributaries that are part of the Bay system, salt ponds, and certain other areas that have been diked off from the Bay)
- Protecting Suisun Marsh, the largest remaining wetland in California, by administering the Suisun Marsh Preservation Act in cooperation with local governments

- Regulating new development within the first 30.5 meters (m) (100 feet) inland from the Bay to ensure that maximum feasible public access to the Bay is provided
- Minimizing pressures to fill the Bay by ensuring that the limited amount of shoreline area suitable for high-priority water-oriented uses is reserved for ports, water-related industries, water-oriented recreation, airports, and wildlife areas
- Pursuing an active planning program to study Bay issues so that BCDC plans and policies are based on the best available current information
- Administering the federal Coastal Zone Management Act (CZMA) within the San Francisco Bay segment of the California coastal zone to ensure that federal activities reflect BCDC policies
- Participating in the region-wide state and federal program to prepare a long-term management strategy (LTMS) for dredging and dredge material disposal in San Francisco Bay
- Participating in California's oil spill prevention and response planning program.

1.13 OTHER PERTINENT STUDIES AND DOCUMENTS

The San Francisco Bay, including the South Bay Salt Ponds, has been studied extensively. A complete list of pertinent studies and documents used for this EIR/EIS is provided in Chapter 15 (References Cited). Additional information on a few of the key pertinent studies and documents for this project are discussed below.

1.13.1 Biological Analysis

Baylands Ecosystem Habitat Goals—A Report of Habitat Recommendations

This report presents recommendations for the kinds, amounts, and distribution of wetlands and related habitats needed to sustain diverse and healthy communities of fish and wildlife resources in the San Francisco Bay area (Goals Project 1999). The Goals Project began in 1995 and involved more than 100 participants representing local, state, and federal agencies, academia, and the private sector. The process for developing the goals involved the selection of key species and key habitats, assembling and evaluating information, preparing recommendations, and integrating recommendations into the goals.

Baylands Ecosystem Species and Community Profiles—Life Histories and Environmental Requirements of Key Plants, Fish, and Wildlife *The companion volume* to the Report of Habitat Recommendations (Goals Project 2000), this report is a reference volume for the 120 species of invertebrates, fish, amphibians, reptiles, mammals, and birds evaluated as part of the Goals Project. It provides a detailed overview of each species' historic and modern distribution, use of habitats, migration, relationship and interaction with other species, conservation and management issues, research needs, and habitat recommendations.

1.13.2 Management Plans and Strategies

Comprehensive Conservation and Management Plan The San Francisco Estuary Project developed a Comprehensive Conservation Management Plan (CCMP) for San Francisco Bay with input from more than 100 representatives from the public and private sectors, including government, industry, business, and environmental interests, as well as elected officials from all 12 San Francisco Bay/Sacramento-San Joaquin Delta (Bay-Delta) counties.

The CCMP presents a blueprint of 145 specific actions to restore and maintain the chemical, physical, and biological integrity of the Bay and Delta. It seeks to achieve high standards of water quality; to maintain an appropriate indigenous population of fish, shellfish, and wildlife; to support recreational activities; and to protect the beneficial uses of the Bay-Delta estuary.

Implementation Strategy of the San Francisco Bay Joint Venture (SFBJV) The SFBJV is a partnership of public agencies, environmental organizations, the business community, local governments, the agricultural community, and landowners working cooperatively to protect, restore, increase, and enhance wetlands and riparian habitat in San Francisco Bay and adjoining watersheds. The SFBJV shares the following objectives:

- Secure, restore, and improve wetlands, riparian habitat, and associated uplands by applying incentives and using non-regulatory techniques
- Strengthen and promote new sources of funding for such efforts
- Improve habitat management on public and private lands through cooperative agreements and incentives
- Support the monitoring and evaluation of habitat restoration projects and research to improve future restoration projects

The implementation strategy is a blueprint for acquiring, enhancing, and restoring Bay habitats, seasonal wetlands, and creeks and lakes. Over the next two decades, SFBJV partners plan to protect 63,000 acres, restore 37,000 acres, and enhance another 35,000 acres of bay habitats that include tidal flats, marshes, and lagoons.

Ecological Restoration of Salt Ponds, South San Francisco Bay, California—A Feasibility Analysis The Feasibility Analysis examines a range of biological, physical, chemical, and economic issues relevant to restoring tidal marsh on Cargill Salt Corporation's former 26,000-acre industrial salt complex, including the over 15,000 acres included in the acquisition agreement between Cargill and CDFG and USFWS. The study identifies seven key conclusions and a rough estimate of costs to restore the area included in the public acquisition agreement. The study's conclusions are as follows:

- **Conclusion 1:** Mix tidal marsh restoration and shallow open water management. Promoting recovery of federal listed species and species of concern should be a primary consideration in restoration planning and implementation. To accommodate conflicting ecological requirement between many of these species, an overall restoration plan should include about one-third of the salt ponds retained as managed shallow open water areas and two-thirds restored to tidal marsh.
- **Conclusion 2:** Resolve sediment deficit with phased restoration and/or dredged sediment reuse.
- **Conclusion 3:** Dredged sediment reuse may be desirable and economically competitive.
- **Conclusion 4:** Account for all bittern and hypersaline brine in the short and long term.
- **Conclusion 5:** Commit to immediate and long-term operations, maintenance and monitoring.
- **Conclusion 6:** Restoration needs to consider the many pressures on biological resources.

- **Conclusion 7:** Buyer beware of differential restoration feasibility.

The total roughly estimated cost to restore the 15,000-plus acres offered by Cargill for public acquisition ranges from $614 million to $1.4 billion, depending upon whether natural sedimentation or dredged sediment reuse is employed and depending upon whether low or high unit costs apply.

Inventory of Existing Conditions at Potential Mitigation Sites for San Francisco International Airport's Proposed Runway Reconfiguration Program This report describes existing conditions for selected resource areas (habitats, special-status species, land use, and utilities and infrastructure) at 40 sites in the North and South San Francisco Bay. The sites may be restored to former tidal flow and habitat to mitigate for biological effects of fill placement that would be needed to extend San Francisco International Airport's existing runway. The study includes the Baumberg, Redwood City, Charleston to Guadalupe and Coyote Creek complexes in the present project study area. The airport has been customizing conceptual restoration designs for each of the potential mitigation sites, working from original restoration designs that were based on recommendations of the Goals Project (Goals Project 1999).

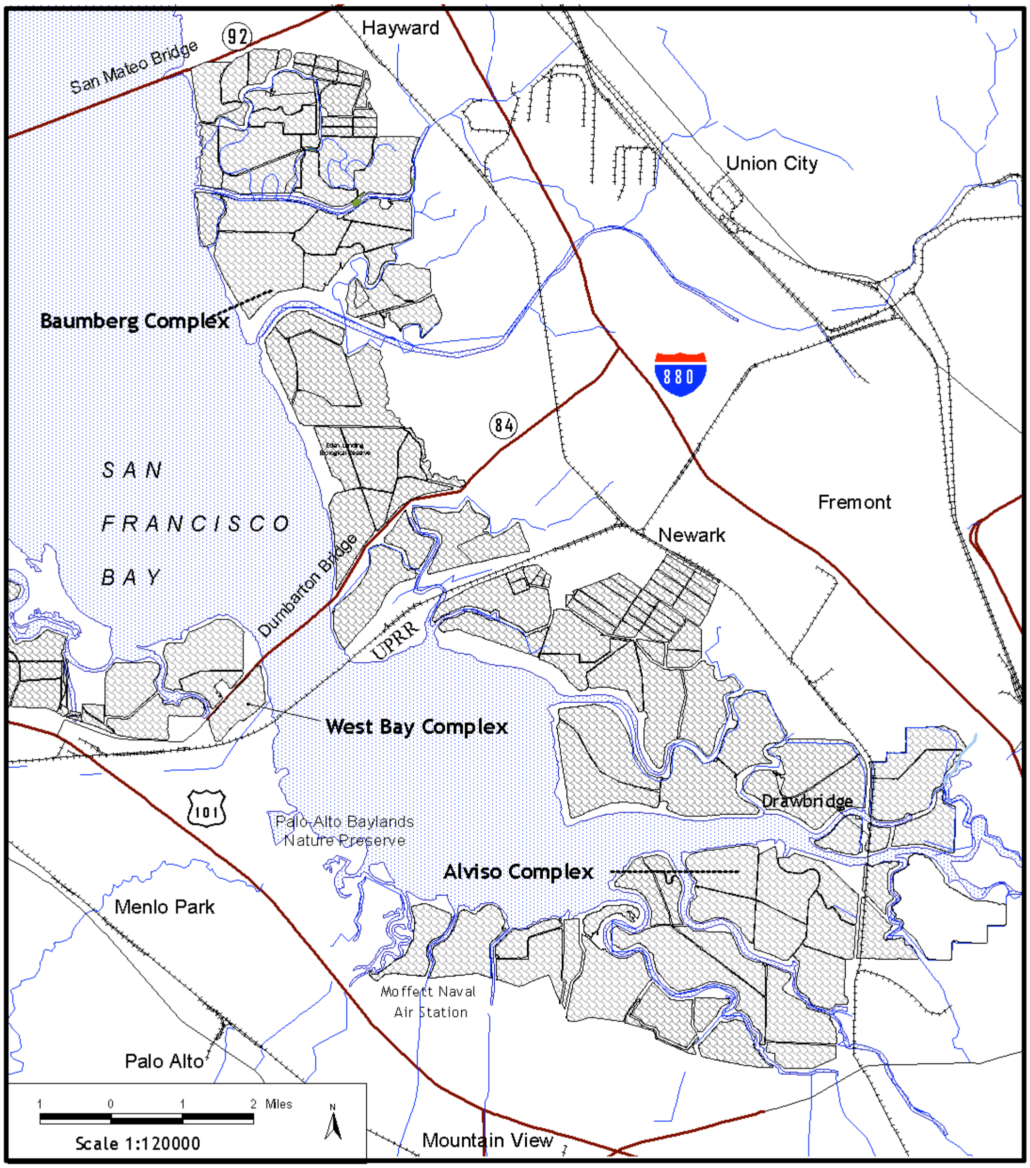

Figure 1-1

Map of Baumberg, Alviso, and West Bay Complexes

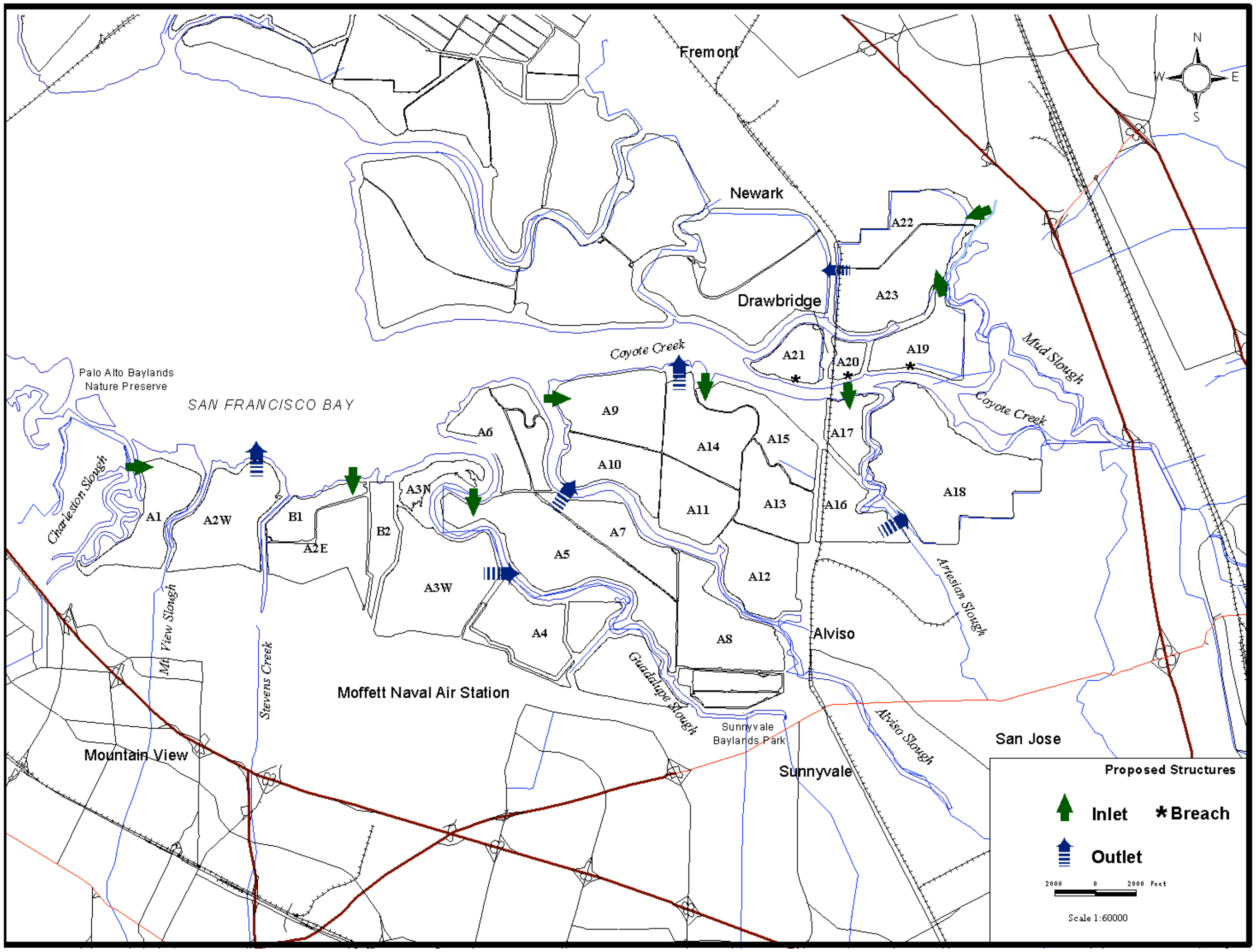

Figure 1-2

Alviso Pond Complex

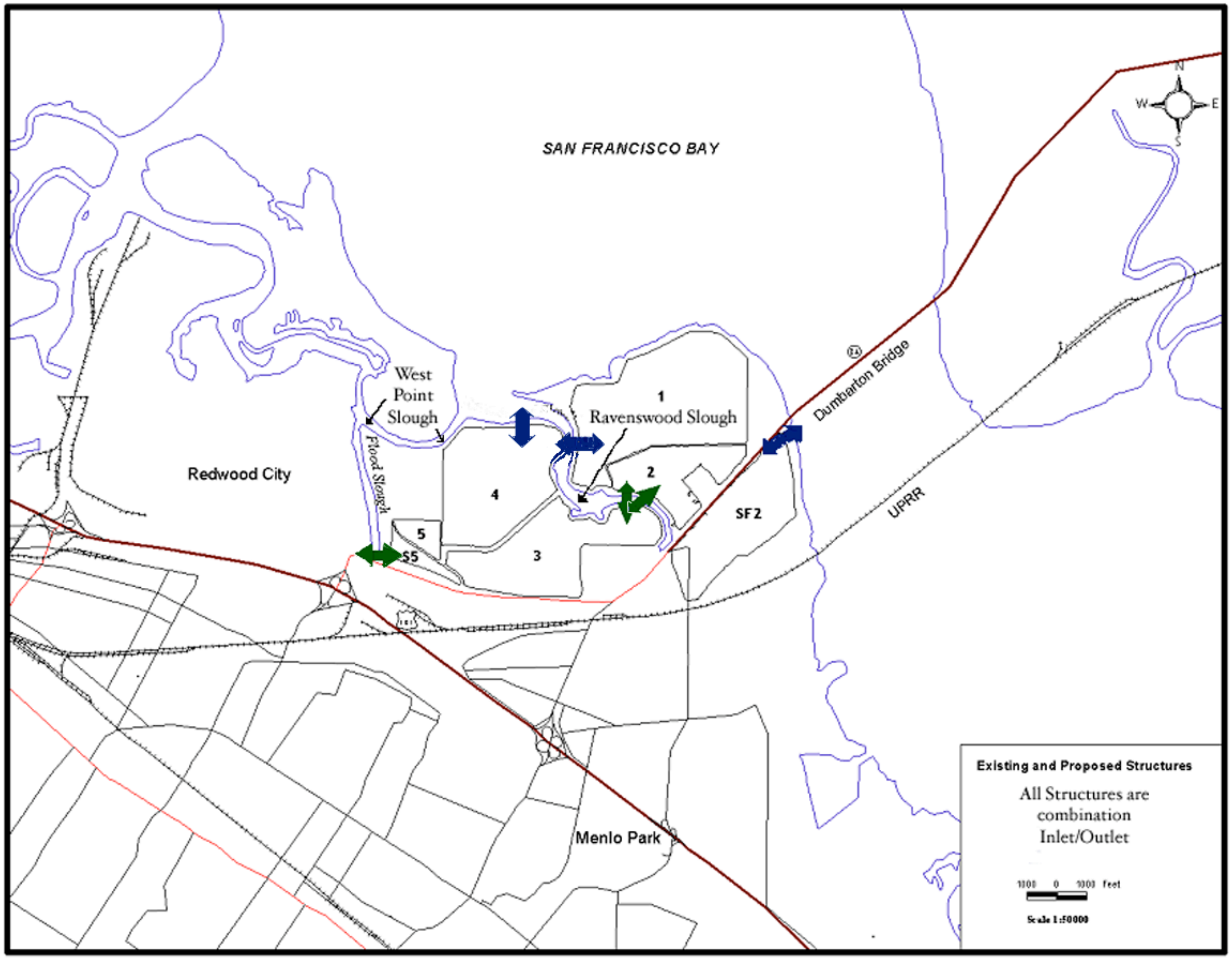

Figure 1-3

West Bay Complex

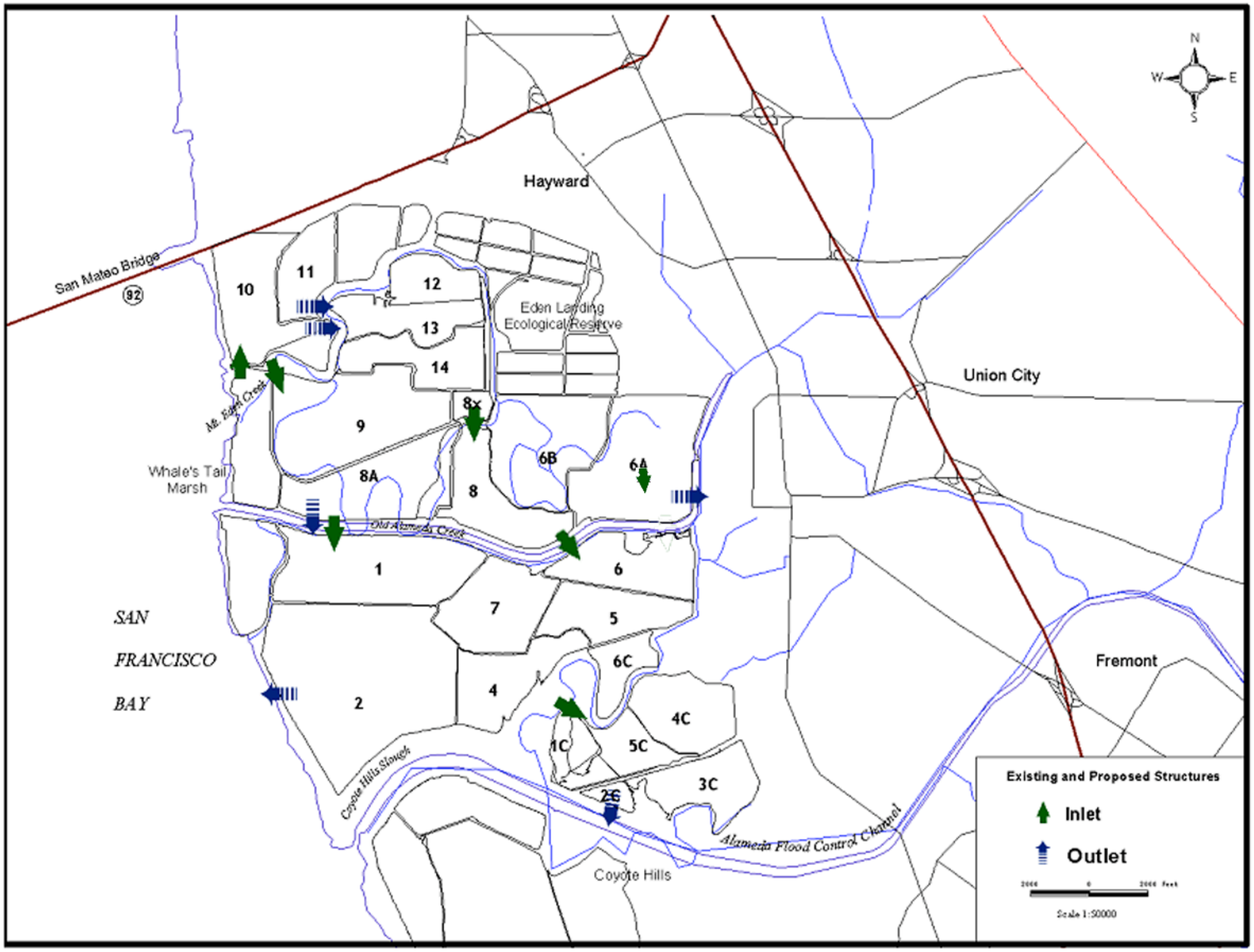

Figure 1-4

Baumberg Pond Complex

2.0 ALTERNATIVES

2.1 INTRODUCTION

This chapter describes and compares the alternatives considered by the USFWS and DFG for interim management of the South Bay salt ponds acquired from Cargill Corporation. Section 2.2 discusses the overall project objectives and the process followed to develop a reasonable range of alternatives that meet them. It also identifies the opportunities and constraints that were considered in formulating alternatives. Section 2.3 briefly describes those alternatives that were initially considered, but were eliminated from detailed study because they did not meet the project objectives, were infeasible or did not meet the purpose and need of the project. Section 2.4 describes in detail those alternatives, including the No Action alternative, a Seasonal Pond alternative, and two alternatives for interim pond management, including the Preferred Alternative (Phased Initial Release). Section 2.5 compares the major characteristics and effects of the alternatives in relation to the significant issues described in Chapter 1. This chapter meets the requirements of NEPA Regulations Section 1502.14 (Alternatives including the proposed action) and CEQA Regulations.

2.2 DEVELOPMENT OF ALTERNATIVES

NEPA Regulations (Section 1502.14) require that agencies "rigorously explore and objectively evaluate all reasonable alternatives…." NEPA Regulations (Section 1502.14) also require that agencies "devote substantial treatment to each alternative considered in detail including the proposed action so that reviewers may evaluate their comparative merits."

CEQA requires that an EIR "…describe a range of reasonable alternatives to the project, or to the location of the project, which would feasibly attain most of the basic objectives of the project but would avoid or substantially lessen any of the significant effects of the project, and evaluate the comparative merits of the alternatives" (CEQA Guidelines Section 15126.6(a), Consideration and Discussion of Alternatives to the Proposed Project). According to the Guidelines (Section 15126.6(a), "…an EIR need not consider every conceivable alternative to a project. Rather it must consider a reasonable range of potentially feasible alternatives that will foster informed decision-making and public participation." Among the factors that may be taken into account when addressing the feasibility of alternatives are site suitability, economic viability, availability of infrastructure, general plan consistency, other plans or regulatory limitations, jurisdictional boundaries (…projects with a regionally significant impact should consider the regional context), and whether the proponent can reasonably acquire, control, or otherwise have access to the alternative site (…or the site is already owned by the proponent).

The general goal of the Initial Stewardship Plan (ISP) is to operate and maintain the South Bay Salt Ponds in an environmentally sound and cost-effective manner while long-term restoration plans are developed and implemented. (See Appendix A). The ISP Team sought to develop a reasonable range of alternatives to be considered in this EIR/EIS that meet this general goal, the purpose and need of the project, and a number of specific objectives of the ISP. The specific objectives of the ISP include:

A. Cease salt concentrating process.
B. Circulate bay water through the ponds and introduce tidal hydrology to Island Ponds, if feasible.
C. Maintain existing open water and wetland habitat for the benefit of wildlife, including habitat for migratory shorebirds and waterfowl and resident breeding species.
D. Maintain ponds in a restorable condition to facilitate future long-term restoration.
E. Meet all regulatory requirements, especially discharge requirements to maintain water quality standards in the South Bay.
F. Work within existing funding constraints.
G. Maintain existing levels of flood control.

In addition, in developing a reasonable range of alternatives to be considered in this EIR/EIS, the ISP Team sought to take advantage of various opportunities and to account for various constraints.

Opportunities include:

- Existing intakes. These conduits, gates, and channels have been in place for decades and are well understood by operational engineers.
- Existing connection infrastructure. Various structures between and among the ponds have been used for years to allow waters in various salinity conditions to flow between ponds in a controlled manner.
- Accessible bay water for circulation. Each of the complexes described in the ISP has multiple potential access points for waters from San Francisco Bay to be admitted to control the water features of the ponds.
- Multiple locations for outlets. Each complex also has multiple exit points for water to be let back into the Bay. The inputs and outputs from the Bay maintain the salt ponds at acceptable water levels, salinity levels, habitat values, and potential restoration conditions.

Constraints include:

- Direction of water flow. Ponds generally have a singular flow direction and sequence established by existing pond bottom elevations and operational infrastructure.
- Existing salt pond levees. These levees, unless modified, may limit pond water elevations.
- Existing pond connections. The maximum flow capacity of existing pond connections is limited by the structure size and the available water surface difference between ponds, although in some cases the connection may be replaced in order to establish greater flow potential.
- Flood protection. Although the salt production levees were not designed for flood control, they have provided incidental flood protection.
- Bottom elevations within ponds. High pond bottoms require high water surface elevations and reduce gravity inflow. In turn, low pond bottoms require low water surface elevations to minimize erosion from wave action and can limit gravity outflows.

- Infrastructure effects. Because of the generally passive nature of the infrastructure, pond water levels vary during weak or strong tidal cycles and after rainfall events.
- Seasonal conditions. The high summer evaporation increases the need for circulation to minimize salinity increases. The longer it takes for water to circulate through the pond systems, the more it evaporates and the more salinity concentrates. Conversely, the low evaporation and rainfall during winter decreases the need for circulation of bay water.
- Water Quality Objectives. WQOs may limit long-term pond discharge salinities. Implementation of the ISP must not degrade water quality to a degree that would have a long-term impact on existing beneficial uses in the receiving waters.
- Slough conditions. Because of the relative lack of water movement in sloughs, discharges to sloughs are more sensitive to water quality concerns and will have to be monitored closely.
- Migrating salmonids. Since water intakes have the potential to entrain juvenile fish or attract adult fish, placement and operation of structures needs to reduce the potential for such impacts.
- Tidal marsh habitat. The location of structures should avoid or minimize impacts to the existing tidal marsh habitat in the South Bay.

2.3 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY

NEPA Regulations (Section 1502.14) require that agencies "…rigorously explore and objectively evaluate all reasonable alternatives, and for alternatives which were eliminated from detailed study, briefly discuss the reasons for their having been eliminated." Likewise, CEQA Guidelines (Section 15126.6(c)) specify that an EIR should identify alternatives that were considered by the lead agency, but were rejected during the scoping process and should identify the reasons for eliminating the alternative from further consideration. Among the reasons that may be used to eliminate an alternative from detailed consideration in an EIR, CEQA Guidelines include the alternative's 1) failure to meet the basic project objectives, 2) infeasibility, and 3) inability to avoid significant environmental impacts.

During the project design phase that led to the ISP, a number of operational alternatives were considered. Some of these alternatives were limited from more detailed study because they failed to meet most of the project objectives, listed in Section 2.2, or because the constraints, also listed in Section 2.2, render them infeasible. These alternatives are described briefly below, along with a statement of why they were eliminated from further analysis in this EIR/EIS.

Note that the purpose of this project is to develop an interim management plan for lands recently acquired from Cargill. USFWS and DFG must determine how to best manage these specific lands over the period covered by this EIR/EIS. Therefore, no alternative locations are offered for this project.

The following alternatives have been eliminated from further study in this EIR/EIS:

2.3.1 Three-System Alternative

Under this alternative, the Alviso Ponds, Baumberg Ponds, and West Bay Ponds, would each be managed as a single system with continuous flow between all of the ponds within each of the three larger pond complexes. This would be similar to the existing process in which all three complexes are managed as a single system.

Although this alternative would involve relatively low costs and would maintain the existing infrastructures (Objectives F and D, respectively), it would not meet other project objectives (A, B, C, and E). Under this alternative, the single-point discharge from each of the systems would be highly saline because the residence time of salt water passing through these larger systems would be much longer than it would be through a system involving a smaller number of ponds (a two- to three-pond system, for example). The longer the salt water takes to move through the system, the more time there is for evaporation and salt concentration. The objective under Cargill operations was to concentrate the salt; the objective of the project is to dilute it (Objective A). The discharge of highly saline water into creeks and sloughs would not meet regulatory requirements, including water quality objectives for pond discharges (Objective E) and would have significant impacts on fish and wildlife. This alternative would also provide less fine-tuned control over individual pond surface elevations, flow rates, and salinity levels, and may make it difficult to control for habitat values within the ponds (Objective C).

2.3.2 Pump All the Baumberg Ponds Alternative

Most of the Baumberg ponds are above tidal elevation. Therefore, tidal water does not flow into these ponds by gravity alone and water must be pumped into the ponds instead. The existing Baumberg infrastructure includes pumps at most ponds, but use and maintenance of these pumps is a significant operational expense.

The continued operation of the Baumberg Pond pumps would have the advantage of maintaining existing open water and wetland habitats during the 5-year interim period (Objective C). This alternative would also meet Objectives A, B, D, and E (i.e., it would cease the salt concentration process, introduce bay water circulation, maintain ponds in a restorable condition, and make it possible to meet discharge WOQs and other regulatory requirements). However, this alternative would not meet financial objectives for the project (Objective F). It was therefore considered infeasible and was eliminated from further study in this EIR/EIS.

2.3.3 Culvert Structures for Island Ponds Alternative

This alternative for the Island Ponds (A19, A20, and A21) would involve constructing and managing a separate culvert inlet/outlet for each pond. The ponds would be managed to maintain water levels in the ponds approximately one foot above the average bottom elevation. The culverts would be constructed to connect to either Mud Slough or Coyote Creek. Since the barge access to A19 and A20 would be from Mud Slough, the preferred location would be along Mud Slough.

This alternative would also meet Objectives A, B, C, D, and E (i.e., it would cease the salt concentration process, introduce bay water circulation, maintain ponds in a restorable condition, maintain existing open water and wetlands habitat, and make it possible to meet discharge WOQs and other regulatory requirements). This alternative would have an advantage over the ISP proposal to breach the Island Ponds on the Coyote Creek side (see below) in that it would allow for a greater degree of control over the surface elevations, flow rates, and salinity levels of the ponds than the ISP proposal and would allow for greater control over habitat values. It would also not have the initial salinity impact that the full breach proposal would have on receiving waters and wildlife. However, the costs of this alternative would be considerably higher than the breach alternative. Due to the Island Ponds' location between Lower Coyote Creek and Mud Slough, they are fairly inaccessible. The culvert structures would be difficult and expensive to construct and to actively manage. Therefore, this alternative would not meet financial objectives for the project (Objective F). It was consequently considered infeasible and was eliminated from further study in this EIR/EIS.

2.3.4 Breach All Ponds Alternative

Under this alternative, all ponds in the Alviso, Baumberg, and West Bay systems would be breached to establish full tidal conditions throughout the systems. This alternative would meet Objectives A and B (i.e., it would cease the salt concentration process and introduce bay water circulation) and would probably be the least expensive alternative (Objective F). However, it would not meet the remaining Objectives C, D, and E (to maintain the ponds in a restorable condition, to maintain existing open water and wetlands habitat, and to make it possible to meet discharge WOQs and other regulatory requirements). At least in the short-term, impacts to receiving waters, wildlife, and wildlife habitat of a one-time introduction of highly saline water from the breached ponds would be significant. In addition, the long-term goal for the project area is to manage it for a diversity of habitat values, which would not be possible under this alternative. As with the Three-System Alternative, described above, the Breach All Ponds Alternative would provide less fine-tuned control over individual pond surface elevations, flow rates, and salinity levels, and may make it difficult to control for habitat values within the ponds. This alternative would represent a significant departure from the long-term habitat planning process. Finally, the breaching of levees which have served a flood control purpose in the past would introduce a potentially significant flood hazard to the project area. For these reasons, this alternative was eliminated from further consideration early in the alternative development process.

2.3.5 Individual System Alternatives

In addition to the alternatives above, a number of individual system alternatives were considered in the project design. However, these alternatives would require different infrastructure than that proposed in the ISP and some of the alternatives would result in significant impacts to receiving waters, habitat, and wildlife. Therefore, they were also ruled out early in the alternative development process for the EIR/EIS.

Alviso A3W System Alternative—In the Alviso A3W system, an alternative intake location was considered for Pond B1. The alternative location was close to the northern end of the pond near Stevens Creek. The alternative location would avoid existing marsh areas along the bay levee and was close to the deeper channel maintained by flows from Stevens Creek. The existing intake location has marsh elevations outside the intake which limit inflow to only high tide periods. After consultation with NMFS, Stevens Creek was identified as potential steelhead habitat. The alternative intake location was not included in the ISP to avoid potential conflicts with steelhead migration to and from Stevens Creek. For this reason, it was also eliminated from further study in this EIR/EIS.

Alviso A14 System Alternatives (2)—The Alviso A14 system included two separate alternatives which would include continuous circulation through all of the ponds. The ISP includes ponds A12, A13 and A15 as batch ponds.

The first alternative included four separate sub systems. A9 and A14 would be one sub system with flow from A9 to A14. A10 and A11 would be intake/outlet sub systems with tidal inflow and outflow to and from Alviso Slough into each pond. A15, A13 and A12 would be the last sub system with flow from A15 to A12. The alternative included potential issues with multiple discharges to Alviso Slough during initial release. The spring or summer freshwater flow in Alviso Slough may not be sufficient to carry the salinity from the pond discharges out to the Bay during the initial release. In addition, the flow from A15 to A12 would transfer Coyote Creek water to Alviso Slough and could represent a distracting trace flow to upstream migrating salmonids which may follow chemical clues from Coyote Creek. Due to this potential impact, the alternative was eliminated from further study in this EIR/EIS.

The second alternative would include all of the ponds in the Alviso A14 system, without sub systems. The inflow would be at A15, the highest pond in the system. The flow would be from A15, through ponds A14, A13, A12, A11, A10 and discharge at A9 to lower Alviso Slough. The alternative would allow gravity flow without the use of the existing pump from A13 up to A15. However, the alternative would reverse the flow of the entire system and would increase operating water levels in ponds A14, A13, and A12, and decrease operating water levels in ponds A9 and A10. The higher water levels in several ponds would require raising several internal levees and the levee along the railroad southeast of ponds A12 and A13. Consequently, the alternative was eliminated from further study in this EIR/EIS.

Alviso A16 System Alternatives —Two alternatives were considered for the Alviso A16 system. The first alternative would reverse the ISP direction of flow to intake from Artesian Slough and discharge to Coyote Creek. The intake from Artesian Slough would avoid potential entrainment of migrating salmonids in Coyote Creek. However, the intake from Artesian Slough would contain low salinity water from the San Jose/Santa Clara Waste Water Treatment Plant (SJ/SC WWTP), and the entire system could operate at much lower salinities. The lower pond salinities could increase the risk of avian botulism in the ponds. Although not considered as a main system alternative, the option for changing the direction of flow will be considered as an adaptive management practice if needed to protect migrating fish during certain times of the year (see Section 2.4.3).

Another alternative operation was considered for the Alviso A16 system which would operate ponds A16 and A17 as batch ponds at higher salinities similar to ponds A12, A13 and A15 in the A14 system. This alternative would require a high salinity discharge to either Coyote Creek or Artesian Slough. Evaluation of the predicted pond discharge shows that the high salinity discharge may not meet receiving WQOs on a long-term basis. Due to this potential impact, the alternative was eliminated from further study in this EIR/EIS.

Baumberg 2 System Alternative—An alternative operation was considered for the Baumberg 2 system to maintain the water levels in all four ponds on a year around basis. This would require additional pumping at the pond 1 intake and construction of additional pumping capacity. Due to the high cost of pumping during the summer peak evaporation season, the alternative was eliminated from further study in this EIR/EIS.

Baumberg 2C System Alternative—An alternative flow operation was considered for the Baumberg 2C system to maintain the existing direction of flow from pond 4C to 5C to 1C. However, the existing Coyote intake pump would have to be used to supplement the flow from the pond 6 intake pump. Due to the high cost of pumping during the summer peak evaporation season, the alternative was eliminated from further study in this EIR/EIS.

Baumberg 8A System Alternative—An alternative operation was considered for the Baumberg 8A system to maintain the water levels in all four ponds on a year-round basis. This would require construction of an intake pump into the system. The intake pump was proposed at pond 8A to flow through to pond 9 and discharge at pond 9 to Mount Eden Creek. The flow from 8A to 9 was proposed to follow the existing pond bottom elevations to maintain similar pond depths in the two ponds. However, due to the high cost of pumping during the summer peak evaporation season, the alternative was eliminated from further study in this EIR/EIS.

2.4 ALTERNATIVES CONSIDERED IN DETAIL

Alternatives considered in detail include:

- No Project/No Action Alternative
- Alternative 1 (Seasonal Ponds Alternative)
- Alternative 2 (Simultaneous March/April Initial Release)
- Alternative 3 (Phased Initial Release-Preferred Alternative)

The No Project/No Action Alternative and Alternative 1 are similar, except that under No Project/No Action, existing levees and water control structures would not be maintained and would be allowed to deteriorate. Under Alternative 1, by contrast, levees and water control structures would be maintained and repaired as needed. Under this alternative, the ponds would be managed as seasonal ponds until the final restoration plan has been completed.

Alternatives 2 and 3 closely follow the June 2003 Initial Stewardship Plan. The main difference between the two alternatives is in the timing of initial release from system ponds. Alternative 2 includes a March/April initial release, while Alternative 3 includes a phased initial release. Both alternatives incorporate plans to breach the Island Ponds (Ponds A19, A20, and A21 only) and a similar combination of individual pond management strategies, as proposed in the ISP. Alternatives 2 and 3 both incorporate flexibility for pond management by proposing a number of alternative management strategies for individual ponds and pond systems, including the Island Ponds. . In addition, Alternative 3 includes a modification in the operation of Baumberg System 11 (see description in Section 2.4.4), which is not included in Alternative 2. Alternative 3 represents the agencies' Preferred Alternative (see additional discussion in Section 2.4.4).

Alternatives 2 and 3 incorporate the following four management strategies, which are defined below:

- Batch ponds management
- High salinity batch ponds management
- Seasonal batch pond management
- Seasonal pond management

Batch ponds are ponds that do not have a direct hydrologic connection to the Bay or tidal sloughs and creeks and are not integrated into one of the continuous tidal circulation systems. They remain peripheral to these systems, but normally remain wet throughout the year. The volume and frequency of the intake and release from/to a neighboring pond can be used to control the batch pond salinity and water levels. Bottoms of batch ponds may be high, generally requiring pumping to fill the ponds (Baumberg 12, 13, and 14). For other batch ponds, the pond bottoms may be low, generally requiring pumping to remove water from the ponds (Alviso A8, A12, and A13). The batch pond management strategy allows for fine-tuned control over habitat values. Batch ponds can be managed for salinities in the range of 120-150 parts per thousand (ppt) to favor brine shrimp and brine fly production, an important food source to certain migratory birds. A **high salinity batch pond** is a batch pond that is specifically managed for high salinity levels throughout the year.

A **seasonal batch pond** is a pond that is peripheral, but remains connected, to one of the continuous tidal circulation system. In the winter, rainwater fills the seasonal batch pond and additional water may be brought in from a neighboring pond. The pond remains wet and is operated as a batch pond throughout the winter. That is, the volume and frequency of the intake and release from/to a neighboring pond can be used to control the batch pond salinity and water levels to achieve water quality or habitat objectives. In the summer, the seasonal batch pond is allowed to dry out (although, depending upon the amount of winter precipitation and the depth of the pond, some ponds may never completely dry in the summer). The seasonal batch pond strategy allows for some control over habitat values, but is less costly than the batch pond strategy because it does not involve year-round pumping and operation of water control structures.

A **fully seasonal pond** involves minimal management and operates basically independently from any tidal circulation systems. Seasonal ponds will fill from high groundwater or rain during winter and be allowed to dry-down through the summer. The pond salinity would not be controlled, but would fluctuate due to residual salt in the pond, rainwater inflows, and seasonal evaporation. In the summer, like the seasonal batch pond, the fully seasonal pond is allowed to evaporate. In the wintertime, depending upon bottom elevations across the pond, a seasonal pond may fill to only a few inches or may not fill completely. In the summer, the pond may dry out completely or may retain some water. The major benefits of a seasonal operation are the habitat provided for certain species and the elimination of costly pumping of water to maintain water levels.

2.4.1 No Project/No Action Alternative

Evaluation of the “No Action” or “No Project” Alternative is required under NEPA Regulations 1502.14 and CEQA Guidelines 15126.6(e), respectively. As stated in the CEQA Guidelines, “the purpose of describing and analyzing a no project alternative is to allow decision-makers to compare the impacts of approving the proposed project with the impacts of not approving the proposed project.”

Under the No Project/No Action alternative, there would be no flow circulation through the pond systems. No additional water control structures would be installed, no release of pond contents or management of water and salinity levels would occur, and the existing infrastructure would not be maintained. During the interim period and until a long-term restoration plan is developed for the ponds, the existing levees and water control structures would be allowed to deteriorate.

Operation and management of the ponds will be transferred from Cargill to CDFG and USFWS once the ponds meet the discharge requirements established by the Regional Water Quality Control Board. At transfer, the depth of water and salinity will vary among the ponds. Depending on climatic conditions and starting depth, ponds would evaporate at varying rates, leaving behind salt-crusted flats and, in deeper areas, residual pools of concentrated brine. The deepest portions of the ponds would be seasonally wet during winter, filling with water after rain events.

It is important to note that the No Project/No Action Alternative is not identical to the existing environmental setting, and therefore the No Action Alternative is not the baseline for determining whether the proposed project’s environmental impacts may be significant. The existing environmental setting includes the pond infrastructure in its presently maintained condition as managed by Cargill. As noted above, under the No Project/No Action Alternative, the existing pond infrastructure would not be maintained once ownership is transferred to CDFG and USFWS.

Under the No Project/No Action Alternative, impacts to the existing environmental setting would occur. The advantage of this alternative is that it would be the lowest cost alternative. It would also minimize additional inputs of salinity and would not require a permit to discharge pond contents into the Bay. However, most of the existing open water habitats currently used by wildlife would be eliminated. Without maintenance, pond levees and control structures would be prone to failure, increasing risk of uncontrolled intake and release of flows from/to the Bay. This would present potentially significant impacts to water quality, fish, and wildlife habitat. It would also introduce a flood hazard to neighboring areas since some of the existing pond levees have come to serve a purpose of flood control for these areas. Long-term pond drying may cause some gypsum/salt-affected soils to be left on the sediment surface of some ponds. This may cause the chemistry of the soil to be affected in a manner that would likely increase the cost and level of effort of future restoration. However, results from other restoration efforts indicate that soil conditions return to normal once bay waters are returned. In addition, ponds would take 1 to 2 years to dry. During this time, there would be potentially significant impacts to nearby residents from nuisance odors.

The No Project/No Action Alternative would meet project Objectives A (cease salt production) and F (cost objectives), but would fail to meet several of the stated project objectives. Specifically, it would fail to meet Objective B (circulate bay water through the ponds), Objective D (maintain ponds in a restorable condition), and Objective E (meet all regulatory requirements). Although it would maintain some of the existing open water and wetland habitat, at least seasonally, it would not allow fine-tuned control of the ponds for habitat values (Objective C). Although the No Project/No Action Alternative would not meet most of the project objectives, in compliance with NEPA and CEQA, it is evaluated in detail in this EIR/EIS.

2.4.2 Alternative 1 (Seasonal Pond Alternative)

This alternative is the same as the No Action Alternative, except that the levees and water control structures would be maintained and repaired as needed. The ponds would be managed as seasonal ponds until the final restoration plan has been completed. Under this scenario, the pond contents would be allowed to evaporate during the summer and would be allowed to remain dry throughout the summer to minimize construction and management costs. During winter, they would fill during precipitation events, but contents would not be discharged.

This alternative minimizes additional inputs of salinity and does not require a permit to discharge pond contents into the Bay. Maintenance of the levees and water control structures would prevent their deterioration and prevent the accidental breaching of the ponds and release of pond contents to the Bay. Under this alternative, most of the existing open water habitats currently used by wildlife would be greatly reduced, significantly changing the character of the South Bay salt ponds. The duration and depth of water in the ponds would be reduced in most years, and the open water character of the salt ponds would be lost. The single intake pond for each pond complex would be closed. Intake ponds would no longer be present; the pond systems would not support fish and bay invertebrates, resulting in reduced foraging habitat for piscivorous (fish-eating) birds.

Alternative 1 would meet project Objectives A (cease salt production), E (meet all regulatory requirements), and F (cost objectives). By preventing deterioration of the existing infrastructure, it would partially meet Objective D (maintain ponds in a restorable condition). It would only partially meet this objective because, as with the No Project/No Action alternative, long-term pond drying may result in some gypsum/salt affected soil conditions in some ponds. This may cause the soil chemistry of those ponds to be affected, and increase the cost and level of effort of future restoration. However, results from other restoration efforts indicate that soil conditions return to normal once bay waters are returned. This alternative would also fail to meet Objective B (circulate bay water through the ponds) and Objective C (maintain existing open water and wetland habitat). Nevertheless, in order to evaluate the impacts of a complete range of reasonable and feasible alternatives, Alternative 1 is evaluated in detail in this EIR/EIS.

2.4.3 Pond Management Alternative 2: Simultaneous March/April Initial Discharge

This alternative includes an initial release period of March/April for project ponds and a variety of adaptive management strategies for individual ponds, including the option of breaching the Island Ponds (A19, A20, and A21) in the Alviso Complex. To accommodate the movement of brines out of the systems to the plant, implementation of all features described in the ISP may take up to 6 years. The operation of Alviso Ponds

A22 and A23 will remain under current operations for years 1-2 of the ISP; during years 3-6, they will be operated as seasonal ponds with some intake of Bay waters to reduce salinity. Similarly, the West Bay Ponds will remain under current operations for years 1-3 of the ISP; during years 3-6, pond salinities will be reduced to meet discharge standards. Once the ponds can be discharged, they will transition to ISP circulation.

Initial Release Period. The initial release period is the startup period for the circulation of bay water through the pond systems. Using tidal water management techniques, the targeted ponds' salinity will be reduced to levels similar to the salinity of the Bay. Under the proposed ISP, structures would be installed when site constraints allow and initial discharge of the existing pond contents would begin the following March/April when salinities within the ponds and receiving waters are the lowest. March/April was considered a reasonable time for the initial release because bay salinities are generally low to maximize dilution of the higher initial release salinities within the ponds before discharge and in the receiving waters after discharge. Also, March/April is the beginning of the summer high evaporation season, before the salinity levels in the ponds start to increase. It is anticipated that initial releases from one or two ponds would occur in 2004 and releases from the remaining ponds would occur in 2005.

Individual Pond Management Strategies The description of individual pond management strategies contained in this section includes a brief summary of the proposed circulation hydraulics and management operations for each of the pond systems in the Alviso, Baumberg, and West Bay complexes. This information is summarized from the ISP. Table 2-1 provides a comparison of pond-specific existing conditions and proposed ISP conditions. The table also identifies options for flow direction, possible alternative operations, and management constraints. Alternative operations for adaptive management of individual ponds are also discussed in detail below.

Additional pond-specific information, including existing water surface elevations and seasonal salinity levels and modeled water surface elevations and seasonal salinity levels under the proposed interim management are described in detail for each of the ponds in the ISP (see Appendix A).

The proposed ISP is a pioneering project. The restoration of salt production ponds to a diversity of tidal habitats has not previously been undertaken on such a massive scale at any known location. The South Bay hydrology and habitats comprise a complex interrelated system. Partly due to a lack of existing data from related projects, it is not known what effect the project will have on fish and wildlife and their habitats. Impacts can only be inferred from a variety of vaguely related projects, such as from reported impacts to fish and wildlife from highly saline waters discharged from desalinization plants in Saudi Arabia and other remote locations.

Due to the complexity of the project and the abundance of unknown factors and potential for significant impacts, USFWS and CDFG prefer to have flexibility in the implementation of management strategies for specific ponds and pond systems. Alternative 2 incorporates a number of additional pond-specific or system-specific management alternatives, which are noted in Table 2-1 (below) and discussed further in the text that follows. These alternatives employ a combination of batch pond, high salinity batch pond, seasonal batch pond and seasonal pond management strategies. They introduce a considerable degree of flexibility into on-going habitat restoration planning and infrastructure management efforts at the project sites and allow project managers to make adjustments to respond to impacts as they are observed.

Table 2-1
Summary of Existing and Proposed Management for Individual Ponds

			Existing Management			**Alternatives 2 and 3 Proposed Management**						
System	**Pond**	**Pond Area (Acres)**	**Type of Pond**	**Salinity Range (ppt)**	**Average depth (year-round)**	**Type of Pond**	**Salinity Range (ppt)**	**Average depth (summer - winter)**	**Proposed water level compared to existing**	**Flow direction options**	**Possible alternative operations *[1]**	**Management constraints**
Alviso Ponds												
A2W*[2]	A1	277	System intake	11-42	1.8	System intake	<40	1.4-1.7	Close to existing			Minimize disturbance to tidal marsh and mudflat outboard of this pond
A2W*[2]	A2W	429	System pond	15-43	1.8	System outlet	<40	1.2-1.7	Close to existing			
A3W*[2]	B1	142	System intake	13-41 (low)	1.5	System intake	<40	1.2-1.7	Close to existing			Locate intake to avoid entrainment of Stevens Creek salmonids
A3W*[2]	A2E	310	System pond	18-43	1.9	System pond	<40*[3]	2.6-3.1	Deeper		Possible batch pond. Could be managed for high salinity, depending on dilution flow in A3W	
A3W*[2]	B2	170	System pond	13-43	1.3	System pond	<40	1.0-1.5	Close to existing			
A3W*[2]	A3W	560	System pond	23-44	1.9	System outlet	<40	1.8-2.1	Close to existing			Minimize disturbance to marsh along A3W slough levee
A3W*[2]	A3N	163	Batch	16-41	0.6	Seasonal	<40*[3]	NA	Close to existing		Could be managed as high salinity batch pond	

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System	**Pond**	**Pond Area (Acres)**	**Type of Pond**	**Salinity Range (ppt)**	**Average depth (year-round)**	**Type of Pond**	**Salinity Range (ppt)**	**Average depth (summer - winter)**	**Proposed water level compared to existing**	**Flow direction options**	**Possible alternative operations *[1]**	**Management constraints**
A7*[2]	A5	615	System pond	28-60	0.7	System intake	<40	1.0-1.2	Close to existing	Reversible		Locate intake to avoid entrainment of migrating steelhead using Alviso Slough
A7*[2]	A7	256	System pond	28-75	0.6	System outlet	<40	0.9-1.1	Deeper	Reversible		
A7*[2]	A8	406	System pond (partially seasonal, bermed southern portion)	31-110	1.6	Seasonal	<40*[3]	Variable	Variable		Northern portion could be operated as high salinity batch pond	
A14 (3 sub-systems)	A9	385	System intake	11-38	4.1	System intake	<40	2.2-1.7	Shallower			Avoid entrainment of salmonids by limiting winter inflow
A14	A10	249	System pond	17-45	3.3	System pond	<40	2.6-2.3	Shallower			Avoid entrainment of salmonids by limiting winter inflow
A14	A11	263	System pond	28-69	3.5	System pond	<40	3.1-3.2	Close to existing			Avoid entrainment of salmonids by limiting winter inflow
A14	A14	341	System pond	48-135	1.4	System outlet	<40	0.9-1.3	Close to existing			
A14	A12	309	System pond	35-66	3.4	High salinity batch	120-150	3.0-3.4	Close to existing			Avoid entrainment of salmonids by limiting winter

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						(multiple intakes)						inflow
A14	A13	269	System pond	38-77	2.3	High salinity batch (multiple intakes)	120-150	2.0-2.3	Close to existing			
A14	A15	249	System pond	40-111	2.2	High salinity batch (multiple intakes)	120-150	2.0-2.2	Close to existing			Avoid entrainment of salmonids by limiting winter inflow
A16	A17	131	System pond	45-137	1.6	System intake	<40	1.2-1.1	Close to existing	Reversible		Avoid entrainment of salmonids by reversing winter flow; Minimize Avian Botulism (AB) by controlling salinity (AB is a particular concern for Pond A16 intake)
A16	A16	243	System pond	43-122	2.1	System outlet	<40	1.7-1.6	Close to existing	Reversible		Avoid entrainment of salmonids by reversing winter flow; Minimize AB by controlling salinity
Island Ponds	A19	265	System pond	79-290	2.0	Tidal	Not managed	Not managed	Tidal	N/A	Operate as seasonal pond	Locate breaches to minimize disturbance to tidal marsh habitat
Island	A20	63	System	87-289	1.9	Tidal	Not	Not	Tidal	N/A	Operate as	Locate breaches to

Table 2-1
Summary of Existing and Proposed Management for Individual Ponds

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Ponds			pond				managed	managed			seasonal pond	minimize disturbance to tidal marsh habitat
Island Ponds	A21	147	System pond	87-304	1.2	Tidal	Not managed	Not managed	Tidal	N/A	Operate as seasonal pond	Locate breaches to minimize disturbance to tidal marsh habitat
A22/A23	A22*[4]	270	Batch	66-296	1.0 Variable	Intake pond; Seasonal	NA	NA	NA			Primarily seasonal. Intake only to dissolve salt deposits when plant capacity is available.
A22/A23	A23*[4]	445	Batch	178-302	1.5 Variable	Intake pond; Seasonal	NA	NA	NA			Primarily seasonal. Intake only to dissolve salt deposits when plant capacity is available.
Baumberg Ponds												
2*[2]	1	337	System pond	18-46	2.6	System intake	<40	1.3-2.3	Lower than existing (different summer/ winter surface elevation)	Reversible flow at intake to drain system		
2*[2]	4	175	System pond	16-60	1.5	Winter - System pond; Summer-seasonal	<40*[3]	0.2-1.5	Lower than existing (different summer/		Possible batch pond. Could be managed for high salinity,	

Table 2-1
Summary of Existing and Proposed Management for Individual Ponds

			Existing Management			Alternatives 2 and 3 Proposed Management						
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									winter surface elevation)		depending on dilution flow in pond 2	
2*[2]	7	209	System pond	23-59	2.3	Winter - system pond; Summer- seasonal	<40*[3]	0.6-1.9	Lower than existing (different summer/ winter surface elevation)		Possible batch pond. Could be managed for high salinity, depending on dilution flow in Pond 2	
2*[2]	2	673	System pond	20-49	2.7	System outlet	<40	1.0-2.3	Lower than existing (different summer/ winter surface elevation)	Reversible flow at outlet to fill system		
2C	6	176	System pond	25-148	2.3	System intake	<40	2.8-2.5	Similar to existing (different summer/ winter surface elevation)			
2C	5	159	System pond	23-149	2.2	System pond	<40	2.7-2.5	Similar to existing (different summer/ winter surface elevation)			

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2C	6C	78	System pond	23-132	1.7	System pond	<40	2.2-2.1	Similar to existing (different summer/ winter surface elevation)			
2C	4C	175	System pond	23-143	1.0	System pond (intake from 5C)	<40	1.3-1.6	Similar to existing (different summer/ winter surface elevation)			
2C	3C	153	System pond	23-145	1.3	System pond	<40	1.1-1.7	Similar to existing (different summer/ winter surface elevation)			
2C	2C	24	System pond	20-178	1.3	System outlet	<40	1.3-1.7	Similar to existing (different summer/ winter surface elevation)			

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System	**Pond**	**Pond Area (Acres)**	**Type of Pond**	**Salinity Range (ppt)**	**Average depth (year-round)**	**Type of Pond**	**Salinity Range (ppt)**	**Average depth (summer - winter)**	**Proposed water level compared to existing**	**Flow direction options**	**Possible alternative operations *[1]**	**Management constraints**
2C	1C	66	System pond	22-147	0.6	System intake	<40[*3]	0.9-1.2	Similar to existing (different summer/ winter surface elevation)		Operate as high salinity batch pond	
2C	5C	111	System pond	20-136	0.8	Outlet to 4C	<40[*3]	1.1-1.4	Similar to existing (different summer/ winter surface elevation)		Operate as high salinity batch pond	
6A	8	180	System pond	48-296	2.5	Winter – intake/ Summer-seasonal	<40	Winter – 0.6	Lower than existing (different summer/ winter surface elevation)			
6A	6B	284	System pond	35-231	0.9	Winter – system pond/ Summer-seasonal	<40	Winter – 0.9	Lower than existing (different summer/ winter surface elevation)			

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Summary of Existing and Proposed Management for Individual Ponds

			Existing Management			Alternatives 2 and 3 Proposed Management						
System	**Pond**	**Pond Area (Acres)**	**Type of Pond**	**Salinity Range (ppt)**	**Average depth (year-round)**	**Type of Pond**	**Salinity Range (ppt)**	**Average depth (summer - winter)**	**Proposed water level compared to existing**	**Flow direction options**	**Possible alternative operations *[1]**	**Management constraints**
6A	6A	340	System pond	32-184	2.2	Winter – outlet/ Summer-seasonal	<40	Winter – 2.1	Lower than existing (different summer/ winter surface elevation)		Summer – may include a limited muted tidal area	
8A*[2]	9	366	System pond	62-241	2.1	System intake	<40	0.8-2.0	Lower than existing (different summer/ winter surface elevation)	Reversible intake to drain pond		
8A*[2]	8A	256	System pond	69-265	0.7	Winter – system outlet/ Summer-seasonal, tidally muted in borrow ditch	<40	2.0-0.6	Lower than existing (different summer/ winter surface elevation)	Intake and outlet		
8A*[2]	8X					Open tidal culvert to ditch-Pond is seasonal	<40		Lower than existing (different summer/ winter surface elevation)			

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8A*[2]	12	99	System pond	27-328	1.7	Winter intake; Summer-seasonal	<40*[3]	Winter - 1.1	Lower than existing (different summer/ winter surface elevation)		Possible batch pond. Could be managed for high salinity, depending on dilution flow in Pond 9	
8A*[2]	13	132	System pond	27-334	1.5	Winter - intake; Summer-seasonal	<40*[3]	Winter - 0.9	Lower than existing (different summer/ winter surface elevation)		Possible batch pond. Could be managed for high salinity, depending on dilution flow in Pond 9	
8A*[2]	14	156	System pond	32-304	1.2	Winter batch; Summer seasonal	<40*[3]	Winter – 0.5	Lower than existing (different summer/ winter surface elevation)		Possible batch pond. Could be managed for high salinity, depending on dilution flow in Pond 9	
11*[2]	10	214	Muted tidal (Open culvert)	16-74	1.3	Winter system intake; Summer intake and outlet	<40		Lower than existing (different summer/ winter surface elevation)	Reversible	Alternative 3 (phased release): Pond 10 intake operates as combined intake/ outlet	

Table 2-1
Summary of Existing and Proposed Management for Individual Ponds

			Existing Management			Alternatives 2 and 3 Proposed Management						
System	**Pond**	**Pond Area (Acres)**	**Type of Pond**	**Salinity Range (ppt)**	**Average depth (year-round)**	**Type of Pond**	**Salinity Range (ppt)**	**Average depth (summer - winter)**	**Proposed water level compared to existing**	**Flow direction options**	**Possible alternative operations *[1]**	**Management constraints**
11*[2]	11	118	System pond	16-81	1.4	Winter system outlet; Summer seasonal	<40	Winter – 1.1	Lower than existing (different summer/ winter surface elevation)	Reversible	Alternative 3 (phased release): operate as fully seasonal (year-round)	
						West Bay Ponds						
	1*[5]	445	System intake	35-326	0.5	System outlet	<40	0.9	Deeper than existing			
	2*[5]	145	System pond	64-306	1.6	System intake	<40	0.8	Lower than existing			Locate intake to minimize disturbance to tidal marsh habitat.
	3*[5]	273	System pond	145-320	1.2	System intake	<40	0.8	Lower than existing			Locate intake to minimize disturbance to tidal marsh habitat.
	4*[5]	297	System pond	88-341	0.4	System outlet	<40	0.7	Close to existing			.
	5*[5]	31	System pond	96-340	0.6	System pond	<40	1.0	Deeper than existing			
	S5*[5]	29	System pond			System intake	<40	1.2				Locate intake to minimize disturbance to tidal marsh habitat.

Table 2-1
Summary of Existing and Proposed Management for Individual Ponds

			Existing Management			Alternatives 2 and 3 Proposed Management						
System	**Pond**	**Pond Area (Acres)**	**Type of Pond**	**Salinity Range (ppt)**	**Average depth (year-round)**	**Type of Pond**	**Salinity Range (ppt)**	**Average depth (summer - winter)**	**Proposed water level compared to existing**	**Flow direction options**	**Possible alternative operations *[1]**	**Management constraints**
	SF2*[5]	242	System pond	76-316	1.0	System outlet	<40	0.7	Lower than existing			

Notes for Table 2-1:

1 Proposed management under Alternative 3 is identical to proposed conditions under Alternative 2, except where noted here.
2 Systems with July/August 2004 initial discharge under phased release scenario (Alternative 3).
3 Salinity levels could be higher than those proposed under Alternative 2 if pond is managed as a high salinity batch pond (Adaptive management strategy).
4 In years 1-3 the operation will remain similar to existing conditions; in years 3-6 the ponds will be operated as seasonal ponds to reduce salinity.
5 In years 1-3 the operation will remain similar to existing conditions; in years 3-6 the pond salinities will be reduced to transfer standards. After year 6, the ponds will transition to ISP circulation

Alviso System A2W— System A2W will consist of two ponds, A1 (intake) and A2W (outlet). See Figure 4-1 in the ISP (Appendix A). The proposed system would make use of an existing gate intake at A1 from lower Charleston Slough, an existing siphon under Mountain View Slough between A1 and A2W, and an existing staff gauge at A1. It would involve constructing a new gate outlet structure at A2W to the Bay and a new staff gage at A2W.

The intake location at the northwesterly end of A1 was selected to utilize the existing intake, as well as to allow inflow from lower Charleston Slough. The high tide salinities near the Bay would be closer to normal bay salinity than farther upstream. The bay salinity would be closer to existing conditions in the ponds. The outlet location at the northerly end of A2W was selected to allow outflow directly into the Bay. The specific location of the outlet was selected because the mudflat and tidal marsh communities outside the levee are narrowest at the proposed location. However, the rate of discharge from A2W into the Bay may be limited by the elevations of mudflat/marsh area in the vicinity.

Ponds A1 and A2W will require limited active management. This would include on-going monitoring and inspections. The system may require adjustment of the control gates monthly or seasonally. System A2W could be operated with reduced inflow and circulation during the winter season when evaporation is low. The proposed system includes an outlet weir to maintain minimum water levels with low flow rates. The system can be operated without an outlet weir, but may require more frequent adjustment of the control gates to control both water levels and salinities.

Alviso System A3W— Alviso System A3W consists of 5 ponds: B1 (intake), B2, A2E, A3N, and A3W (outlet). See Figure 4-2 in the ISP (Appendix A). The proposed system would make use of three existing gate structures, existing pipes between A2E and A3W, and existing staff gages at all ponds. It would require construction of four new gate structures.

The intake location at the northeasterly end of B1 was selected to be near the existing intake and avoid inflow from the Bay near the mouth of Stevens Creek. Stevens Creek has been identified as a potential salmonids fishery and migrating salmonids could be entrained in the intake flow if the intake were at Stevens Creek. The outlet location at the easterly end of A3W was selected to allow outflow into Guadalupe Slough in close proximity to the existing dock structure. At that location, the new outfall would have the least impact on existing marsh along the slough levee.

The proposed control gates will allow intake at the outlet structure. It may be useful to intake at A3W to dilute the pond contents if the pond salinity exceeds the discharge goals. Because of the flapgates and the relative elevations of the tide and pond water levels, all intake flow would occur at high tide, and all outflows would occur at low tide. The long term discharge salinity levels at A3W would be at or above bay salinity, and would generally be higher than low tide salinity in Guadalupe Slough. Due to freshwater inflow from San Thomas Aquino Creek, Calabazas Creek, and the Sunnyvale WWTP, the salinity in Guadalupe Slough is typically lower than bay salinity, particularly at low tide water levels.

Ponds B1, B2, and A3W will require limited active management. The intake, internal connections, and outlet structures generally have sufficient capacity and gravitational head for salinity control in winter and spring.

Pond A3N would be operated as a seasonal pond. For seasonal operations, the pond would be drained initially and no further operation would be required. The pond would fill with 1 to 2 feet of rainwater during the winter, which would evaporate during the summer. Because the bottom of pond A3N is 1_ feet below sea level, some groundwater seepage may occur to keep portions of the pond bottom wet during the summer.
The discharge flow from the gravity outlet from pond A3W to Guadalupe Slough may be affected by high flood tides during periods of high rainfall. There is a low levee on the south side of the pond which can be eroded by wave action if the water levels are high. It may be preferable to limit or stop inflow to the system during the winter to control the maximum water level. This is similar to the existing commercial salt operation. The outlet gates would need to be adjusted after large storms to drain excess volume from the system. Based on system model estimates, the outlet culverts would have capacity to allow circulation during the winter.

Alviso System A3W Adaptive Management Options

Alviso Complex Pond A2E—Pond A2E, in the Alviso A3W System, is currently operated as a system pond and Alternative 2 proposes to operate it as a low salinity system pond. As an additional alternative, Pond A2E could be managed as a high salinity batch pond, depending on the dilution flow in A3W.

Alviso Complex Pond A3N—Pond A3N, in the Alviso A3W System, is currently operated as a batch pond and Alternative 2 proposes to operate it as a seasonal pond. As an additional alternative, Pond A3N could be managed as a high salinity batch pond. Pond A3N has existing gates to operate as a batch pond. Water would be released from B2 to A3N to manage the volume in the pond and thus manage the amount of salt in the pond. This may affect the circulation in B1, B2, and A3W and may require additional analysis of flow rates and mixing in A3W. If the salinities in A3N become significantly higher than the salinity in A3W, there may be constraints on the discharge flow to A3W and the Guadalupe Slough. The flows through B1 and B2 to A3W would need to dilute the higher salinity inflow from A3N to a level that could be discharged from A3W. This may be limited during the summer high evaporation season due to the hydraulics of the system. The availability of the batch operation alternative also depends upon potential levels of methyl mercury that exist in pond sediments and the potential need to maintain higher water levels to reduce bioavailability of sediment contaminants to wading and shorebirds. Additional sediment sampling to determine levels is planned for fall and winter (2003-2004).

Alviso System A7— System A7 consists of 3 ponds: A5 (intake) and A7 (outlet) and seasonal pond A8. See Figure 4-5 in the ISP (Appendix A). The system would make use of the existing control gate from A7 to A8, the existing pump from A8 to A11 and existing staff gages in all ponds. The system would involve construction of new intake and outlet gates. A new cut would be made at the internal levee between A5 and A7 and the existing cut between these ponds would be filled.

The intake location at the northwesterly end of A5 was selected to allow inflow from Guadalupe Slough as close to the Bay as possible. The high tide salinities near the Bay would be closer to normal bay salinity than farther upstream. Due to freshwater inflows from Calabazas and San Tomas Aquino Creeks, other drainage channels, and the Sunnyvale WWTP, the salinity upstream in Guadalupe Slough generally is lower than bay salinity. The bay salinity would be closer to existing conditions in the ponds.

The outlet location at the northerly end of A7 was selected to allow outflow into Alviso Slough as close to the Bay as possible. The outlet salinity levels would be at or above bay salinity, but would generally be higher than low tide salinity in Alviso Slough. Due to freshwater inflow form Guadalupe River the salinity in Alviso Slough generally is lower than bay salinity, particularly at low tide levels.

Ponds A5 and A7 will require limited active management. Pond A8 would be operated as a fully seasonal pond. The pond would be drained initially and no further operation would be required. It would fill with 10 to 20 inches of rainwater during the winter, which would evaporate during the summer. Because the bottom of pond A8 is over 3 feet below sea level, some groundwater seepage may occur to keep portions of the pond bottom wet during the summer.

If the salinity in A8 is significantly higher than the salinity in A11 or A7, there may be constraints on the flow to A11 or A7. The flow through the A14 system, which includes A11, or the A7 system, would need to dilute the higher salinity inflow from A8 to a level that could be discharged from A14 or A7. This may be limited during the summer high evaporation season due to the hydraulics of the system. The flow to A11 would also be limited during the winter when the flow through the A14 system would be reduced or closed to limit potential entrainment of salmonids.

Pond A5 includes an existing siphon under Guadalupe Slough from pond A4. Pond A4 has been acquired by the Santa Clara Valley Water District (SCVWD) for a proposed restoration project. Based on the proposed schedule for the long-term restoration of pond A4 there may be a requirement for interim management of the pond during the initial stewardship period for the DFG and FWS ponds. One or more alternatives being considered by the SCVWD for interim management may include operation of pond A4 as a batch pond with periodic outflows through the siphon to pond A5. If SCVWD and USFWS agree that flows from A4 are appropriate, the flows would be restricted to time periods and salinity levels which would not have a significant effect on flow rates or discharge salinities from pond A7. SCVWD would be responsible for preparation of a suitable operation plan for interim management of pond A4 in coordination with the operation of System A7.

The Santa Clara Valley Water District has obtained all permits necessary to implement the Lower Guadalupe River Flood Protection Project, which will accommodate the 17,000 cfs 100-year flood capacity of the Guadalupe River Flood Control Project currently under construction. The Guadalupe River Project is located upstream of the Lower Guadalupe River Flood Protection Project and is scheduled to go on line in spring 2004.

As currently designed, the Lower Guadalupe River Flood Protection Project would affect the magnitude and duration of flooding downstream of the project at the Cargill Salt

Ponds, and in Alviso. Currently, when flood flows in the lower Guadalupe River exceed 6,800 cfs, Alviso Slough downstream of the Union Pacific Railroad crossing will over-top its west bank at Pond A8W. The flood control project would increase lower Guadalupe River channel capacity at the railroad crossing 17,000 cfs and therefore increase the potential for flooding conditions in the downstream salt ponds. During flood conditions, estimated depths in ponds A5, A7, A8D and A8W would increase by up to 1 foot compared to current conditions. Flood volumes would increase from 15 to 21% and duration of flooding would increase by 12 to 30%. Without pumping or other evacuation methods, it would take months, even years for the floodwaters to evaporate under current conditions.

To reduce the potential for flooding and duration of flooding in the ponds, additional mitigation measures to be implemented include constructing an Alviso Slough Overflow Weir at pond A8W and hardening of the pond A6 levee. Continuing flood flows into ponds A5, A6, A7, A8, and A8D via the Alviso Weir would allow adequate storage of flood waters to minimize overbanking in Alviso Slough.

Note that, although the proposed interim batch management of the SCVWD's Pond A4 and potential projects at Ponds A6 and A8 in conjunction with the SCVWD's Lower Guadalupe River Flood Protection Project would directly and indirectly impact ponds included in the ISP project, these SCVWD are not part of the ISP project. These projects are being developed separately and their environmental impacts are being evaluated separately. Implementation of the ISP is not dependent upon implementation of these projects. Nor is implementation of these projects dependent upon implementation of the ISP.

Alviso System A7 Adaptive Management Options

Alviso Complex Pond A8—At the present, the only pond in the project area that is truly seasonal is a portion of A8 (referred to a A8 South in the Alviso A7 System. The depth of this pond is sufficiently shallow that the south portion of the pond, which has been separated from the remainder of the pond by a berm, dries out during the summer and provides seasonal habitat for snowy plovers. Alternative 2 proposes to operate the remainder of Pond A8 as a fully seasonal pond.

As an alternative strategy, A8 could be operated as a seasonal batch pond and the northern portion of the pond could be managed as a high salinity batch pond to favor brine shrimp and brine fly production, an important food source to certain migratory birds. As a seasonal batch pond, A8 would not have continuous flow operation similar to A5 or A7. All outflows from A8 must be pumped to A11 or A7. The seasonal batch pond operation would minimize the amount of pumping required. Water would be diverted from A7 to maintain the volume in the pond. Water would be pumped from A8 to A11 or A7 to decrease the volume in the pond and reduce the amount of salt in A8. If the salinity in A8 is maintained at a level similar to the A11 or A7 levels, there would be no constraint on the timing and flow from A8 to A11 or A7.

If the salinity in A8 is significantly higher than the salinity in A11 or A7, there may be constraints on the flow to A11 or A7. The flow through the A14 system, which includes A11, or the A7 system, would need to dilute the higher salinity inflow from A8 to a level that could be discharged from A14 or A7. This may be limited during the summer high evaporation season due to the hydraulics of the system. The flow to A11 would also be limited during the winter when the flow through the A14 system would be reduced or closed to limit potential entrainment of salmonids.

The availability of this alternative for Pond A8 depends on the extent to which this pond will be flooded with fresh waters under the Lower Guadalupe River Flood Control Project.

Alviso System A14— System A14 consists of 7 ponds: A9 (intake), A10, A11 and A14 (outlet) and batch ponds A12, A13, and A15. See Figure 4-7 in the ISP (Appendix A).

The existing intake at A9 allows intake only, and would not be modified. The new outlet structures would include operable gates and flapgates, to allow inflow at the outlet when necessary. For instance, it may be necessary to use A14 as a mixing chamber for higher salinity flows from A15, which may require inflows from Coyote Creek to A14. In addition, the control gates would allow partial culvert openings to control water levels. Because of the flapgates and the relative elevation of the tides and pond water levels, all intake flow would occur at high tide, and all outflows would occur at low tide.

The outlet location at the northerly end of A14 was selected to allow outflow into Coyote Creek at a location near an existing channel within the marsh area along the levee. The existing channel drains part of the marsh area to the existing dredge lock cut at the north end of A15. This would minimize the potential disturbance in the marsh.

Ponds A12, A13, and A15 are proposed for batch operations that will allow higher salinities in those ponds. The goal for these higher salinity ponds would be to reach summer salinity levels between 120 and 150 ppt to provide habitat for brine shrimp and wildlife which feeds on the brine shrimp. Lower salinity water would be diverted from ponds A11 and A14 in A12 and A13 and evaporation would increase the salinity over time. Higher salinity water would be pumped up to A15 as needed to maintain the pond volume. Additional low salinity water would be added to make up lost volume and lower salinity if needed. Excess volume in the batch system would be released to the A16 system for dilution and discharge to Artesian Slough and Coyote Creek.

Ponds A12, A13, and A15 are called a batch system because it is anticipated that the ponds will be operated in a series of batch operations to control the individual pond volumes and salinities. For example, a typical operation may be to add 3 inches of low salinity water from A11 to A12 to make up lost volume and reduce the pond salinity, or release 6 inches of water from A15 to A16 to lower the pond volume to make room for inflows from A12 and A13. Using individual transfers of volume from one pond to another simplifies the planning necessary for control of the pond salinities.

Ponds A9, A10, A11, and A14 will require limited active management. During the winter season, the A9 intake would be closed to prevent entrainment of migrating salmonids. For planning purposes, this was assumed to extend from December through April. During the winter, rainfall would tend to increase the water levels in the ponds. The water levels in the ponds would be set by a weir at the outfall or adjustment of the control gates to avoid flooding of the existing internal levees or wave damage to the levees.

Ponds A12, A13 and A15 would be operated as batch ponds to maintain summer salinity levels in the range of 120 to 150 ppt for brine shrimp habitat. Water would be diverted from A11 or A14 into ponds A12 and A13 for makeup water as necessary to control salinity. Water would be pumped from A13 to A15 for makeup water in A15. Excess volume in A12 and A13 would be pumped up to A15. Excess water in A15 would be discharged to A16.

The proposed intake to A15 from Coyote Creek would also allow flow from the creek into A15 during the summer. Inflows from the creek would have lower salinity than makeup water from A13. This would lower the salinity in A15, if necessary. In addition, control gates would be available from A9 to A14 and from A15 to A14. These gates could be used to increase the flow through A14 from A9 and allow A14 to be used as a mixing pond for releases from A15. Flow could also be released from A13 to A14 by adjusting the water level in A13.

For winter operation, the gates from A9, A10, and A11 were assumed to be open to allow rainfall to drain to A14. This would minimize the need for water level management during the winter. However, the water levels in A9 and A10 would be lower than existing conditions. The winter water level in A9 would be approximately 2.3 feet below the average winter water levels for the existing commercial salt operations. The winter water levels in each individual pond could be maintained at different water levels by closing the internal pond connection gates at the start of the winter season. Excess water from rainfall would need to be drained from the system after larger storms and would require additional active management to adjust the interior control gates.

The summer water level for pond A9 for the ISP condition is approximately 1.9 feet below the existing condition average summer water level. The lower water level was required to increase the intake flow through the existing intake gates and provide sufficient circulation flows to maintain salinities within the system. The gravity intake flows are dependent on the size of the intake structure and the pond water level in comparison to the slough water levels. More active management of water levels in the system may allow summer operation of ponds A9 and A10 at higher levels depending on the discharge salinities, flows to the batch ponds, and the intake salinities. The modeled discharge salinities at pond A14 were near 35 ppt during the summer with higher than normal intake salinities.

Alviso System A16— System A16 consists of 2 ponds: A17 (intake) and A16 (outlet). See Figure 4-9 in the ISP (Appendix A).

The inlet and outlet structures would include operable gates and flapgates to close off all flow, allow inflow only, or allow outflow only. Therefore, the inflow and outflow direction for the system could be reversed if necessary. For instance, a summer operation with an intake from Coyote Creek was preferred to avoid inflows from Artesian Slough at the City of San Jose wastewater treatment plant outfall. However, it may be necessary to intake at A16 from Artesian Slough during the winter to minimize potential entrainment of migrating salmonids in Coyote Creek. The control gates would allow partial culvert openings to control water levels. Because of the flapgates and the relative elevations of the tides and pond levels, all intake flow would occur at high tide, and all outflows would occur at low tide.

Ponds A16 and A17 will require limited active management. During the winter season, December through April, the A17 intake would be closed to prevent entrainment of migrating salmonids. The control gates would need to be adjusted weekly or monthly during the summer circulation period.

Pond A16 includes a siphon from pond A15 in the A14 system. Pond A15 would contain higher salinity water between 120 and 150 ppt to provide brine shrimp habitat. Excess water from ponds A12, A13, and A15 would be released to A16 on a batch basis. Because the proposed salinity in A15 would be significantly higher than the salinity in A16, there may be constraints on the flow to A16. The flow through the A16 system would need to dilute the higher salinity inflow from A15 to a level that could be discharged from A16. This may be limited during the summer high evaporation season due to the hydraulics of the system. It would also be limited during the winter when the flow through the A16 system would be reduced or closed to limit potential entrainment of salmonids from Coyote Creek at A17. An operational alternative would be to reverse the flow in the A16 system during the winter and intake from Artesian Slough instead of Coyote Creek. Salinities in Artesian Slough are lower than in Coyote Creek due to the SJ/SC WPCP discharge, and may be more effective to dilute higher salinity inflows from A15. In addition, Artesian Slough does not have a salmonid fishery.

Based on the average salinity of the inflows from Coyote Creek and the average summer inflows to the A16 system, in an average year the release from the batch ponds through A15 to A16 would need to extend for approximately 4 months to prevent the salinity in A16 from exceeding 40 ppt.

Island Ponds (A19, A20, and A21) — The Island Pond group in the Alviso Complex contains three separate ponds. Under this alternative, there would be one or more levee breaches to Coyote Creek at each pond, allowing full tidal circulation within the ponds. The ponds would operate independently. The proposed breach locations were selected to avoid locations near the existing railroad bridge at Coyote Creek and to minimize impacts within the existing marsh areas along Coyote Creek (see Figure 4-11 in the ISP, Appendix A). The existing Coyote siphon pump and Mud Slough pump would be removed. The existing control gate from pond A21 to the Mud Slough pump would also be removed. Existing water surface elevations and seasonal salinity levels and modeled water surface elevations and seasonal salinity levels under the proposed interim management are described in detail in the ISP (Appendix A, Sections 4.2.6.2 and 4.2.6.3).

Following the breaching of the Island Ponds, these ponds will require no active management or maintenance. It is anticipated that the existing levees will degrade over time due to erosion from rainfall, tidal flows, and flood flows. The existing pond bottoms are relatively high in elevation and would become vegetated with middle level salt to brackish marsh vegetation relatively quickly. The estimated maximum breach velocities for certain breach locations may be higher than 4 feet per second (fps). The initial breach size and configuration would be expected to erode over time to a more stable configuration. The size and shape of breaches would depend on long-term circulation through the individual breach, elevation of the Coyote Creek marsh at the breach location, and durability of soils within the levee. Depending on site conditions, individual breaches may become deeper and wider.

Adaptive Management Option - Island Ponds (A19, A20, and A21) — One adaptive management alternative would be to stagger the breaches of Ponds A19, A20, and A21 over several years. This strategy would allow the USFWS to obtain information from the first breach that could be applied to subsequent breaches. A second alternative would include the potential for operating the island ponds as seasonal ponds for the Initial Stewardship period. The existing brines in the ponds would be transferred to the Cargill Plant 2 to the maximum extent possible. The residual brines in the borrow ditches and low areas would evaporate in place. As seasonal ponds, the Island Ponds would partially fill with winter rainfall. The rainwater would evaporate during the spring and summer, and the ponds would be dry until the following winter. The seasonal pond alternative would not require construction of any intake or outlet structures at the Island Ponds. There would be no discharges to the Bay or sloughs. The ponds could be breached in the future as part of the long-term restoration plan.

Alviso System A22/A23— This system includes ponds A22 and A23, both of which are presently operated as batch ponds. The operation of Alviso Ponds A22 and A23 will remain under current operations for years 1-2 of the ISP. During years 3-6, they will be operated as seasonal ponds to reduce salinity. See Figure 4-16 in the ISP (Appendix A). They would, however, each be able to intake water from Mud Slough as needed to dissolve salt deposits when plant capacity is available.

Baumberg System 2—The Baumberg System 2 consists of 4 ponds: ponds 1 (intake), 2 (outlet), 4 and 7. See Figure 4-17 in the ISP (Appendix A).

The circulation pattern for the system would be to intake at pond 1, then flow through ponds 7 and 4 to the outlet at pond 2. All four intake culverts would include operable gates and flapgates to allow inflow. Two culverts would include gates to allow outflow, if necessary. Controls to allow outflow at the intake structure are included to maintain management flexibility and allow discharge from pond 1 in the event of flooding or a gate failure within the system. Because of the flapgates and the relative elevation of the tides and pond levels, all gravity intake flow would occur at high tide, and all outflows would occur at low tide.

The existing intake pump station at pond 1 will remain to supplement gravity inflows into the system during the summer high evaporation period. Because the pond bottom elevations and water elevations are relatively high, the gravity flow intakes are effective only during short periods at high tides. During periods of weak tides, little gravity inflow would occur and the pump would be needed to supplement the inflow. The intake pump station also operates only at high tide.

The outlet structure at pond 2 to the Bay would include operable gates and flapgates to close off all flow or allow outflow only. The control gates at the intake and outlet culverts would allow partial culvert openings to control water levels.

The initial stewardship conditions would include different operation plans for the winter and summer. The operating water levels in the ponds would be lower during the summer to increase the gravity inflow into the system during the higher evaporation season. The water level in pond 2 would be approximately 3.1 feet (ft) NGVD during the summer, and 3.4 ft NGVD during the winter. Because of the high bottom elevations in ponds 7 and 4, they would be only partially wet during the summer.

Baumberg System 2 will require active management during the summer, as well as during the transitions to and from the summer operation. The intake culverts do not have sufficient capacity to allow adequate flow for salinity control during the summer. The inflow may need to be supplemented using the intake pump to control the summer salinity. It is anticipated that the supplemental pump would be controlled manually based on the measured salinity in pond 2 on approximately a weekly basis. The intake pump includes an automatic level switch to turn the pump on at high tide and off at low tide.

For the winter operation, the gate from Pond 1 to Pond 7 would be open and the gate from Pond 1 to Pond 2 would be closed. Water from the Bay would circulate from Pond 1 to 7, to 4, and to Pond 2. Because of rainfall and low evaporation during the winter, no supplemental pumping would be required in normal years. The water level in the system would be controlled by the outlet gate settings.

In the spring the system would be changed to the summer operation condition. This was assumed to occur in early May, but could vary depending on habitat conditions in the ponds. For example, the transition could be delayed or advanced based on use of the pond by migratory birds, or salinity levels in the ponds.

For the summer operation, the planned water levels would be lower by approximately 1 foot. The water levels in the system would be controlled by the outlet gate settings. The lower operating levels throughout the system would provide a significant increase in the gravity inflow from the intake culverts in pond 1. In addition, the gate from pond 1 to pond 2 would be at least partially opened to reduce the headloss for flow from pond 1 to pond 2. The gate from pond 1 to pond 7 would be partially open to provide limited circulation through ponds 7 and 4.

Based on modeling of the system for historic tide and evaporation conditions in 1994, the gravity intake system would not be sufficient to maintain the maximum salinity goals during periods of weak tides. Gravity inflows would only occur at high tide levels in the Bay. During periods of weak tides, with lower high tides, the inflow would be reduced. Weak tide periods may extend for a week to 10 days. With low inflows from the Bay and high evaporation, the salinity levels in the ponds would increase, and may exceed the design goal of 40 ppt. Therefore, supplemental pumping would be provided from the existing intake pump from Old Alameda Creek to pond 1. A proposed operation scheme was developed in which pumping would start if the discharge salinity exceeds 37 ppt, and stop if the discharge salinity is below 36 ppt. Because the discharge salinity responds slowly to the increased inflow, the pumps generally would operate for several days or weeks at a time. The pumping criteria could be modified to conform to other discharge goals. A higher allowable discharge goal would reduce the need for pumping. Based on the pond modeling for 1994 and 1995, the supplemental pumping would be necessary during summer periods with higher bay intake salinity, but may not be required during wet years with lower ambient salinity in the Bay.

Baumberg System 2 Adaptive Management Options

Baumberg Complex Pond 4—This pond is presently managed as a low salinity system pond within the Baumberg 2 system. Alternative 2 proposes to operate this pond as a low salinity seasonal batch pond (see Section 2.4.3). As an alternative, Pond 4 could be operated as a high salinity batch pond (120-150 ppt salinity), depending upon the dilution flow in Pond 2 of the Baumberg 2 system.

Baumberg Complex Pond 7—This pond is presently managed as a low salinity system pond within the Baumberg 2 system. Alternative 2 proposes to operate this pond as a low salinity seasonal batch pond (see Section 2.4.3). As an alternative, Pond 7 could be operated as a high salinity batch pond (120-150 ppt salinity), depending upon the dilution flow in Pond 2 of the B2 system.

Baumberg System 2C—The Baumberg System 2C consists of eight ponds: ponds 6 (intake), 5, 6C, 4C, 3C, 2C (outlet), 1C (intake) and 5C. See Figure 4-19 in the ISP (Appendix A).

The proposed intake pump would provide continuous circulation through ponds 6, 5, 6C, 4C, 3C, and 2C during the summer months. Water would be pumped primarily during high tide into pond 6 and then be conveyed by gravity into ponds 5, 6C, 4C, 3C and 2C. A new gravity outlet at pond 2C consisting of two 48” gates would discharge flows into the Alameda FCC.

The existing intake pump at pond 1C would operate to provide inflows to a smaller sub-system consisting of pond 1C and 5C. This pond sub-system would operate on a continuous basis or could be operated seasonally as a batch system to allow higher salinity in ponds 1C and 5C. Pond 5C would discharge to pond 4C.

Flows through both these two sub-systems would be primarily unidirectional to pond 2C. The outlet structure from pond 2C would discharge to Alameda FCC through two 48” flapgates at low tide. The new outlet in pond 2C would be constructed as close to San Francisco Bay as possible. The outlet structure would also include a weir to control the minimum water level in pond 2C. The weir would include weir boards to adjust the weir elevation.

The control gates at the intake and outlet culverts would allow partial culvert openings to control water levels. Because of the flapgates, all gravity outflows would occur during low tide in the channel. Because of the shallow depths in Old Alameda Creek, all pumped inflows would occur at high tide.

The initial stewardship conditions would include different operation plans for the winter and summer. The operating water levels in the lower ponds (4C, 3C, and 2C) would be slightly lower during the summer to increase the gravity flow through the system from the upper ponds (6, 5, and 6C) during the higher evaporation season. The water level would vary approximately 1 foot in elevation NGVD during the summer between the upper and lower ponds.

Baumberg System 2C will require active year round management because the intake pumping would be controlled by the discharge salinities at pond 2C. Active management will also be important in the transition period entering and exiting the summer management regime. The water surface elevations would be controlled primarily by the intake pump operations at ponds 6 and 1C and the discharge weir elevation at pond 2C.

Because of rainfall and low evaporation during the winter, winter pumping would typically not be required. However, limited pumping may be required during extreme drought winters with low rainfall. For winter operation, the discharge weir elevation at the 2C outlet structure would be set high enough (4.3 NGVD) to provide open water throughout the system. Winter operation pumping may be required to maintain water levels.

In the spring the system would be changed to the summer operation condition. The outlet weir would be lowered by approximately 1 foot (3.6 NGVD). This was assumed to occur in early May, but could vary depending on habitat conditions in the ponds. For example, the transition could be delayed or advanced based on use of the pond by migratory birds, or salinity levels in the ponds.

Lowering the discharge weir would lower the operating levels throughout the system and provide a significant increase in the gravity flow between ponds. The summer operation elevations would be similar to the existing operating elevations for downstream ponds. The new intake pump at pond 6 and the existing pump at pond 1C should have sufficient capacity to provide flow for salinity control during the spring, summer, and fall as needed. A proposed operation scheme was developed in which pumping would start if the discharge salinity exceeds 37 ppt, and stop if the discharge salinity is below 36 ppt. Because the discharge salinity responds slowly to the increased inflow, the pumps generally would operate for several days or weeks at a time. The pumping criteria could be modified to conform to other discharge goals such as a reduction in odors associated with pond drying.

A higher allowable salinity discharge goal would reduce the need for pumping. Based on the pond modeling for 1994 and 1995, the supplemental pumping would be necessary during summer periods with higher bay intake salinity, but may be significantly reduced during wet years with lower ambient salinity in the Bay.

Ponds 1C and 5C would be a separate sub system within the overall system. Inflows from Alameda Flood Control Channel would be pumped as necessary to control salinity in the sub system. The sub system would discharge to pond 4C. This sub system may also be operated as a batch system with higher salinity to provide habitat for brine shrimp and related species. This may require additional analysis of pond salinities in pond 2C.

There are no salmonid migration concerns in Old Alameda Creek to limit pumped intake at pond 6, however there is the potential for future restoration of anadromous fish in Alameda Flood Control Channel. Steelhead go up Alameda Creek, but are blocked from migration to spawning areas by several barriers. Local anglers transport some fish above the barriers. Until fish movement past the barriers is addressed, there is not a viable steelhead fishery in Alameda Creek.

Baumberg System 2C Adaptive Management Options

Baumberg Complex Pond 1C—This pond is presently managed as a low salinity system pond within the Baumberg 2C system. Alternative 2 proposes to operate this pond as a low salinity intake pond. As an alternative, Pond 1C could be operated as a high salinity batch pond (120-150 ppt salinity).

Baumberg Complex Pond 5C—This pond is presently managed as a low salinity system pond within the Baumberg 2C system. Alternative 2 proposes to operate this pond as a low salinity outlet to Pond 4C. As an alternative, Pond 5C could be operated as a high salinity batch pond (120-150 ppt salinity).

Baumberg System 6A—The Baumberg System 6A consists of 3 ponds: ponds 8 (intake), 6B and 6A (outlet). See Figure 4-21 in the ISP (Appendix A).

As a seasonal or muted tidal pond system, the system would not be subject to continuous circulation through ponds during the summer high evaporation season. The seasonal ponds would be filled during the fall to provide open water during the winter and early spring. The seasonal ponds would be drained in the spring. Due to the hydraulic limitations of the intake to pond 8 and the limited capacity of Old Alameda Creek, it was not considered practical to maintain continuous circulation in the 6A system during the summer.

Pond 6A may be operated as a muted tidal pond during the summer. With muted tidal operation, the outlet culvert would be opened to allow both inflow and outflow on each tidal cycle. The pond would then have a daily cycle of wetting and drying for part of the pond. Because of the limitation of the culvert and the creek channel, the daily tidal cycle within the pond would be relatively small, generally less than one foot. The tidal cycle in the Bay is generally over six feet.

The intake and outlet structures and internal connections were designed to provide circulation for filling the pond system in the fall and to empty the ponds in the spring. The proposed intake structure into pond 8 at North Creek would include one 48” gravity culvert. All gravity intake flows would occur at high tide. The proposed intake structure would be constructed as part of the North Creek levee improvements to be completed as part of the Eden Landing restoration project.

In addition, the existing control structures include two control ponds located between the three ponds near Old Alameda Creek. The control ponds are shown in Figure 4-19, but not to scale. The actual ponds are each less than 1 acre. As shown in the plan, the south control pond (also called a donut) is connected by gated culverts to ponds 8 and 6A, to the north control pond and the siphon to pond 6 across Old Alameda Creek. The north control pond is connected to Pond 6B. The north control pond was the source for water for the Continental pump, which pumped up into pond 8. For the salt making operations, the control ponds and pump were used to transfer water to and from pond 6. For the initial stewardship conditions, the pump and siphon would not be required. The system would be separate from the pond system south of Old Alameda Creek.

The system outlet structure would be located on the eastern end of pond 6A, and would discharge to Old Alameda Creek. All outflows would occur at low tide.

The initial stewardship conditions would include different operation plans for the ponds during the winter and summer seasons. The ponds would be seasonal and would have open water through the system during the winter. During the summer, the ponds would be dry or include a limited area of muted tidal area in pond 6A.

Baumberg System 6A will require limited active management, primarily during the transitions to and from the winter operation conditions. Pond water surface elevations would be controlled primarily by adjusting the control gates at the intake and outlet, between ponds. Intake salinities would be the similar to the bay salinity and pond salinities would be similar to existing bay salinities.

For the winter operation, the gates from pond 6B to pond 6A would be open to equalize the water surface elevations within the ponds. Water from the Bay would circulate from pond 8 to 6B and 6A. Pond 8 would operate at a higher elevation because the pond bottom is higher. The water level in pond 8 may be controlled by a weir at the discharge, or by adjustment of the pond 8 control gates.

In the spring the system would be drained for the summer condition. This was assumed to occur in early May, but could vary depending on habitat conditions in the ponds. For example, the transition could be delayed or advanced based on use of the pond by migratory birds, or salinity levels in the ponds.

Because ponds would be operated as seasonal ponds, the ponds would slowly drain and dry during the late spring, and no further management would be required until winter. The ponds would then become part of the continuous flow operation in winter.

If pond 6A is to be operated as a muted tidal pond during the summer, the outlet culvert would be opened to allow inflow and outflow and the water level would be controlled by the outlet weir. Without the outlet weir the pond would only contain minimal water at extreme high tides.

Baumberg System 6A Adaptive Management Options

Baumberg Complex Pond 6A—This pond is presently managed as a system pond with widely ranging seasonal salinities within the Baumberg 6A system. Alternative 2 proposes to operate this pond as a low salinity outlet pond in the winter and as a seasonal pond in the summer. As an alternative, Pond 6A could include a limited muted tidal area in the summertime.

Baumberg System 8A—The Baumberg System 8A consists of 6 ponds: ponds 9 (intake), 8x and 8A (outlet) and seasonal ponds 12, 13 and 14. See Figure 4-23 in the ISP (Appendix A).

All four culverts of the pond 9 intake structure at Mount Eden Creek would include operable gates and flapgates to allow inflow. However two culverts would include gates to allow outflow, if necessary. Controls to allow outflow at the intake structure are included to maintain management flexibility and allow discharge from pond 9 in the event of flooding or a gate failure within the system. A 48” intake gate has been constructed at the northeasterly end of pond 8A as part of the Eden Landing restoration project. The pond 8A intake would increase circulation within pond 8A.

The outlet structure from pond 8A would include operable gates and flapgates to close off all flow or allow outflow only or allow inflow and outflow. The control gates at the intake and outlet culverts would allow partial culvert openings to control water levels. All gravity intake flow would occur at high tide, and all outflows would occur at low tide.

The operating water levels in the ponds would be lower during the summer to increase the gravity inflow into the system during the higher evaporation season. The water level in pond 9 would be approximately 3.4 ft NGVD during the summer, and 4.6 ft NGVD during the winter. The minimum water level in pond 9 would be controlled by fixed weirs at the connections to pond 8A. The fixed weirs would not be adjustable using weir boards. Because of the high bottom elevations in pond 8A, it would be only partially wet during the summer.

The existing brine pump at pond 13 will remain to provide inflows to the seasonal ponds 12, 13, and 14. The pump will intake from pond 8x. Inflows to pond 8x will use the existing intake from North Creek. Because of the high bottom elevation in pond 8x, only the borrow ditches will be wet for normal tidal conditions. The ditches will be used to transport inflow from North Creek to the pump at pond 13.

Baumberg System 8A will require limited active management, primarily during the transitions to and from the summer operation conditions, as well as winter management of ponds 12, 13, and 14 if they are operated as batch ponds.

For the winter operation, the gates from pond 9 to pond 8A would be open. Water from the Bay would circulate from pond 9 to 8A. The outlet control gates from pond 8A would be set to control the water levels in ponds 8A and 9.

In the spring the system would be changed to the summer operation condition. This was assumed to occur in early May, but could vary depending on habitat conditions in the ponds. For example, the transition could be delayed or advanced based on use of the pond by migratory birds, or salinity levels in the ponds.

For the summer operation, the inlet and outlet structures at pond 8A should be open for muted tidal inflow and outflow. The water level in pond 9 would be controlled by fixed weirs between pond 9 and pond 8A.

Based on modeling of the system for historic tide and evaporation conditions in 1994, the gravity intake system would be sufficient to maintain the maximum salinity goals during periods of weak tides. Weak tide periods are the portion of the lunar cycle with higher low tides and lower high tides. Gravity inflows would only occur at high tide levels in the Bay. During periods of weak tides, with lower high tides, the inflow may be reduced. Weak tide periods may extend for a week to 10 days. A sensitivity analysis was prepared to evaluate the potential effects of extreme high evaporation combined with weak tides. The 1994 weak tide summer period was rerun using evaporation values 20 percent higher than normal. This corresponds to an evaporation condition with approximately a 25-year recurrence interval. This means that on average, it would be exceeded once in a 25-year period.

Ponds 12, 13, and 14 would be operated as seasonal or winter batch ponds. For seasonal pond operations, the pond would be drained initially and no further operation would be required. The pond would fill with 10 to 20 inches of rainwater during the winter that would evaporate during the summer.

As batch ponds, ponds 12, 13, and 14 would not have continuous flow operation similar to 9 and 8A. All inflows to 12, 13, and 14 must be pumped from pond 8x and North Creek. Water would be pumped from 8x in the fall to establish an operational water level in the ponds. Supplemental water may be added during the winter to maintain water levels in dry years. In wet years, surplus water may be released from pond 14 to pond 9 to limit the maximum water level in the ponds. Depending on weather conditions, the batch operation may require gate adjustment weekly or more frequently. If the salinity in ponds 12, 13 and 14 begins to increase in the spring the ponds may require additional inflows to control the salinity. In general, the batch ponds would be drained to pond 9 in the spring to minimize the pumping required for salinity control in the seasonal ponds during the summer high evaporation season.

Baumberg System 8A Adaptive Management Options

Baumberg Complex Pond 12—This pond is presently managed as a system pond with widely ranging seasonal salinities within the Baumberg 8A system. Alternative 2 proposes to operate this pond as a low salinity intake pond in the winter and as a seasonal pond in the summer. As an alternative, Pond 12 could be operated as a batch pond, and possibly as a high salinity batch pond (120-150 ppt salinity), depending upon the dilution flow in Pond 9.

Baumberg Complex Pond 13—This pond is presently managed as a system pond with widely ranging seasonal salinities within the Baumberg 8A system. Alternative 2 proposes to operate this pond as a low salinity batch pond in the winter and as a seasonal pond in the summer. As an alternative, Pond 13 could be operated as a batch pond, and possibly as a high salinity batch pond (120-150 ppt salinity), depending upon the dilution flow in Pond 9.

Baumberg Complex Pond 14—This pond is presently managed as a system pond with widely ranging seasonal salinities within the Baumberg 8A system. Alternative 2 proposes to operate this pond as a low salinity batch pond in the winter and as a seasonal pond in the summer. As an alternative, Pond 14 could be operated as a batch pond, and possibly as a high salinity batch pond (120-150 ppt salinity), depending upon the dilution flow in Pond 9.

Baumberg System 11—The Baumberg System 11 consists of ponds 10 (intake and outlet) and pond 11 (outlet). See Figure 4-25 in the ISP (Appendix A).

This pond group would contain two continuous circulation ponds: 10 & 11. The system has different operation plans for winter and summer seasons to meet summer evaporation conditions. The intake and outlet structures and internal connections were designed to provide circulation for water quality control during the summer evaporation season and allow seasonal flow through pond 11. All four intake gates would allow tidal inflow to pond 10. Two of the culverts would include control gates to allow outflow at the intake structure. All gravity intake flows would occur at high tide. The proposed intake structure would replace an existing intake structure from San Francisco Bay into pond 10. The replacement has been proposed due to the age and condition of the existing intake. The new location has been proposed to improve flow conditions at the intake. The existing intake is located in a large marsh area with tidal action only at high tide. The proposed location would be in an area of lower Mount Eden Creek with less marsh area.

A new 48” gate would be installed between ponds 10 & 11 at the southern end of pond 11. This additional internal connection would supplement existing inflows to pond 11 from pond 10 via two 43” wood gates located in the northern half of the ponds.

There are existing wooden gates from ponds 10 and 11 to a brine ditch on the west side of Mount Eden Creek that would be removed. The brine ditch has been used to transfer water for the commercial salt operation. The ditch connected ponds 10 and 11 with the existing brine pump at pond 13. The brine ditch and the existing gates to the brine ditch will be removed as part of Mount Eden Creek improvements for the Eden Landing Restoration project.

Two outlet structures, one on the eastern end of pond 10 and the other on the southeastern end of pond 11, would discharge to Mount Eden Creek. The outlet structures would both consist of a single 48” culvert. All outflows would occur at low tide. The outlet culverts would be constructed as part of the Mount Eden Creek improvements for the Eden Landing restoration project to replace the existing wooden gates and the existing brine ditch.

The initial stewardship conditions would include different operation plans for each pond during the winter and summer seasons. The operating water levels in the ponds would be lower during the summer to increase the gravity inflow into the system during the higher evaporation season. The water level would be approximately 3.1 ft NGVD during the summer, and 4.0 ft NGVD during the winter. Because of the high bottom elevations in pond 11, it would be only partially wet during the summer. Therefore, pond 11 would be closed off from pond 10 and pond 11 would be operated as a muted tidal or seasonal pond during the summer. Pond 10 would discharge directly to Mt. Eden Creek during the summer.

During the winter, the circulation pattern would be from pond 10 to pond 11, then to Mount Eden Creek. The control gates would be adjusted to maintain higher water levels and create open water habitat in both ponds. Pond 11 would discharge into Mt. Eden Creek during the winter.

Baumberg System 11 will require active management, primarily during the transitions to and from the summer operation conditions. Water surface elevations would be primarily controlled by adjusting the outlet control gates. Intake salinities would be the same as bay salinities and pond salinities would be similar to existing bay salinities.

For the winter operation, the gates from pond 10 to pond 11 would be open. Water from the Bay would circulate from pond 10 to 11. The control gates at the outlet structures from ponds 10 and 11 would be set to provide open water throughout the system.

In the spring the system would be changed to the summer operation condition. This was assumed to occur in early May, but could vary depending on habitat conditions in the ponds. For example, the transition could be delayed or advanced based on use of the pond by migratory birds, or salinity levels in the ponds.

For the summer operation, the pond 10 outlet gate would be adjusted to lower the pond water level by approximately 1.0 feet. This would provide a significant increase in the gravity inflow from the intake culverts in pond 10. The internal connections between ponds 10 and 11 would be closed so that pond 11 would be operated as a seasonal pond or muted tidal pond.

Based on modeling of the system for historic tide and evaporation conditions in 1994, the gravity intake system would be sufficient to maintain the maximum salinity goals during periods of weak tides. Gravity inflows would only occur at high tide levels in theBbay. During periods of weak tides, with lower high tides, the inflow may be reduced. Weak tide periods may extend for a week to 10 days. A sensitivity analysis was prepared to evaluate the potential effects of extreme high evaporation combined with weak tides. The 1994 weak tide summer period was rerun using evaporation values 20 percent higher than normal. This corresponds to an evaporation condition with approximately a 25-year recurrence interval. This means that on average, it would be exceeded once in a 25-year period. The estimated inflow from the gravity intake culverts would maintain the discharge salinity below approximately 40 ppt.

Because pond 11 would be operated as muted tidal or seasonal pond, the pond would slowly drain and dry up over summer and no further management would be required until winter. The pond would then become part of the continuous flow operation in winter. If pond 11 is to be operated as a muted tidal pond during the summer, the outlet culvert would be opened to allow inflow and outflow and the water level would be controlled by the outlet weir. Without the outlet weir the pond would only contain minimal water at extreme high tides.

West Bay Ponds— The West Bay pond group consists of five pond systems. The complex includes seven ponds: 1, 2, 3, 4, 5, S5 and SF2. See Figure 4-27 in the ISP (Appendix A).

As noted above, the West Bay Ponds will remain under current operations for years 1-3 of the ISP. During years 3-6, pond salinities will be reduced to meet discharge standards. Once the ponds can be discharged, they will transition to ISP circulation, under which they would contain five separate sub systems. Ponds 1, 2, 3, and SF2 would each be an independent single pond system with inlet/outlet structures. The inlet/outlet structures would allow tidal inflow at high tide and outflow at low tide. The intake/outlet structures were designed to provide circulation for water quality control during the summer evaporation. All gravity intake flows would occur at high tide, and all outflows would occur at low tide. The proposed intake/outlet structures were located minimize construction within the existing marsh areas along the Bay and slough levees.

The other West Bay pond group would include S5 (inlet), 5, and 4 (inlet/outlet). The major flow to the system would be from the pond 4 intake. There would be a supplemental intake structure to provide circulation from the Flood Slough Restoration Area west of pond S5. The supplemental intake would provide circulation through both ponds S5 and 5.

The West Bay ponds will require limited active management. Once the muted tidal and tidal circulation operation has been established the operation would only require active management to adjust the operating water surface elevations. With outlet weirs, this may be necessary for an unusual event or maintenance, or to improve the habitat conditions within the ponds. Without the outlet weirs, the water levels would be controlled by the outlet control gate settings. The gate settings may require adjustment on weekly or monthly periods.

The five separate sub systems in the West Bay complex include intake/outlet structures. Since the inflows and outflows would occur at the same location, there may be limited mixing within the individual ponds. Shallow areas within the ponds may not be well mixed by wind and wave action. For ponds 1, 2, 3, and 4, the Ravenswood pump station and existing connection structures between the ponds may be used to increase mixing by providing circulation to other locations within the individual ponds.

Alternative 2 would meet all of the stated project objectives, including Objectives A (cease salt production), B (circulate bay water through the ponds), C (maintain existing open water and wetland habitat), e D (maintain ponds in a restorable condition), E (meet all regulatory requirements), and F (cost objectives). Alternative 2 is evaluated in detail in this EIR/EIS.

2.4.4 Pond Management Alternative 3: Phased Initial Discharge (Preferred Alternative)

With the exception of a difference in the timing of initial discharge from project ponds and a change in the proposed management of ponds in Baumberg System 11, Alternative 3 is identical to Alternative 2.

Alternative 3 would meet all of the stated project objectives, including Objectives A (cease salt production), B (circulate bay water through the ponds), C (maintain existing open water and wetland habitat), e D (maintain ponds in a restorable condition), E (meet all regulatory requirements), and F (cost objectives). Alternative 3 is evaluated in detail in this EIR/EIS.

Initial Release Period. Under this alternative, the initial release from a limited number of ponds would occur in July/August 2004, with release from other pond systems to follow in subsequent years as salinity levels are sufficiently reduced to meet WQOs. Most of the proposed water control structures are not accessible for construction during the winter. Phased release would allow early July releases from some ponds that can be accessed earlier and that can achieve WQOs for discharge more rapidly, while structures are installed and salinities reduced at the remaining ponds as site constraints allow. Initial discharge of existing pond contents at these remaining ponds would begin the following March/April when salinities within the ponds and receiving waters are the lowest.

Based on construction and operational constraints, ponds that could be included in the first release phase (July release) include Alviso Systems A2W, A3W, A7 and Baumberg Systems 2, 8A and 11. Initial releases from Alviso Systems A14 and A16, and Baumberg System 2C, would likely take place in the subsequent year. Initial releases from the Island Ponds (A19, A20, A21) would not occur for 3 years, and from the West Bay Ponds for six years due to the time needed for Cargill to move the salts from these high salinity ponds back to its plant site in Newark.

The advantages of this alternative are that it allows for early initial releases from some priority ponds and it allows room for adjustments in proposed releases, depending upon observed impacts from first phase releases. However, there remain some concerns regarding this alternative, relative to the ability to meet regulatory requirements for the initial discharge of pond contents and effects of elevated salinity at discharge locations to salmonids and bay shrimp for March/April releases.

Individual Pond Management Strategies The phased release scenario includes modification of the operation for Baumberg System 11 from the operation proposed under Alternative 2 and described in Section 2.4.3, above. Pond 10 is presently managed as a muted tidal pond with an open culvert in the Baumberg 11 ystem and Pond 11 is presently managed as a low to medium salinity system pond within the Baumberg 11 system. Alternative 2 proposes to operate Pond 10 as a low salinity intake pond in the winter and as an intake and outlet pond in the summer. Alternative 2 proposes to operate Pond 11 as a low salinity outlet pond in the winter and as a seasonal pond in the summer.

Because the phased release would occur prior to completion of the Mount Eden Creek channel construction project, the proposed outlets to the new channel from Ponds 10 and 11 would not be available for the phased release scenario. An alternative initial operation scheme would use the existing Pond 10 intake as an intake/outlet. The initial release would be from the intake and would release the volume of Ponds 10 and 11. After the initial release, Pond 11 would be operated as a seasonal pond with no intake or discharge. Pond 11 would partially fill with rainwater during the winter and dry out during the summer.

Pond management would be identical to Alternative 2 for all other systems.

Preferred Alternative. NEPA does not specifically require that agencies identify a preferred alternative. However, under NEPA Regulations 1502.14, agencies shall "identify the agency's preferred alternative or alternatives, if one or more exists, in the draft statement and identify such alternative in the final statement unless another law prohibits the expression of such a preference." Under CEQA, a typical EIR identifies a "proposed Project" studied in considerable detail, and then identifies a "reasonable range of alternatives" considered in much less detail. Like NEPA, CEQA does not specifically require that agencies identify a preferred alternative. However, CEQA's statutory and regulatory scheme presupposes a single proposed Project as the starting point against which environmental effects are studied and alternatives are measured.

As discussed in Section 2.4.3 above, due to the pioneering nature of the ISP and lack of existing data from related projects, the results of implementing the project are difficult to predict. Therefore, the responsible agencies (USFWS and CDFG) prefer to have flexibility in the implementation of management strategies for specific ponds and pond systems. Alternative 3 incorporates the phased initial release scenario, which offers the maximum flexibility in the timing of initial release, as well as the individual pond management strategies included in Alternatives 2 (including the proposal to breach the Island Ponds and various adaptive management alternatives for individual ponds). Selection of this alternative would allow the agencies a high degree of flexibility to adjust management strategies in response to water quality, habitat, and wildlife impacts that are observed as various components of the project are implemented. The complexity of this project and its pioneering nature call out for such an iterative process. Therefore, the agencies (CDFG and USFWS) have identified this alternative as the Preferred Alternative.

2.5 COMPARISON OF ALTERNATIVES

NEPA Regulations (Section 1502.14) require that an EIS present the environmental impacts of the proposal and the alternatives in comparative form, thus sharply defining the issues and providing a clear basis for choice among options by the decision-maker(s) and the public. While CEQA requires a greater level of analysis for the Proposed Project, NEPA requires that all project alternatives be given an equivalent level of analysis. Since this project must comply with both CEQA and NEPA standards, all alternatives were considered equally.

Table S-3 in the preceding summary presents the anticipated impacts for each of the alternatives described in Section 2.4 that were analyzed in detail in this EIR/EIS. The standard for information contained in Table S-3 is information without which the public and responsible agencies cannot make a fully informed decision regarding the project. Table 2-2a, b, and c below, shows projected cost over the next ten years for each of the alternatives. Table 2-3 shows a summary of habitat for each of the alternatives.

Table 2-2a Projected costs over 10 years for the Baumberg Complex.

Type of Cost	No Project	Alternative 1	Alternative 2	Alternative 3
Management	$1,000,000	$4,000,000	$4,000,000	$4,000,000
Maintain levees	$0	$790,000	$790,000	$790,000
Install Structures	$0	$0	$3,750,000	$3,500,000
Totals	**$1,000,000**	**$4,790,000**	**$8,540,000**	**$8,290,000**

Table 2-2b Projected costs over 10 years for the Alviso Complex .

Type of Cost	No Project	Alternative 1	Alternative 2	Alternative 3
Management	$1,000,000	$2,500,000	$10,000,000	$10,000,000
Maintain levees	$0	$1,900,000	$1, 900,000	$1,900,000
Install Structures	$0	$0	$5,700,000	$5,700,000
Totals	**$1,000,000**	**$4,400,000**	**$17,600,000**	**$17,600,000**

Table 2-2c Projected costs over 10 years for the West Bay Complex.

Type of Cost	No Project	Alternative 1	Alternative 2	Alternative 3
Management	$75,000	$250,000	$500,000	$500,000
Maintain levees	$0	$480,000	$480,000	$480,000
Install Structures	$0	$0	$2,600,000	$2,600,000
Totals	**$75,000**	**$730,000**	**$3,580,000**	**$3,580,000**

Table 2-3 Summary of Habitat Changes under the ISP Alternatives

	Low salinity ponds (0-60ppt)	**Medium salinity ponds (60-180ppt)**	**High salinity ponds (above 180 ppt)**	**Seasonal ponds**	**Tidal**
Existing	6,300	5,110	1,460	29	
No Project/ No Action				12,900*	
Alternative 1 (Seasonal Pond Management)				12,900	
Alternative 2 (Simultaneous March/April Initial Release)	8,700	827		2,827	475
Alternative 3 (Phased Release)	8,700	827		2,827	475

*Under No Project/No Action, ponds would be seasonal as long as levees remain intact.

Total acreage of land acquired is approximately 12,900 acres salt production ponds, 1,300 acres of associated levees and uplands, 700 acres of marsh and tidal wetlands, 200 acres of seasonal ponds

3.0 HYDROLOGIC AND HYDRAULIC CONDITIONS

This chapter describes the existing hydrological resources within the project area, including the regional hydrology, project hydrology, and flood control benefits of the existing salt production pond levees. It describes hydraulic modeling conducted for the proposed pond management alternatives and identifies hydraulic impacts, including flooding impacts, which could result from implementing the various alternatives.

3.1 AFFECTED ENVIRONMENT

The San Francisco Bay estuary is the largest estuary on the west coast of North and South America and is typically divided into three distinct areas: San Pablo Bay, the Central San Francisco Bay, and the South San Francisco Bay. The Cargill South Bay Salt Ponds encompass 15,100 acres located in South San Francisco Bay. This area of the Bay is shallow and hydrodynamic processes are highly variable and are greatly influenced by tides, wind and wave activity, and freshwater inflows.

South San Francisco Bay (SSFB) is defined as the portion of San Francisco Bay south of the Oakland Bay Bridge. The length of SSFB from the Oakland Bay Bridge to the southern end at Coyote Creek is approximately 50 kilometers. The width of SSFB varies from less than 2 kilometers (km) near the Dumbarton Bridge to approximately 20 km north of the San Mateo Bridge. SSFB consists of broad shoals and a deep relict river channel (Walters, 1982). The mean depth of SSFB is less than 4 meters (m), while the channel is typically 10-15 m deep. Intertidal areas typically contain a system of small branching channels that effectively drain these areas at low water.

3.1.1 SSFB Tides and Tidal Currents

Tidal flows contribute to erosion and sedimentation which affect the formation and shape of channels and inlets in SSFB. The hydrodynamics of SSFB are fairly well understood due to extensive data collection by the USGS and others (e.g., Cheng & Gartner, 1984) as well as modeling of the areas (e.g., Cheng et. al., 1993 and Gross et. al., 1999a). Currents in SSFB are predominantly tidally driven (e.g., Walters et. al., 1985). Tidal amplitude increases with distance from Central Bay SSFB. The mean tidal range at the Golden Gate Bridge is 1.25 meters, the tidal range at Alameda is 1.45 meters and the tidal range at the Dumbarton Bridge is 2.00 meters (NOAA, 2003). The tides in SSFB are “mixed semidiurnal” meaning that high tides occur twice daily and one of the high tides is significantly higher than the other. Tidal currents are stronger in the channel than in the shoals (Walters et. al., 1985) and slack water generally occurs in the shoal regions before the channel. Additional tidal data for SSFB are presented in Section 2.5 (*Hydraulic Setting*) of the ISP.

3.1.2 Freshwater Inflows to SSFB

Most freshwater inflow enters SSFB during the winter and spring. During summer, there is little freshwater inflow to SSFB and most of this freshwater inflow is effluent from municipal wastewater treatment plants. The largest tributaries to SSFB are:

- Alameda Creek, which flows into the Alameda Flood Control Channel (AFCC)
- Guadalupe River, which flows into Alviso Slough
- Coyote Creek, which becomes a tidal slough and connects to SSFB

Streamflow varies greatly from season to season and year to year. As an example of variability within a given year at a single station, the average gauged flow at USGS station #11179000 (Alameda Creek near Niles) during February is 12.5 cubic meters per second (cms), while the average gauged flow during October is 0.4 cms. As an example of variability at a single station between years, during February of 1994 the average gauged flow at this location was 3.7 cms, while during February of 1998 the average was 105.2 cms (USGS, 2003).

3.1.3 SSFB Tidal Sloughs

SSFB has several tidal sloughs that provide important habitat for various species. Sloughs also impact the tidal and freshwater flows into and out of the Bay. Descriptions of the tidal sloughs within or near each of the three pond complexes (Alviso, Baumberg, and West Bay) are provided below.

Alviso Complex Tidal Sloughs. The Alviso Complex is located in the Lower South Bay, defined as the portion of SSFB south of the Dumbarton Bridge (Figure 1-2). The Lower South Bay is a relatively shallow subembayment with an average depth of 2.6 m at mean tide. Tides in this region are particularly strong due to amplification of tidal energy with distance south in SSFB. Because of the strong tides and small depths, “the area covered by water in the Lower South Bay at mean lower low water (MLLW) is less than half the surface area at mean higher high water (MHHW), indicating that over half of Lower South Bay consists of shallow mudflats that are exposed at low tides” (Schemel, 1998). Furthermore, the volume of water in the Lower South Bay at MLLW is less than half of the volume of water at MHHW, indicating that more than half of the water volume present in Lower South Bay at high water can pass through the Dumbarton Bridge during a single ebb tide (Schemel, 1998). The following tidal sloughs border the Alviso salt ponds:

- Coyote Creek
- Mud Slough
- Artesian Slough
- Alviso Slough
- Guadalupe Slough
- Stevens Creek
- Mountain View Slough
- Charleston Slough

The largest of these is Coyote Creek, which meets SSFB at Calaveras Point. Coyote Creek is a substantial source of fresh water during winter and spring. Salt marsh regions are present in several parts of Coyote Creek, particularly bordering salt ponds. The bottom elevation of the main channel of Coyote Creek ranges from -1 to -4 m National Geodetic Vertical Datum 1929 (NGVD). The tidal range in Coyote Creek, reported as 2.2 m at NOAA Station 9414575 (NOAA, 2003), is particularly large.

At the western end of Alviso Pond A21, Mud Slough splits off from Coyote Creek and, bordering Alviso Ponds A21, A20 and A19 (the Island Ponds), continues landward to connect with the Warm Springs marsh restoration area. Mud Slough is a shallow tidal slough, which receives minimal freshwater input during all seasons.

Artesian Slough borders Alviso Ponds A16 and A17 and is a tributary to Coyote Creek. The discharge from the City of San Jose municipal wastewater treatment plant enters the upstream end of Artesian Slough with a flow trigger of 120 million gallons per day (mgd) included in its NPDES permit through flows in recent years have been less.

Alviso Slough borders ponds Alviso A7, A8, A9, A10, A11 and A12. The Guadalupe River, the second largest tributary to SSFB (after Alameda Creek) in terms of drainage area and flow, discharges to Alviso Slough. The bottom elevation of Alviso Slough ranges from -1 to -3 m NGVD. The tidal range in Alviso Slough is particularly large, with measured high water approximately a factor of 1.6 higher (relative to mean tide) than high water at the Golden Gate Bridge (NOAA, 2003). Given the combination of strong tides and shallow depths, most of the volume present in Alviso Slough at high water drains to Coyote Creek (and subsequently SSFB) during ebb tide. Therefore this slough, as well as Coyote Creek and Guadalupe Slough, actively exchanges water with SSFB due to tidal motions.

Guadalupe Slough borders Alviso Ponds A3W, A4 and A5. Guadalupe Slough receives flow from Calabazas Creek and San Tomas Creek. The Sunnyvale municipal wastewater treatment plant also discharges Moffett Channel which connects to Guadalupe Slough (approximately 14-15 mgd) and is the primary source of freshwater to Guadalupe Slough during summer and fall. The bottom elevation of Guadalupe Slough ranges from -1 to -4 m NGVD. The tidal range in Guadalupe Slough is similar to the tidal range in Alviso Slough (NOAA, 2003).

Stevens Creek, Mountain View Slough and Charleston Slough are relatively shallow and narrow tidal sloughs that contribute little freshwater flow to SSFB and drain relatively small areas.

Baumberg Complex Tidal Sloughs. The Baumberg Complex borders the eastern shore of SSFB and extends from AFCC on the south to San Mateo Bridge on the north (Figure 1-4). The region near the eastern shore of SSFB is a large mudflat. Relevant tidal sloughs flanking the Baumberg salt ponds are:

- Alameda Flood Control Channel (AFCC; also known as Coyote Hills Slough)
- Old Alameda Creek
- Mount Eden Creek
- North Creek

The largest and most ecologically important slough in this region is the AFCC. Alameda Creek flows into the AFCC. Alameda Creek, which drains an area of 633 square miles upstream of Niles (USGS, 2003), is the largest tributary to SSFB. The U.S. Army Corps of Engineers (Corps) designed and constructed the AFCC. The deepest part of the channel has bottom elevation of approximately -1.5 m NGVD near the mouth of the AFCC and slopes gently up with distance upstream. The portion of the AFCC that adjoins the salt ponds is tidal, with high tide elevation slightly lower than the high tide elevation at San Mateo Bridge, and low tide elevation considerably higher than low tide elevation at San Mateo Bridge (NOAA, 1933). Therefore, the tidal range in the AFCC is quite substantial, but less than the tidal range in nearby areas. Depths in the channel of the AFCC typically range from 2 to 3 m at high water and less than 1 m at low water in the deepest part of the AFCC. In addition, the AFCC contains a large intertidal area, which is only covered with water near high water and is drained during ebb tides. Therefore, a large portion of the water volume present in the AFCC at high water drains into SSFB during ebb tides.

North of the AFCC is Old Alameda Creek. Before Alameda Creek was diverted into the AFCC, it drained into what is now known as Old Alameda Creek. Currently, Old Alameda Creek receives minimal freshwater input. It comprises two distinct channels: a narrow northern channel and a wider southern channel, divided by a vegetated bar that is only submerged at higher high water during strong (spring) tides. Limited water elevation data for Old Alameda Creek indicate that high water elevations, measured about 2 km from the mouth of Old Alameda Creek, are as high as 1.8 m NGVD, and low water elevations are typically near the bed elevation of -0.5 m NGVD (ISP September 2003).

Additional tidal channels and marsh areas are currently under construction in the Baumberg Complex. These sloughs are part of an ongoing tidal restoration project. When this restoration project is complete, Mount Eden Creek and North Creek will connect the Eden Landing Ecological Preserve to San Francisco Bay. North Creek will connect directly to Old Alameda Creek, approximately 2 km from SSFB, and Mount Eden Creek will enter the Bay, approximately 2 km north of the mouth of Old Alameda Creek.

West Bay Complex Tidal Sloughs. The West Bay Complex is located on the western side of the Dumbarton Bridge. The Dumbarton Strait, with a width of approximately 2 km, is the narrowest part of SSFB. The mean tidal range in the Bay at this location is 2.0 m (NOAA, 2003). Observed velocities in this region, for example currents measured at USGS/NOAA station C14, are relatively large due to the strong tides and narrow cross-section of the Dumbarton Strait.

The largest tidal slough located near the West Bay System is Ravenswood Slough. Local freshwater input to this slough is relatively low.

3.1.4 Flood Protection

Previous studies (USACE 1988) identified approximately 80 miles of of salt pond levees that are boundaries to other private and public properties. Many of these levees were not designed to provide flood protection and do not meet Corps of Engineers design standards. The salt pond levees have been raised periodically to compensate for past land subsidence and have been maintained by Cargill (and previously the Leslie Salt Company) for erosion. The majority of the levees in the project area were not designed or maintained as flood control measures. Furthermore, the levees were not designed to Corps standards for flood control. Therefore the levees do not provide for flood control as they are currently designed and maintained.

According to the USACE 1988 shoreline study, there have been few failures of the salt pond levees. However, the crest of some levees may not be high enough to prevent overtopping during extreme high tide and wind wave events. The USACE report identified the following as salt pond levees that were selected for additional tidal flooding analysis.

- Reach 17- Alviso
- Reach 19 – Sunnyvale
- Reach 21/22 – Mountain View/South Palo Alto
- Reach 23 – North Palo Alto

This list may not include all salt pond levees that may provide incidental flood control benefits. The Coastal Conservancy has recently retained a flood control specialist to review and update the list of critical flood control levees as part of final design efforts.

The work on this review is under way at this writing and there are no results that are suitable for reporting here. Congress has authorized and appropriated funds to the Corps in fiscal year 2004 to initiate a study to review the results of the 1988 study and evaluate the federal interest in tidal and fluvial flood damage reduction, environmental restoration and protection, and related purposes.

3.1.5 Ponds A4 and A18

Alviso Pond A4 has been purchased by the SCVWD to restore wetlands and riparian habitat to mitigate for losses resulting from construction of the lower Guadalupe River Flood Protection Project and from ongoing maintenance of stream channels under the District's multi-year Stream Maintenance Program. Pond A18 has been purchased by the City of San Jose. During Cargill's operations of the salt ponds, water flowed into Pond A4 from Pond A3W through an intermediate saline channel, and Pond A4 discharged through a siphon under Guadalupe Slough into Pond A5. The intermediate saline channel between A3W and A4 is still owned by Cargill. Water flowed into Pond A18 through a siphon under Artesian Slough from Pond A17, and discharged through a siphon under Coyote Creek to Island Pond A19. Prior to implementation of the ISP, Cargill will take Ponds A4 and A18 out of the existing circulation pattern, as part of its various acquisition agreements. These disconnections are not part of the ISP. However, the USFWS will work with both the SCVWD and the City of San Jose to determine the feasibility and need for maintaining some flow connections between A4 and A5 and/or between A17 and A18 during the ISP.

3.2 CRITERIA FOR DETERMINING SIGNIFICANCE OF EFFECTS

Criteria for determining significance of hydrological effects are based upon professional judgment, review of previous studies, and CEQA Guidelines. Criteria pertaining to water quality issues are presented in Chapter 4 (Water Quality). A project would have a significant hydrologic impact if it would:

- Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level.
- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or by altering or otherwise affecting flow to adjacent ponds that are not part of the ISP, in a manner which would result in substantial erosion or siltation on- or off-site.
- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or by alterning or otherwise affecting flow to adjacent ponds that are not part of the ISP, in a manner which would result in flooding on- or off-site.
- Place within a 100-year flood hazard area structures that would impede or redirect flood flows.
- Expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of the failure of a levee or dam, inundation by seiche, tsunami, or mudflow.

- Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff.
- Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map.

For NEPA purposes, Executive Order 11988, Floodplain Management, applies to the project. It requires that federal agencies take actions that will preserve the natural and beneficial values served by floodplains.

3.3 ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Schaaf and Wheeler (S&W) used several hydraulic models to evaluate the hydrologic impacts of various pond management alternatives. These models and their results are discussed below under Alternative 2: Simultaneous March/April Initial Release. The No Project/No Action Alternative and Alternative 1: Seasonal Ponds were not specifically modeled, but the results of modeling for the pond management alternatives serves as the benchmark against which impacts from the other alternatives can be compared.

3.3.1 No Project/No Action Alternative

Under the No Action alternative waters would be allowed to evaporate in the ponds. The ponds would then fill seasonally with rainwater each winter and dry through the evaporation process each summer. No action would be conducted by the agencies, including levee maintenance, and some levees would likely fail during this period. Existing public access would be lost in areas of levee failure

> *HYDROLOGY IMPACT-1*: Increased flooding of adjacent properties may result from erosion of salt pond levees that offer some flood control benefit.

The majority of the salt pond levees in the project area were never designed to provide flood protection for adjacent properties. However, these levees have been providing some flood control protection as an incidental benefit. Under the No Project/No Action Alternative, the existing levees would be allowed to degrade over time, which may lead to an increased risk of flooding of adjacent properties from those levees that do provide this incidental flood control benefit.

Significance: Potentially significant. Since this alternative will result in the project not being implemented, no mitigation measures are proposed.

> *HYDROLOGY IMPACT-2*: Increased tidal prism and associated velocities within the ponds due to uncontrolled levee breaches may re-suspend sediments, resulting in erosion of pond sediments and subsequent deposition in receiving waters.

As the existing salt pond levees degrade over time, the individual levees may fail in an uncontrolled manner, allowing tidal circulation into the ponds. Tidal circulation would result in an increase in velocities and shear forces within the ponds. The increased velocity may result in erosion of sediments and input of additional suspended sediments to receiving waters. In ponds with known or potential contaminated sediments at depth, this increased velocity may result in erosion of contaminated sediments and transport and deposition into receiving water bodies. Impacts pertaining to suspended sediments and contaminated sediments and their transport are also addressed in Chapters 4 (Water Quality) and 5 (Sediments).

Significance: Potentially significant. Since this alternative will result in the project not being implemented, no mitigation measures are proposed.

3.3.2 Alternative 1: Seasonal Ponds

In Alternative 1 waters would be allowed to evaporate in the ponds. The ponds would then fill seasonally with rainwater each winter and dry through the evaporation process each summer. The only action taken by the agencies would be to maintain the levees at their current standard of maintenance (i.e., salt pond maintenance, not for flood control).

The flood protection benefit provided by pond levees to adjacent properties would be maintained and the potential flooding impacts considered under the No Project/No Action Alternative would be reduced to less than significant levels. Maintenance of the levees would also reduce potential impacts from increased erosion of pond sediments and transport into receiving waters to less than significant levels.

3.3.3 Alternative 2: Simultaneous March-April Initial Release

In Alternative 2, the contents of most of the Alviso and Baumberg Ponds would be released simultaneously in March and April. The ponds would then be managed as a mix of continuous circulation ponds, seasonal ponds and batch ponds, though management of some ponds could be altered through adaptive management during the continuous circulation period. Higher salinity ponds in Alviso and in the West Bay would be discharged in March and April in later years when salinities in the ponds have been reduced to appropriate levels. The Island Ponds (A19-A21) would be breached and open to tidal waters.

Schaaf and Wheeler (S&W) conducted extensive hydraulic and salinity modeling of various project alternatives considered in the ISP (LSI 2003 (ISP). S&W did not study or model sediment transport. Impacts considered in this section are limited to hydrology and sedimentation. Chapter 4 (Water Quality) addresses salinity impacts. The ISP (Appendix A) and other technical reports (Appendix D) describe modeling methods and results in detail. This section summarizes information contained in these documents and provides specific references to the relevant documents.

Description of Hydrologic Models Used. The key feature of the water management plan for the project is the circulation of Bay water through the ponds and release of this water to the receiving sloughs and channels in the South Bay. During the first period of circulation through the ponds, referred to as the initial release period, the water currently in the ponds will be discharged to the Bay and replaced with Bay water brought into the ponds at the intakes. This circulation is different than the existing salt making operations because the pond systems will circulate water back to the Bay and because the flow rate through the ponds will be increased relative to existing flows.

Computer models were applied to estimate the water surface elevations and velocities within the ponds and receiving water bodies during the Initial Stewardship period. S&W used two types of models:

1. Pond Model. The Pond Model was used to estimate inflows to the ponds from the Bay, flows between ponds, volume of water evaporated from the ponds, volume of water added to the ponds by precipitation and flow rates from the ponds to the Bay and sloughs. Section 3.3.1 of the ISP (Appendix A) contains a description of the Pond Model. Results of the Pond Model are presented in the ISP (LSI, 2003) and are summarized below.
2. South San Francisco Bay Model. A three-dimensional hydrodynamic model was used to estimate physical conditions (flows, tides, currents etc.) in the Bay and sloughs. Section 3.3.2 of the ISP (Appendix A) contains a description of the South San Francisco Bay Model. Model results are presented in Appendix D.

S&W modeled both the simultaneous March/April initial release and the phased release alternatives. Results of the Pond Model were used as an input to the hydrodynamic models to evaluate potential project impacts on receiving waters.

In addition, S&W conducted finer resolution modeling of the impacts of breaching the Island Ponds (Alviso Ponds A19, A20, and A21) and restoring them to tidal flow.

The Pond Model and South San Francisco Bay Model require tide and weather input data. As discussed in Section 3.3.3 of the ISP (Appendix A), pond and receiving water conditions were modeled for a simulation period of 19 months (April 1994 to October 1995), which includes two summer periods and one winter period. The particular period was selected to include a relatively recent period where Bay tidal and salinity profile information was available, and to include a range of meteorological conditions. 1994 represents a relatively dry year, with above average salinity in the South Bay, while 1995 represents a relatively wet year with low average salinity in the Bay and sloughs and a higher likelihood of flood conditions that could affect the stability or erosion of the ponds.

Results of Hydrologic Modeling. This section summarizes the modeled hydrologic changes within the pond complexes. Chapter 4 of the ISP (see Appendix A) presents detailed descriptions of the water levels anticipated within each of the ponds and other modeling results for Pond Management scenarios (Alternatives 2 and 3).

The modeled initial release scenarios in the ISP are as follows:

- Alternative 2: Simultaneous March/April Initial Release - All systems except the island ponds (A19, A20, and A21), the A23 system, and the West Bay pond group to begin discharge in April. Initial pond salinities based on maximum salinities shown in Table 4-3.
- Alternative 3: Phased Initial Release - Selected ponds would begin initial release at the same time. These would include Alviso Systems A2W, A3W, A7 and Baumberg Systems 2, 8A and 11. The ponds were selected to represent a significant number of systems that could be included in a first phase of the project based on construction and operational constraints. The staggered release was assumed to begin in July, to allow some construction in the spring after the winter rainy season. Most of the proposed system structures would not be accessible for construction during the winter. The initial pond salinities were based on the maximum salinities from ISP Table 4.1.5. The remaining pond systems, Alviso Systems A14 and A16, and Baumberg System 2C, would start circulation in the

subsequent year. The initial release for these later systems is proposed for April and would be similar to the Simultaneous Release scenario above.

- April 2002 Values – An additional modeling scenario, not directly related to an Alternative, used actual pond salinity values from April 2002 (rather than maximum values) to examine more likely results of a March/April simultaneous discharge.

Alviso Complex Ponds

Results for each pond system are complex and presented in detail in Chapter 4 of the ISP (Appendix A). Although the ISP operation would allow tidal circulation through the pond system, the flow into and out of the ponds on a daily basis would be relatively small compared to the volume in the ponds. A goal of all the pond modeling alternatives is to maintain long-term discharge salinities below 40 ppt and to maintain water levels as close to existing conditions as possible. Typical daily water surface elevations would fluctuate by less than 0.1 ft in most pond systems. The ponds are managed to reduce salinity within the ponds to an acceptable level within an initial discharge period.

Island Ponds

The Island Ponds (Alviso Ponds A19, A20, and A21) would be breached in a controlled manner to allow them to return to full tidal action. If the ponds are restored to full tidal action, available hydrologic modeling indicates that they would be inundated on the higher high tides but would be above water at other times during the tidal cycle (S&W, 2003).

S&W ran hydrodynamic simulations of existing conditions and breach conditions for the Island Ponds. The models and model results are described in the Alviso Island Pond Breach Initial Stewardship Plan Study in Appendix K (referred to hereafter as the Island Pond Study (S&W, 2003). In the analysis, Ponds A19 and A21 contain two breaches and A20 contains a single breach. S&W analyzed flow through nine cross-sections and through each of the five breaches (see Figure 1-2 of Appendix A). The dimensions of the initial pond breaches is equal to the smallest grid spacing of the model at 25 meters and is larger than what will likely be constructed in the field. It is expected that the actual initial breaches constructed for the project would be fairly small and that they would be allowed to open up over time due to erosion. These assumptions are considered to be conservative, since they may overestimate the rate at which water is initially released from the ponds to Coyote Creek.

Two different initial breach scenarios were evaluated for the ISP. The first scenario assumes that the elevation in each breach is near the elevation of the pond bottom, and is referred to as the Breach at Pond Bottom Elevation scenario. The breach width in this scenario is 25 m. This scenario provides a conservative estimate of the initial release of the pond water because, though it is expected that the initial breach elevation may be near the pond bottom elevation, it is likely that the initial breach width will be less than 25 m. This scenario is discussed further in Section 5.1 of the Island Pond Study (S&W, 2003)

The second scenario assumes that each breach elevation is at 0 ft NGVD, and is therefore referred to as the Breach at 0 ft NGVD scenario. The breach width in this scenario is also 25 m. This scenario provides an even more conservative estimate of the initial release of the pond water and represents the maximum rate of exchange in Coyote Creek that is plausible for the initial breach of Ponds A19, A20, and A21. This scenario is discussed further in Section 5.2 of the Island Pond Study (S&W, 2003)

The model report uses conservative assumptions that result in the maximum possible tidal prism in the ponds. However, as a result of other various model assumptions and limitations, the S&W analysis should not be considered a worst-case or overly conservative estimate. The velocities and velocity differences could be greater than predicted by the simulations, although this is not considered likely.

A comparison of simulation results for existing conditions and the two breach scenarios is summarized below and presented in detail in the Island Pond Study (S&W, 2003). These results give an indication of the potential effect that breaching the Island Ponds would have on the tidal range, tidal prism, local velocities, and local bed shear stresses in the Alviso region.

Tidal Elevation Impacts of Island Pond Breaching—The breaches would affect the tides in Coyote Creek, with effects varying by location. Adjacent to the Island Ponds, the predicted tidal range decreases and both low water and high water elevations are affected. At the Island Ponds, the tidal range is reduced by approximately 6 inches. The existing tidal range is approximately 7 feet. Downstream of the Island Ponds, the predicted tidal range changes only slightly by increasing the elevation at low water. Upstream of the Island Ponds, the predicted tidal range decreases slightly, due to decreased high water elevations.

Tidal Prism Impacts of Island Pond Breaching—Breaching the Island Pond levees would increase the tidal prism in the Alviso region; in particular, it would influence the tidal prism of Coyote Creek. An increase in flow into and out of Coyote Creek during the tidal cycle would lead to increased velocities in Coyote Creek. Because Coyote Creek is known to be a depositional environment, increased velocities could either cause the Coyote Creek sedimentation regime to become less strongly depositional or lead to scour. Velocity simulation results are discussed further below ("Velocity Impacts of Island Pond Breaching").

Based on the S&W simulation results, it is expected that breaching the Island Pond levees will increase the tidal prism in regions of Coyote Creek located adjacent to the levee breaches and downstream of the levee breaches. For the regions adjacent to the levee breaches, the predicted increases in tidal prism are substantial, while in the regions downstream of the levee breaches, the predicted increases in tidal prism are smaller. Upstream of the levee breaches, in portions of Coyote Creek and Artesian Slough, the predicted tidal prism decreases. The analysis of cross-sectional velocities predicted maximum velocities at the Island Pond breaches ranging from 1.79 to 4.54 feet per second (ft/s). The maximum velocity magnitude for a stable inlet channel should be about 1.0 ± 0.15 m/s (3.28 ± 0.5 ft/s, Goodwin 1996). The maximum predicted velocities at the downstream breach for Pond A21 and the downstream breach for A19 exceed this range, which suggests that these breaches may scour to be wider than 25 m (the initial breach width for both breach scenarios modeled).

Velocity Impacts of Island Pond Breaching—The S&W analysis included simulation of cross-sectional velocities and depth-averaged velocities throughout the Alviso region under existing conditions and breach conditions. The analysis of depth-averaged velocity throughout the Alviso Region gives a prediction of the daily Root Mean Square (RMS) velocity and maximum velocity at each horizontal location in the model grid for a representative day (June 7, 1994) from the month-long (June 7 to July 7, 1994) simulation. The RMS velocity gives a weighted average of the velocity that occurs at each modeled grid cell.

Results of the depth-averaged velocity analysis show that the levee breaches will result in increased tidal velocities in regions of Coyote Creek located adjacent to the levee breaches and smaller increases downstream of the levee breaches. The tidal velocities are expected to decrease upstream of the levee breaches and in Artesian Slough, Mud Slough and the Warm Springs Marsh area. For the majority of the area, the breach scenario results in a less than 0.1 ft/s change in predicted maximum velocities compared to existing conditions. Maximum predicted velocity magnitude increases of 0.1 to 0.2 ft/s are seen in the channel of Coyote Creek from the open boundary to the mouth of Mud Slough. The greatest increases in predicted RMS velocities under breach conditions occur between the mouth of Mud Slough and the Pond A19 breach.

Between the mouth of Mud Slough and the Alviso A19 breach (downstream of the breach), maximum predicted depth-averaged velocities also increase by approximately 0.5 fps, with the highest increases seen immediately adjacent to the levee breaches. Upstream of the Pond A19 breach, the predicted maximum velocities in Upper Coyote Creek and Artesian Slough are reduced under the Long-Term Breach scenario.

Concerns have been raised that increased velocities in Coyote Creek could cause scour at the Union Pacific railroad bridge which crosses Coyote Creek between ponds A21 and A20. S&W conducted an analysis of the potential for scour of this railroad bridge if the Island Ponds are breached. The analysis assumed that, at present, the channel cross-sectional geometry (bathymetry) at the railroad bridge is at or near equilibrium with the cross-sectional velocities. That is, it was assumed that under present conditions neither scour nor deposition occurs. This implies that, with an increase in velocity following breaching of the Island Pond levees, the cross-sectional area would increase at the railroad bridge until the cross-sectional average velocity at this location is equal to the cross-sectional average velocity under existing conditions (i.e., the geometry of the channel would return to equilibrium with cross-section velocities). Under this assumption, larger than existing tidal velocities would lead to scour. Conversely, smaller tidal velocities should lead to deposition.

The assumption that the channel geometry at the railroad bridge is presently at or near equilibrium with cross-section velocities is considered conservative and is likely to overestimate the extent of scour that would result from the levee breaches for several reasons. First, as noted above, field data suggests that Coyote Creek is not presently in equilibrium and that it is actually a depositional environment. Therefore, it is likely that tidal velocities could actually increase to some extent without leading to scour. In addition, at present, the channel of Coyote Creek may already be scoured to some extent during and following large storms when freshwater flows in Coyote Creek are large. Scour, which presently occurs due to freshwater flows, would probably not be significantly changed by the presence of the levee breaches.

Based on the modeling results, it is estimated that during both flood and ebb tides, following the breaching of the Island Pond levees, the cross-sectional area at the railroad bridge would increase by approximately 20 to 30 percent before the channel would return to a state of equilibrium with channel velocities equivalent to existing conditions.

Either a widening or a deepening of the channel could accomplish the predicted increase in cross-sectional area. During flood tide, a depth adjustment of approximately 1.5 to 3 feet would be required in the channel region. It is unknown what the impact to the existing railroad bridge will be due to the potential 3 foot deepening of the channel in this area. Therefore, a mitigation measure to inspect the bridge piers has been included as described below.

Baumberg Complex Ponds

Hydrologic modeling indicates that, in general, the ISP will result in slightly lower elevations and possibly more frequent drawdown. Under ISP modeled conditions, Baumberg System 2C (Ponds 6, 5, 6C, 4C, 3C, 5C, 1C, and 2C) would have average water depths about 0.1 to 1 foot higher than existing conditions, although some of those Ponds (1C and 5C) would still be seasonal. The remaining Baumberg ponds would have average water depths about 0.5 to 2 feet lower than existing conditions. Average water depths in the Baumberg Ponds would range from zero to about 2.5 feet in summer, and about 1.0 to 2.5 feet in winter. Water levels under the ISP are therefore likely to be at or below the sediment elevation for some portion of the year. Hydrologic modeling indicates that water levels would vary by about 0.5 feet, due to weather and tides.

West Bay Complex Ponds

Hydraulic modeling of the West Bay Ponds was included in the final ISP (Appendix A). The West Bay pond group consists of five pond systems. The complex includes seven ponds: 1, 2, 3, 4, 5, S5 and SF2. The ponds will be managed to maintain long term discharge salinity levels to below 40 ppt and to establish tidal circulation through the ponds.

> *HYDROLOGY IMPACT-1:* Increased flooding of adjacent properties may result from erosion of salt pond levees that offer some flood control benefit.

The project design allows for increased tidal flows through hydraulic structures to accelerate reduction of pond salinity. Although unlikely, this increased tidal flow could lead to the acceleration of levee erosion and a reduction in flood control benefits. As noted above under the No Project/No Action Alternative, salt pond levees were never specifically designed to provide flood protection for adjacent properties. However, these levees have been providing some flood control protection as an incidental benefit.

Except for the Island Ponds (A19, A20, and A21), the existing levees would be maintained to meet existing flood control benefits under this alternative. Therefore, for the pond levees, the existing level of flood control benefit would be maintained and impacts would be less than significant.

Significance: Less than Significant.

> *HYDROLOGY IMPACT-2:* Increased tidal prism and associated velocities within the ponds could re-suspend sediments, resulting in erosion of pond sediments and subsequent deposition in receiving waters.

Under Alternative 2, tidal inflows would circulate through the pond systems and return to the Bay. The increased flow through the ponds may result in an increase in velocities and shear forces within the ponds. This increased velocity may result in erosion of sediments, transport of suspended sediments, and deposition of those sediments into receiving water bodies. In ponds with known or potential contaminated sediments at depth, this could result in transport of contaminants to receiving waters. The exact nature and location of scour that could result is impossible to predict.

For most of the managed pond systems, significant increases in tidal prism and in velocities and shear forces are not anticipated. Therefore, the potential for widespread scour within tidal marshes and channels adjacent to these systems is considered unlikely. Typical flow velocities in the ponds are estimated to be much smaller than existing wind and wave-generated velocities.

The Island Ponds are likely to be breached and to function as fully tidal systems. Sediments in the Island Ponds do not contain elevated levels of contaminants. The Island Pond breaches may increase scour and release sediments at the breach locations, some channel areas, and within the ponds as pond bottoms drain at low tide. At the same time, the ponds represent a major depositional area added to Coyote Creek. At high tide, water from Coyote Creek will deposit sediment within the ponds as the pond bottoms transition to high marsh. The balance between net erosion and sedimentation will depend on the rate at which the breaches expand by erosion in comparison to the deposition within the ponds

Significance: Less than Significant.

> *HYDROLOGY IMPACT-3:* Breaching of Island Ponds could result in increased velocities in the surrounding areas, resulting in erosion of mud flats and damage to the Southern Pacific railroad bridge piers.

Modeling by S&W (see discussion above) concluded that breaching of the Island Ponds is likely to cause an increase in velocities and scour potential within Coyote Creek around the railroad bridge. S&W estimated scour depths of 2-3 feet around the railroad bridge based on conservative assumptions regarding existing sedimentation conditions in Coyote Creek. It is not anticipated that this scour depth would cause damage to the railroad bridge. However, the exact nature and extent of any scour problems on adjacent mud flats or the railroad bridge piers is unknown and difficult to quantify with modeling alone. It is also possible that the current depositional environment could handle an increase in velocities without significant erosion or scour.

The potential erosion in the marsh and mudflat areas of Coyote Creek were not included in the scour analysis. However, S&W found that the potential for scour of existing mudflats is limited by several factors including the brief inundation period at high tide, low velocities near slack water, protection from existing marsh vegetation and limited water depths.

Significance: Potentially significant.

> *HYDROLOGY MITIGATION-1A:* A qualified engineer should conduct regular inspections of adjacent mudflats and the railroad bridge piers during the first 5 years following breaching to look for evidence of scour or damage to bridge pier supports. This inspection should be coordinated with regular bridge inspections conducted by Union Pacific.

The engineer should prepare inspection reports documenting the results of the inspection and any recommendations for additional work.

> *HYDROLOGY MITIGATION-1B:* If bridge inspections identify excessive scour or damage to bridge piers not related to weather patterns or upstream changes, then

a qualified engineer shall develop a plan for protecting the piers and USFWS work with the railroad tol implement the plan.

Post-mitigation Significance: Less than significant

HYDROLOGY IMPACT-4: Flow into the ponds may result in excessive sediment deposition near inlet/outlet structures that could impact operation of water control structures.

As velocities of water carried away from the water control structures are reduced, additional sediments are deposited adjacent to water control structures and "delta" formation occurs. Excessive sediment deposition could impede operation of the water control structure and impact water management operations.

Significance: No Impact in Island Pond under full breached conditions (since no structures are used). Potentially significant in other pond systems.

HYDROLOGY MITIGATION-2A: Conduct annual inspections of all water control structures. USFWS and DFG will conduct an annual inspection of all water control structures to look for areas of excessive sediment deposition or scour. Results of these inspections will be recorded on maintenance log sheets along with any follow-up inspections or maintenance sediment removal or regrading operations. If monitoring determines sediment buildup is excessive and must be removed, the agencies will comply with all regulatory requirements from the U.S. Army Corps of Engineers and the Water Board in accordance with Sections 404 and 401 of the Clean Water Act prior to removing deposited sediment.

HYDROLOGY MITIGATION-2B: Remove deposited sediment and regrade as required to avoid deposition impacts.

In areas where sediment deposition interferes with culvert function, USFWS or CDFG, as appropriate, shall implement measures to remove deposited sediment and regrade as required to avoid deposition impacts.

Post-mitigation Significance: Less than significant

3.3.4 Alternative 3: Phased Initial Release

Impacts and associated mitigation measures are as described for Alternative 2 above (Section 3.3.3). The timing of initial release will not affect hydrologic impacts. It is not anticipated that there will be different impacts beyond those described for Alternative 2.

4.0 WATER QUALITY

This chapter describes the water quality in the project salt ponds and surrounding creeks and sloughs. Information on the existing conditions is derived from extensive water quality monitoring by the USGS Water Quality of the San Francisco Bay (http://sfbay.wr.usgs.gov/access/wqdata/); on-going water quality monitoring data from the City of San Jose; and recent sediment and water quality sampling conducted specifically for the project by Hydroscience Engineers. This chapter also describes the results of hydrodynamic and water quality modeling developed for the restoration project by Schaaf and Wheeler.

4.1 AFFECTED ENVIRONMENT

4.1.1 Regulatory Setting

Several state and federal agencies have regulatory authority or responsibility over project-related activities that affect water quality. Table 4-1 below summarizes project related activities and the government agency with regulatory authority over the activity.

Table 4-1.
Summary of Regulatory Setting for Water Quality

Project Related Activity	**Regulatory Authority**
Construction activities that could adversely affect water quality	RWQCB-NPDES storm water permit (CWA Section 402); CWA Section 401 water quality certification
Operations of physical structures (e.g. gates, weirs, pumps, siphons) and/or levee breaches could adversely affect water quality	RWQCB-WDRs (Porter Cologne Act and Basin Plan) for waste discharge to waters of the state; CWA Section 401 water quality certification

Notes:
RWQCB = Regional Water Quality Control Board
NPDES = National Pollutant Discharge Elimination System
WDRs = waste discharge requirements
CWA = Clean Water Act
Basin Plan = Water Quality Control Plan, San Francisco Bay Region

Regional Water Quality Control Board (RWQCB) Authority

The RWQCBs have primary authority for implementing provisions of the federal, state, and California's Porter-Cologne Water Quality Control Act. These statutes establish the process for developing and implementing planning, permitting, and enforcement authority for waste discharges to land and water.

Water Quality Control Plan, San Francisco Bay Region (Basin Plan)

The Water Quality Control Plan, San Francisco Bay Region (Basin Plan) establishes beneficial uses for surface and groundwater resources (San Francisco Bay RWQCB 1995). Under the current Basin Plan, designated beneficial uses of the San Francisco Bay's surface waters include:

- Industrial service supply;
- Groundwater recharge;
- Contact and non-contact recreation;
- Freshwater fish habitat;
- Wildlife habitat;
- Migration of aquatic organisms; and
- Spawning, reproduction, and/or early development of fish.

Beneficial uses of San Francisco Bay area groundwater include municipal and domestic supply, agricultural supply, and industrial service supply.

The Basin Plan establishes numeric and narrative surface and groundwater quality objectives designed to protect designated beneficial uses of surface water and groundwater resources. Other applicable water quality criteria include the California Toxics rule (CTR), which establishes numeric criteria for aquatic life and human health protection for approximately 130 priority trace metal and organic constituents. Numeric water quality objectives include specific concentration-based values that may be imposed on the effluent or at the edge of an allowable mixing zone with the receiving water. Numeric Basin Plan and CTR criteria differ depending on the salinity content.

The Basin Plan defines fresh water and saltwater as follows:

- Fresh water has a salinity of less than 1 ppt more than 95% of the time; and
- Saltwater has a salinity of more than 10 ppt more than 95% of the time.

Estuarine water, therefore, has a salinity that is more than 1 ppt and less than 10 ppt more than 95% of the time. In general, the lower (more conservative) of the saltwater or freshwater criteria apply to estuarine conditions.

Narrative criteria provide general guidance to avoid adverse water quality impacts for constituents including salinity, sediment (i.e., total suspended solids [TSS]), tastes and odors, sulfides, toxicity, and bioaccumulation. Numeric criteria included in the Basin Plan include such parameters as trace metals, dissolved oxygen, turbidity, temperature, pH, bacteriological pathogens, and un-ionized ammonia. Table 4-2 shows selected surface water quality objectives (WQOs) of potential concern for tidal wetland management projects and applicable numeric and narrative criteria.

Table 4-2
Surface WQOs for Potential Constituents of Concern

Constituent	Units	Water Quality Objective (WQO)*
Temperature	ºF	Controllable water quality factors shall not increase temperature by more than 5 ºF.
Dissolved Oxygen	mg/l	5.0 mg/l. Minimum dissolved oxygen is applicable to tidal waters downstream of Carquinez Bridge. The median dissolved oxygen concentration for any 3 consecutive months shall not be less than 80% of the dissolved oxygen content at saturation.
Salinity	ppt	Controllable water quality factors shall not increase the total dissolved solids or salinity of waters of the state so as to

Constituent	Units	Water Quality Objective (WQO)*
		adversely affect beneficial uses, particularly fish migration and estuarine habitat.
pH	Standard units	6.5 to 8.5. The pH shall not be depressed below 6.5 or raised above 8.5. This range encompasses the pH range usually found in waters within the basin. Controllable water quality factors shall not cause changes greater than 0.5 unit in normal ambient pH levels.
Turbidity	NTU	Water shall be free of changes in turbidity that could cause nuisance or adversely affect beneficial uses. Increases in turbidity as a result of discharge shall not be greater than 10% in areas where natural turbidity is greater than 50 NTU.
Sediment	mg/l	The suspended sediment load and suspended sediment discharge rate of surface waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses.
Sulfide	mg/l	All waters shall be free of dissolved sulfide concentrations above natural background levels. Sulfide occurs in bay mud as a result of bacterial action on organic matter in an anaerobic environment.
Toxicity	N/A	All waters shall be maintained free of toxic substances in concentrations that are lethal to or that produce other detrimental responses in aquatic organisms. There shall be no acute toxicity in ambient waters. Acute toxicity is defined as a median less than 90% survival, or less than 70% survival more than 10% of the time, of test organisms in a 96-hour static or continuous flow test. There shall be no chronic toxicity in ambient waters. Chronic toxicity is a detrimental biological effect on growth rate, reproduction, fertilization success, larval development, population abundance, community composition, or any other relevant measure of the health of an organism, population or community.
Bio-accumulation	N/A	Many pollutants can accumulate on particles or in the sediment or bio-accumulate in fish and other aquatic organisms. Controllable water quality factors shall not cause a detrimental increase in concentrations of toxic substances found in bottom sediments or aquatic life. Effects on aquatic organisms, wildlife, and human health will be considered.

Table 4-2
Surface WQOs for Potential Constituents of Concern (continued)

		Water Quality Objective (WQO)*	
Constituent	**Units**	**Salt Water**	**Fresh Water**
Arsenic	µg/l	36	150
Calcium	µg/l	9.3	1.1
Chromium, total	µg/l		180
Chromium, hexavalent	µg/l	50	11
Copper	µg/l	3.1	9.0
Lead	µg/l	5.6	2.5
Nickel	µg/l	8.2	5.2
Silver**	µg/l	1.9	3.4
Selenium	µg/l	7.1	5.0
Mercury	µg/l	0.025	0.025
Zinc	µg/l	81	23
PCBs, Total ***	µg/l	0.000170	0.000170

Notes:

* Narrative objectives are used where numeric objectives have not been established. Unless noted otherwise, single numeric values represent the chronic exposure (4-day average) concentration not to be exceeded at a frequency exceeding once every three years. Trace metal criteria represent the lower of the Basin Plan objectives or California Toxics Rule (CTR) for saltwater (S) or freshwater (F) conditions.

** Criteria applicable to acute exposure concentration only (instantaneous maximum).
*** CTR human health criteria for consumption of organisms.

mg/l = milligrams per liter
µg/l = micrograms per liter
ppt = parts per thousand
NTU = nephelometric turbidity units
PCBs = polychlorinated biphenyl compounds
NA = Not applicable

Clean Water Act (CWA) Section 402 and RWQCB Permitting Procedures

Section 402 of the CWA prohibits the discharge of all pollution into surface waters unless permitted under the National Pollutant Discharge Elimination System (NPDES), which is administered by the U.S. Environmental Protection Agency (USEPA), or by a state agency with a federally approved control program. In California, Section 402 authority has been delegated to the SWRCB and is administered by RWQCBs.

To ensure conformance with the Basin Plan and the federal CWA, the RWQCB issues WDR and/or NPDES permits to projects that may discharge wastes to land or water. The federal NPDES permit system includes procedures for point source waste discharges and storm water discharges.

It is anticipated that the San Francisco Bay RWQCB will not impose an NPDES point-source discharge permit on the proposed project because (1) there is currently no effluent guideline for this activity, (2) no pollutants have been added to the ponds as a result of salt making, and (3) available water quality and sediment data do not suggest elevated pollutant levels beyond that expected from evaporation. However, the RWQCB administers the statewide general NPDES storm water permit for general construction activity that applies to projects that disturb more than 1 acre of land; this permit will most likely be required. The NPDES permit requires filing with the San Francisco Bay RWQCB a public notice of intent (NOI) to discharge storm water and preparation and implementation of a storm water pollution prevention plan (SWPPP).

The SWPPP must include a site map and description of construction activities and identify best management practices (BMPs) that would be employed to prevent soil erosion and discharge of other construction-related pollutants (e.g., petroleum products, solvents, paints, cement) that could contaminate receiving waters. Monitoring may be required to ensure that BMPs are implemented according to the SWPPP and are effective at controlling discharges of storm water related pollutants.

Erosion and sediment delivery to estuaries would be minimized during project construction. Related efforts would include measures to minimize the potential for sediment to enter creeks and sloughs, as well as interim measures to stabilize soil, pending establishment of vegetative cover. As part of the SWPPP required for project construction, an erosion and sediment control plan would be prepared and incorporated into project construction plans and specifications.

CWA Section 401—Water Quality Certification

Under CWA Section 401, applicants for a federal license or permit to conduct activities that may result in the discharge of a pollutant into waters of the United States must obtain certification from the state in which the discharge would originate or, if appropriate, from the interstate water pollution control agency with jurisdiction over affected waters at the point where the discharge would originate. Therefore, all projects that have a federal component and may affect state water quality (including projects that require federal agency approval [such as issuance of a Section 404 permit]) must also comply with CWA Section 401. In California, the authority to grant water quality certification has been delegated to the State Water Resources Control Board (SWRCB) and applications for water quality certification under CWA Section 401 are typically processed by the RWQCB with local jurisdiction. Water quality certification requires evaluation of potential impacts in light of water quality standards and CWA Section 404 criteria governing discharge of dredged and fill materials into waters of the United States.

4.1.2 Regional Water Quality Setting

The hydrologic processes and fate and transport factors for chemical constituents in San Francisco Bay, its tributary rivers, and adjacent estuaries are complex and result in dynamic water quality conditions. Water quality in the South Bay is a function of the mixing of ocean water and freshwater inflows from precipitation and other tributary streams. The physical mixing of sediment, nutrients, and salts combines with natural processes of light and heat input and associated primary and secondary production in higher trophic levels in the aquatic ecosystem of the bay. These ecosystem functions have secondary effects on dissolved oxygen, pH, and organic matter production and decay. In addition, the discharge of anthropogenic sources of conventional inorganic contaminants and trace metal and synthetic organic compounds also plays a major role in the quality of bay water and sediments. Examples include municipal and industrial wastewater treatment discharges and urban storm water runoff.

Descriptions of the water quality setting for salinity, metals and other chemicals, dissolved oxygen, turbidity, temperature, and pH are described along with the impacts and mitigation in Section 4.3.

4.2 CRITERIA FOR DETERMINING SIGNIFICANCE OF EFFECTS

Criteria based on the CEQA guidelines and NEPA implementing guidelines were used to determine the significance of water quality impacts. Under NEPA, analysis of significance requires considerations of both the context and intensity of an impact. Consideration of context means the significance of an action must be analyzed within the appropriate temporal and geographic ecological scale, while intensity refers to the severity of the impact. Impacts were evaluated with respect to:

- Temporary construction-related water quality impacts
- Project operations impacts (temporary and long-term changes to water and sediment quality within the salt ponds, receiving water bodies, and other water bodies that may be affected); and
- Constituents of concern including salinity, inorganic contaminants, dissolved oxygen, suspended solids and turbidity, and temperature.

According to criteria based on CEQA and NEPA, the project would have a significant impact on water quality if it would:

- Violate any water quality standards or waste discharge requirements, or
- Substantially degrade water quality. (Note: For this project, a substantial degradation of water quality would occur if ISP pond discharges would raise salinity levels in receiving waters to one that would have a substantial adverse impact on benthic invertebrates. Salinity significance thresholds are described in greater detail under Section 4.3.1.1, Overview of Potential Salinity Impacts, below, and under Section 6.1, Benthic Organisms.)

Potential impacts of the project on water quality were characterized qualitatively and quantitatively by evaluating both the intensity and context of direct, indirect, temporary, and permanent impacts. Direct impacts include direct disturbances, such as construction activities or direct discharges to receiving waters. Indirect impacts include the potential loss or gain of habitat in the receiving waters due to a change in pond salinities or water quality. Temporary impacts have a short duration. Examples would be impacts during construction or during the initial release period. A permanent impact would involve the long-term alteration of receiving water conditions. An example would include the ongoing discharge from the ISP during the continuous circulation period (CCP).

4.3 IMPACTS AND MITIGATION

This section addresses short- and long-term impacts to water quality within the project area, including impacts to the following water quality parameters discussed in Section 4.1:

- Salinity
- Levels of inorganic contaminants (metals)
- Dissolved oxygen (DO)
- Suspended sediments/turbidity
- Temperature
- pH

This following sections include overviews of impact analyses and results for each of the six water quality parameters listed above (Section 4.3.1 to 4.3.6), including a discussion of specific impacts for each of the project alternatives and a comparison of those impacts, including the No Project/No Action, Seasonal Ponds, Simultaneous Initial Release, and Phased Initial Release alternatives.

- Section 4.3.1 addresses salinity impacts to each of the receiving water bodies under each of the alternatives and provides a basis for comparison of impacts for the various alternatives.
- Section 4.3.2 addresses impacts from metals (specifically mercury and nickel) under each of the alternatives.
- Section 4.3.3 addresses impacts from reduced dissolved oxygen, Section 4.3.4 addresses impacts from suspended sediments/turbidity,
- Section 4.3.5 addresses impacts from elevated temperatures, and
- Section 4.3.6 addresses impacts from elevated pH for each alternative.

For each impact, it is clarified whether the impact would be temporary (short-term), occurring only during the Initial Release Phase (IRP) of the ISP, or permanent (long-term), occurring throughout the Continuous Circulation Phase (CCP) of the ISP.

Each section also presents proposed mitigation for impacts that are identified as significant or potentially significant. Proposed mitigation measures immediately follow each significant impact identified. CEQA/NEPA do not require the identification of or, mitigation for temporary impacts that are not significant. However, proposed mitigation measures have been identified for temporary impacts where feasible in order to minimize any negative effects.

4.3.1 Salinity

4.3.1.1 Regional Water Quality Setting Salinity

Salinity in the South San Francisco Bay estuary reflects a balance between the saline marine influence, freshwater dilution, and the effects of evaporation. Saltwater is more dense than fresh water, so fresh water will float on top of saline water. The density difference between saline and freshwater conditions also influences physical mixing between water layers of varying density. In general, salinity is lower in the northern portion of San Francisco Bay and higher in the southern portion, because of differences in the influx of fresh water. Slough salinities in the South Bay increase during the summer low-flow period when freshwater influx is reduced. The USGS and San Francisco Estuary Institute Regional Monitoring Program (RMP) conduct extensive water quality monitoring activities in San Francisco Bay and its freshwater tributaries (RMP 1999, 2000a). The USGS operates continuous salinity meters at the west end of the Bay Bridge and the San Mateo Bridge.

Seasonal and yearly variations in salinity are driven primarily by variability in freshwater flow. During periods of high freshwater inflow, salinity can vary substantially in South Bay, resulting in dynamic three-dimensional circulation patterns (McCulloch et al., 1970). A key feature of these circulation patterns is density-driven exchange between South Bay and Central Bay (Walters et. al., 1985). Therefore, winter salinity conditions in South Bay are dynamic, characterized by unsteady inflows, variable salinity and periodic vertical stratification. When freshwater flows decrease, generally in late spring, the salinity of South Bay gradually increases as water of oceanic salinity mixes into South Bay from the ocean (via Central Bay). During summer the largest sources of freshwater input to South Bay are wastewater treatment plants, and their flows are the same order of magnitude as evaporation in South Bay (Denton and Hunt, 1986). Therefore, salinity is relatively uniform and typically near oceanic (33 ppt) during late summer and fall.

Continuous observations of salinity are made by the USGS at station 11162700, located at the west end of the Oakland Bay Bridge, and station 11162765, located at the San Mateo Bridge on the east side of the ship channel (Schemel, 1998).

- Salinity was measured at a bottom sensor at the San Mateo Bridge salinity station from February 1994 through August 1995. Observed salinity at this location was strongly inversely related to freshwater inflow and varied from over 30 ppt during the summer of 1994 to less than 10 ppt during March of 1995.
- A similar trend is shown at the Dumbarton Bridge station, where salinity observed between November 1994 and August 1995 varies from less than 1 ppt to more than 31 ppt.

The USGS has collected detailed salinity data in San Francisco Bay since 1969 as part of the pilot Regional Monitoring Program (e.g., Edmunds et al, 1995). These data are collected at least once a month at a maximum of 17 stations in the channel of South Bay extending from the Oakland Bay Bridge to the mouth of Coyote Creek. Since 1988 this data has been reported in 1 meter vertical intervals. This data (from 1988 to 2000) has been analyzed to indicate the temporal variability of salinity in South Bay.

The variability of observed salinity at station 30, located in the main channel of South Bay directly west of the Baumberg Complex, shows values ranging from 8 ppt to 31 ppt, measured during winter and spring. A large range in salinity has also been observed at Station 36, located in the main channel of the South Bay near the Alviso Complex. At this location, the minimum salinity recorded during February was 4 ppt, while the maximum salinity was 26.

The existing regional context for salinity in the South San Francisco Bay is thus highly variable, showing at monitoring locations yearly seasonal variation at the San Mateo Bridge between 33 ppt and 9 ppt and between 32 ppt and 1 ppt at the Dumbarton Bridge.

Salinity in Tidal Sloughs Near the Alviso Complex

The Alviso Complex is located in Lower South Bay, defined as the portion of South Bay south of the Dumbarton Bridge.

- Lower South Bay is a relatively shallow sub-embayment with an average depth of 2.6 m at mean tide.
- Tides in this region are particularly strong due to amplification of tidal energy with distance landward in South Bay.
- Because of the strong tides and shallow depths, “the area covered by water in Lower South Bay at mean lower low water (MLLW) is less than half the surface area at mean higher high water (MHHW) indicated that over half of Lower South Bay consists of shallow mudflats that are exposed at low tides” (Schemel, 1998).
- The volume of water in Lower South Bay at MLLW is less than half the volume of water at MHHW, indicating that more than half of the water volume present in Lower South Bay at high water can pass through the Dumbarton Bridge during a single ebb tide (Schemel, 1998). Near-bottom salinity measured continuously by the USGS at the Dumbarton Bridge from 1995 to 1998 was highly correlated with freshwater flows and varied from approximately 5 ppt to 32ppt (Schemel, 1998).
- The daily range of measured salinity at the Dumbarton Bridge can also be great, particularly during winter, when the daily range is typically 5 ppt.

The tidal sloughs that border the Alviso salt ponds are Coyote Creek, Mud Slough, Artesian Slough, Alviso Slough, Guadalupe Slough, Stevens Creek, Mountain View Slough and Charleston Slough.

The largest tidal slough is Coyote Creek, which meets the South Bay at Calaveras Point. Coyote Creek is a substantial source of fresh water during winter and spring. Salt marsh regions are present in several parts of Coyote Creek, particularly bordering salt ponds. The bottom elevation of the main channel of Coyote Creek ranges from -1 to -4 m NGVD. The tidal range in Coyote Creek, reported as 2.2 m at NOAA Station 9414575 (NOAA, 2003), is particularly large.

Artesian Slough borders ponds Alviso A16 and Alviso A17 and is a tributary to Coyote Creek. The discharge from the SJ/SC WPCP enters the upstream end of Artesian Slough. Artesian Slough thus generally has relatively low salinity (Kinnetic Labs, 1987). During 2003, the average dry weather effluent flow from the SJ/SC WPCP was 100 million gallons per day (mgd).

Strong salinity gradients are present in both Coyote Creek and Artesian Slough (Kinnetic Labs, 1987) and frequently result in vertical salinity stratification (Simons, 2000). Observations of salinity suggest that, during winter Coyote Creek is periodically stratified, while Artesian Slough is persistently stratified (Simons, 2000). The daily range of salinity in Coyote Creek can be quite large. In a one week duration data set collected in late January and early February 2000, measured salinity typically ranged from approximately 3 ppt to over 20 ppt during most days (Simons, 2000). Salinity is also highly variable seasonally, with lower salinity during winter and spring in Coyote Creek and Artesian Slough (Kinnetic Labs, 1987)

At the western end of pond Alviso A21, Mud Slough splits off from Coyote Creek and, bordering the north side of ponds Alviso A21, A20, and A19, continues landward to connect with Warm Springs marsh restoration area. Mud Slough is a shallow tidal slough, which receives minimal freshwater input from several small creeks and stormwater channels during all seasons.

Alviso Slough borders ponds Alviso A7, A8, A9, A10, A11, and A12. Guadalupe River discharges to Alviso Slough. The bottom elevation of Alviso Slough ranges from -1 to -3 m NGVD. The tidal range in Alviso Slough is particularly large, with measured high water approximately a factor of 1.6 higher (relative to mean tide) than high water at the Golden Gate Bridge (NOAA, 2003). Given the combination of strong tides and shallow depths in Alviso Slough, it is clear that most of the volume present in Alviso Slough at high water drains to Coyote Creek (and subsequently South Bay) during ebb tide. Therefore this slough, as do Coyote Creek and Guadalupe Slough, actively exchanges water with South Bay due to tidal motions. Salinity is highly variable in Alviso Slough. Salinity observed by Cargill near high water at the mouth of Alviso Slough (measured at the Alviso A9 intake) is generally similar to salinity measured at Dumbarton Bridge.

Guadalupe Slough borders ponds Alviso A3W, A4, and A5. Guadalupe Slough receives flow from Calabazas Creek and San Tomas Creek. The Sunnyvale municipal wastewater treatment plant also discharges to Guadalupe Slough (approximately 18 mgd) and is the primary source of fresh water to Guadalupe Slough during summer and fall. The bottom elevation of Guadalupe Slough ranges from -1 to -4 m NGVD. The tidal range in Guadalupe Slough is similar to the tidal range in Alviso Slough (NOAA, 2003). Measured salinity in Guadalupe Slough varies from 0 ppt to approximately 25 ppt (Kinnetic Labs, 1987). A strong salinity gradient occurs along Guadalupe Slough during summer and fall conditions, with salinity of approximately zero near the Sunnyvale Water Pollution Control Plant (WPCP) discharge and measured salinity typically in the range of 10 to 20 ppt at the mouth of Guadalupe Slough (Kinnetics Labs, 1987).

Stevens Creek, Mountain View Slough and Charleston Slough are relatively shallow and narrow tidal sloughs, which contribute little freshwater flow to the South Bay and drain relatively small areas.

Salinity in Tidal Sloughs Near the Baumberg Complex

The Baumberg Complex borders the eastern shore of South Bay and extends from Alameda Flood Control Channel on the south to San Mateo Bridge on the north. Relevant tidal sloughs flanking the Baumberg salt ponds are Alameda Flood Control Channel (AFCC), also known as Coyote Hills Slough, Old Alameda Creek, and Mount Eden Creek. The region near the eastern shore of the Bay is a large mudflat.

The largest and most ecologically important slough in this region is Alameda Flood Control Channel (AFCC), designed by the Army Corps of Engineers.. Alameda Creek flows into AFCC. Alameda Creek, which flows into AFCC, drains an area of 633 square miles upstream of Niles (USGS, 2003), and is the largest tributary to South Bay. The deepest part of AFCC has bottom elevation of approximately -1.5 m NGVD near the mouth and slopes gently up with distance upstream. The portion of AFCC that adjoins the salt ponds is tidal, with high tide elevation slightly lower than the high tide elevation at San Mateo Bridge and low tide elevation considerably higher than low tide elevation at

San Mateo Bridge (NOAA, 1933). Thus the tidal range in AFCC is substantial but less than the tidal range in nearby portions of South Bay. Depths in the channel of AFCC typically range from 2 to 3 m at high water, while at low water depths can be less than 1 m in the deepest part of AFCC. In addition, AFCC contains a large inter-tidal area that is only covered with water near high water and is drained during ebb tides. Therefore a large portion of the water volume that is present in AFCC at high water drains into South Bay during ebb tides. Salinity generally varies from bay salinity at the mouth of AFCC to fresh water arriving from Alameda Creek. During periods of high flow, fresh water can displace the bay water in AFCC, and the salinity can be depressed significantly in South Bay near the mouth of AFCC (Huzzey et a., 1990). However, the opposite pattern has also been noted, with higher salinity in the shoals than the channel during periods of high Delta flow and relatively low local inflow in which less saline water enters South Bay from Central Bay primarily in the channel (Huzzey et. al., 1990).

The next tidal slough to the north of AFCC is Old Alameda Creek. Before Alameda Creek was diverted intoAFCC, it drained into what is now known as Old Alameda Creek. Currently Old Alameda Creek receives minimal freshwater input. It is comprised of two distinct channels, a narrow northern channel and a wider southern channel divided by a vegetated bar that is only submerged at higher high water during strong (spring) tides. The minimal amount of water level elevation data available on Old Alameda Creek indicates that high water elevations measured about 2 kilometers from the mouth of Old Alameda Creek as high are as 1.8 m NGVD with low water typically near the bed elevation of -.5 m NGVD (Kamman Hydrology, 2000). Observed salinity in this slough, measured at a Cargill intake location, is generally similar to observed South Bay salinity.

Additional tidal sloughs are currently under construction in the Baumberg Complex. These sloughs are part of an ongoing tidal restoration project and are being constructed using the Cargill dredge. When this restoration project is complete, a modified Mount Eden Creek and a new North Creek will connect the Eden Landing Ecological Preserve to San Francisco Bay. North Creek will connect from the preserve to Old Alameda Creek approximately 2 km from SSFB. Mount Eden Creek enters the bay approximately 2 km north of the mouth of Old Alameda Creek. The existing Mount Eden Creek will be expanded and extended as part of the ongoing project. These sloughs will not receive substantial freshwater flows and it is expected that salinity in these sloughs will be similar to Bay salinity.

Salinity in Tidal Sloughs Near the West Bay Complex

The West Bay Complex is located on the west side of the Dumbarton Bridge. The Dumbarton Strait, with a width of approximately 2 km, is the narrowest part of South Bay. The mean tidal range in the Bay at this location is 2.0 m (NOAA, 2003), and the salinity is similar to the salinity measured by the USGS at the Dumbarton Bridge. Observed velocities in this region (for example, currents measured at USGS/NOAA station C13), are relatively large due to the strong tides and narrow cross-section of the Dumbarton Strait.

The largest tidal slough located near the West Bay Complex is Ravenswood Slough. Local freshwater input to this slough is relatively low, and salinity in the Bay and sloughs bordering the West Bay Complex is typically similar to salinity measured at the Dumbarton Bridge.

4.3.1.2 Overview of Potential Water Quality Impacts from Salinity

Initial Discharge Salinities at ISP Ponds During the Initial Release Phase (IRP) and Continuous Circulation Period (CCP)

For purposes of the salinity modeling and impact analysis, the ISP conditions are divided into two phases. The Initial Release Phase (IRP) includes the initial discharge of the existing pond contents at the start of circulation through the individual pond systems. The existing salinity in the ponds is greater than normal oceanic or Bay salinities. The IRP was considered to be the period during which the predicted discharge salinity would exceed approximately 40 ppt. For all of the proposed systems the IRP would be eight weeks or less.

The Continuous Circulation Period (CCP) was considered to be the long-term pond operation period extending from the end of the IRP until the end of the ISP and marking the beginning of the long-term restoration project. The length of the CCP is anticipated to be at least five years for all ponds and longer for some ponds.

Upper limits for initial discharge salinities at the beginning of the ISP were proposed for the purposes of salinity modeling and impact analysis. Ponds were placed into one of three salinity groups, based on the maximum allowable salinity for each pond at discharge (see Table 4-3). Note that not all ponds would directly discharge to the Bay or sloughs, but Table 4-3 lists the maximum salinity of each pond at the time discharge would occur. Ponds were designated for a particular salinity group based on the historic operation of the salt pond and system constraints on changes to the existing salinities.

Figure 4-3 shows representative graphs of the area of Alviso Slough with daily average and daily maximum salinity greater than 32 ppt during the Initial Release Period for the Simultaneous April Initial Release. The area is expressed as a percentage of the entire slough area below high tide water levels from Coyote Creek upstream to near Gold Street. The time period shown is for the approximately two month duration of the IRP. Because the initial release salinity mixes with the water in the slough, the maximum area affected occurs one to two weeks into the IRP, and then decreases over the remainder of the IRP. This corresponds to the decreasing discharge salinity pattern shown in Figure 4-1.

Within the period of maximum effect, the one day with the maximum areas was evaluated to analyze the extent of the increased salinity. This is termed the maximum day, and was used to generate the areas listed in Table 4-5. The area on the maximum day is not representative of the entire IRP, but is the single day with the greatest area of salinity effects. For the example of Alviso Slough for Alternative 2, the maximum day is April 8.

The salinity values in Figure 4-3 and significance criteria for salinity increases are described in Section 4.3.1.3.

Table 4-3
ISP Ponds Within Each of the Salinity Groups (Ponds shown in bold print are discharge ponds)

Salinity Group	Maximum Discharge Salinity	Alviso Complex Ponds	Baumberg Complex Ponds	West Bay Complex Ponds
Group 1	65 ppt	A1, **A2W** A2E, B1, B2, **A3W**, A3N	1, **2,** 4, 7 10, **11**	
Group 2	100 ppt	A5*, **A7***, A8* A9, A10, A11, A14	5, 6, 1C, **2C**, 3C, 4C, 5C, 6C	
Group 3	135 ppt	A12, A13, A15 **A16, A17** **A19, A20, A21**	6A,6B 9, **8A**, 8 12, 13, 14	**1, 2, 3, 4**, 5, 5S **SF2**

* These ponds include an upper limit of 110 ppt.

The ISP salinity conditions for the bay and major sloughs were predicted by hydrodynamic computer models for the IRP and CCP conditions. The model analysis compares predicted salinity conditions based on existing conditions and predicted conditions for the two pond management alternatives. Since the No Project/No Action and Alternative 1 (Seasonal Ponds)do not include planned discharges to receiving waters, they were not modeled.

- **Alternative 2: Simultaneous March-April Initial Discharge --**All systems except the Island Ponds (A19, A20, and A21), the Alviso A23 system, and the West Bay Complex to begin discharge in April. Initial pond salinities to be based on the maximum salinities from Table 4-3 above. The actual initial discharge may have lower salinity values, depending on weather and pond conditions prior to the IRP. The modeled conditions are considered the maximum potential condition.
- **Alternative 3: Phased Initial Discharge**—The initial pond salinities for all ponds were based on the maximum salinities from Table 4-3 above. Selected ponds would begin initial release at the same time. These would include Alviso Systems A2W, A3W, and A7 and Baumberg Systems 2, 8A, and 11. The ponds were selected to represent a significant number of systems that could be included in a first phase of the project based on construction and operational constraints. The phased release was assumed to begin in July, to allow some construction in the spring after the winter rainy season. Most of the proposed system structures would not be accessible for construction during the winter. The remaining pond systems, Alviso Systems A14 and A16, and Baumberg System 2C, would start circulation in the following year. The initial release for these later systems is proposed for the following April, and the model results for those ponds would be

> similar to the Simultaneous March-April Initial Discharge above. The actual initial discharge for all ponds may have lower salinity values, depending on weather and pond conditions prior to the IRP. The modeled conditions are considered the maximum potential condition for each pond system.

Both pond management alternatives (Alternatives 2 and 3) included a modification of the CCP operation from the Baumberg System 11 described in the ISP (Appendix A). Because the initial release would occur prior to completion of the Mount Eden Creek channel construction project, the proposed outlets to the new channel from ponds 10 and 11 would not be available for the IRP. An alternative initial operation scheme was included that would use the existing pond 10 intake as an intake/outlet. The initial release would be from the intake and would release the volume of ponds 10 and 11. After the initial release, pond 11 would be operated as seasonal with no intake or discharge. Pond 11 would partially fill with rainwater during the winter and dry out during the summer.

Estimates of the range of salinities of the discharges from the Alviso, Baumberg, and West Bay Unit Ponds during the Initial Release and Continuous Circulation Periods are summarized in Table 4-4. These estimates were made using mathematical modeling techniques that are described in Chapter 3 of the ISP (Appendix A). It is anticipated that discharges from Alviso Pond Systems A2W, A3W, A7, A14, and A16 and Baumberg 2, 2C, 8A, and 11 will begin during the initial years of the ISP and these discharges are further addressed in this evaluation. Due to constraints associated with the existing salt operations and agreements between Cargill and CDFG/USFWS, circulation and discharge of waters from the West Bay Unit Ponds and the Alviso Island Ponds (A19, A20, and A21) will not begin until later years.

Table 4-4
Estimated Range of Salinities at Discharge Point (ppt) during:

Discharge Point	Initial Release Period: Beginning on April 1 (first 2 months)	Phased Initial Release Period: Beginning on July 1 (first 2 months)	Continuous Circulation Period
Alviso Unit			
A2W	27-65	45-65	14-44
A3W	27-65	43-65	14-44
A7	26-110	41-110	12-44
A14	36-100		20-44
A16	29-135		15-44
A19, A20, A21	29-135		15-44
Baumberg Unit			
2	30-65	45-65	18-44
11	28-65	40-65	15-44
2C	32-100		18-44
8A	74-135	35-135	20-44
6A*			16-44
West Bay Unit			
SF-2	40-135		16-44
1	40-135		16-44
2	40-135		16-44
3	40-135		16-44
4	40-135		16-44

* 6A is presently dry no initial release required.

The salinity of each of the discharges is predicted to vary over the course of the ISP. In all cases, the salinity will be the highest during the Initial Release Period (IRP), when the water that has been concentrated by evaporation is first pushed out of the ponds. Discharge salinities during the IRP are discussed above. There will be variation among discharge points, but, in general, the discharge of the high salinity waters under the IRP will last between one and two months, with the salinity of the discharge decreasing with time. Figure 4-1 shows a representative graph of predicted pond discharge salinity through the first 18 months of operation.

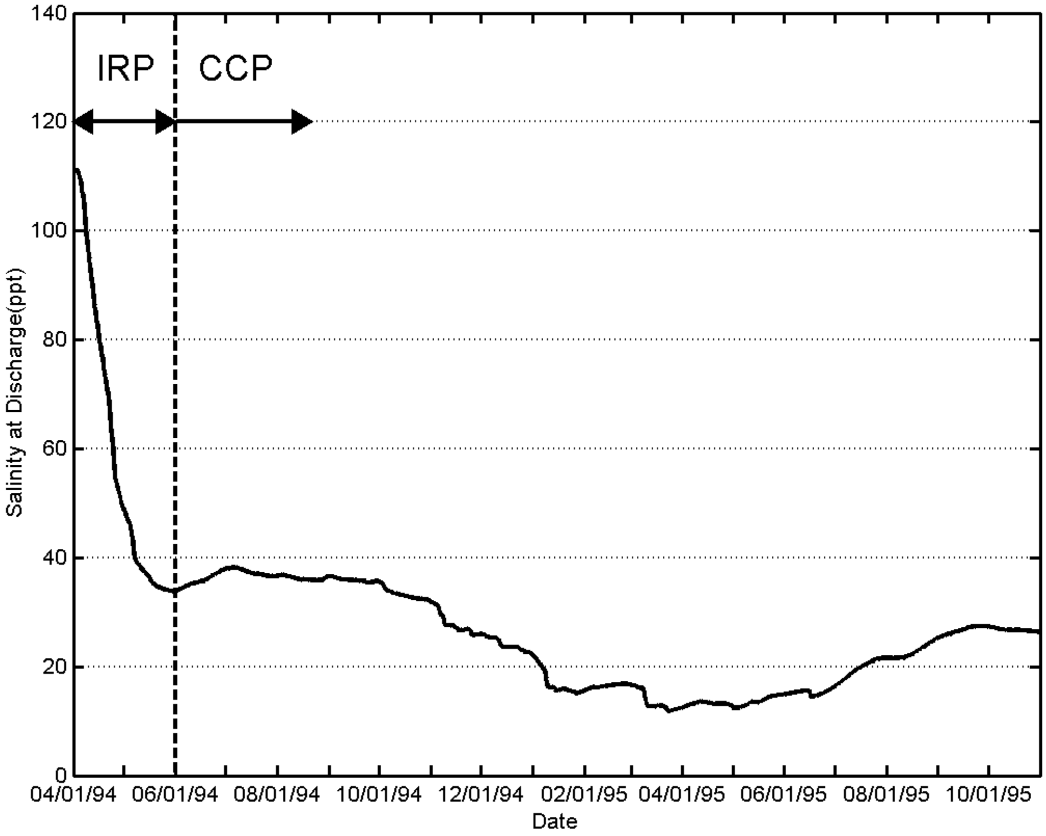


Figure 4-1 – Representative Pond Discharge Salinity (Pond A7)

The water control structures were designed to maintain discharge levels below 40 ppt year-round during the CCP. However, to anticipate potential operational issues that could occur during ISP operations, the possibility of salinity peaks up to 44 ppt were evaluated. After the IRP, discharge salinities during the CCP will also vary, but water will be circulated through the ponds in a manner that will generally prevent discharge salinities from exceeding 40 ppt throughout the year.

Under all scenarios, the actual discharge salinities during the CCP will vary over the course of the year, with lower salinities during the wet season (due to dilution by rainwater and low evaporation rates) and higher during the dry season (due to high evaporation rates).

Changes in Salinity in Receiving Water Bodies During the Initial Release Phase (IRP) and Continuous Circulation Period (CCP)

The saline water circulated from the salt ponds during the ISP will enter either directly into the South Bay or into one of several tributaries that eventually discharge into the South Bay. Segments of the South Bay and of each of these tributaries will experience increases in salinity as a result of these discharges. As with discharge salinities, the magnitude of these increases will vary over the course of the ISP, but will be the greatest during the Initial Release Period (IRP). In this section, the nature of these increases in salinity are discussed for two segments of San Francisco Bay proper (i.e., near the Alviso Complex and near the Baumberg Complex) and for each of four tributaries (Alameda Flood Control Channel, Coyote Creek, Alviso Slough, and Guadalupe Slough).

For each receiving water body, changes in salinity are predicted during both the IRP and CCP. For the IRP, in order to capture the full range of predicted changes in salinity, evaluations are made for two points in time:

(1) The week when the highest IRP salinities are being discharged, and

(2) At the end of the IRP when the lowest IRP salinities are being discharged.

Similarly, in order to capture the full range of outcomes for the CCP, evaluations are made for four points in time:

(1) At the end of September, when pond salinities are predicted to be the highest and freshwater inflow the lowest;

(2) During a winter storm event when pond salinities are predicted to be the lowest and freshwater inflow the highest;

(3) During a winter dry period when pond salinities are predicted to be low and freshwater inflow is moderate; and

(4) Late spring dry period, when pond salinities are relatively low, and freshwater inflow is relatively low.

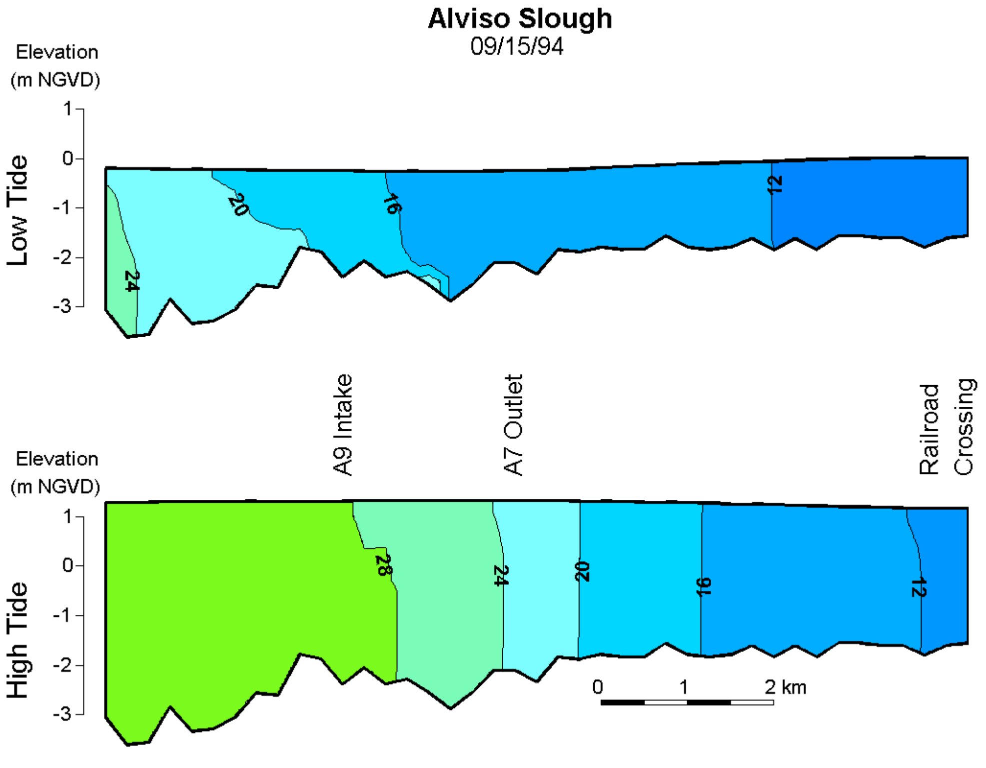
The ISP salinity conditions for the bay and major sloughs were predicted by hydrodynamic computer models for the IRP and CCR conditions. The model results describe several types of salinity values to characterize the salinity conditions in the receiving waters.

Depth-averaged salinity is the average salinity in the water column from the bottom to the surface. For well mixed areas the salinity in the entire water column would be similar to the depth-averaged salinity. For stratified areas, the bottom salinity would generally be higher than the depth-averaged salinity, while the surface salinity would be lower. Because the areas of significant stratification are highly variable, both spatially and temporally, most salinity values described are depth averaged to simplify the discussion.

Although depth-averaged salinity values are generally representative of salinity conditions in the water column, since bottom salinities may have a greater effect on benthic communities, a sensitivity analysis for Alviso Slough and AFCC was prepared to compare the area, extent and intensity of predicted bottom salinities to depth-averaged salinity conditions. The analysis showed no difference in daily average conditions and very small differences in intensity for daily maximum salinity values. Because the normal areas of stratification at the interface of bay water and fresh water moves with the tide cycle it has a limited effect on the areas of daily maximum salinity for salinities greater than 32 ppt. The small differences in intensity for the daily maximum salinity values tend to occur in the vicinity of the pond discharge due to short periods of stratification at low tide. Figure 4-2 shows high tide and low tide salinity profiles of a typical slough for existing conditions. The low tide profile shows an area of stratification in the downstream area of the slough, i.e., where the upper profile salinity contours of 16 and 20 ppt are slanted.

Daily averaged salinity is the average salinity at a particular location for one 24-hour period. The daily average salinity provides a measure of the typical salinity at a specific location, but does not represent the high and low salinity within the tidal cycles. The daily-averaged salinity provides an estimate of exposure over a period that is shorter that that used in the San Francisco. Water Quality Control Plan and in USEPA ambient water quality criteria in establishing chronic objectives and criteria and is longer than that used in establishing acute objectives and criteria. Consequently, if the assessment of impacts for this exposure is based on the results of chronic toxicity tests and/or observations made in the field following chronic duration exposures, the assessment should be conservative. Figure 4-2 shows the type of daily variability of salinity values in a slough area between high and low tide conditions.

Daily maximum salinity is the maximum salinity during the day at a specific location. Depending on the location and ISP discharge conditions, the daily maximum may occur at high or low tide. For locations away from the pond discharges, daily maximum salinity occurs at high tide due to inflows from the Bay. For locations in the vicinity of a pond discharge, the daily maximum may occur at low tide because the pond discharge occurs at low tide. Typically the daily maximum salinity would occur for one to two hours during the extremes of the tidal range. The daily maximum salinity provides an estimate of exposure over a relatively short period that is more similar to an estimate of acute exposure as defined in the S.F. Water Quality Control Plan and in USEPA ambient water quality criteria. Consequently, assessment of impacts for this short duration exposure would be based on the results of acute toxicity tests and/or observations made in the field following similarly short exposures.



Note: Salinity profile computed along a longitudinal transect in the hydrodynamic model. Predicted based on 1994-1995 weather and tidal conditions.

Figure 4-2 Predicted Alviso Slough Salinity (ppt) for Existing Conditions on September 15

Changes in Salinity in the Receiving Waters Near Alviso Complex

This segment of the receiving waters includes San Francisco Bay proper south of the Dumbarton Bridge. The salinity of this segment will be affected primarily by the circulation from five discharge points i.e., A2W (direct discharge to bay), A3W (discharge via Guadalupe Slough), A7 (discharge via Alviso Slough), A14 (discharge via Coyote Creek), and A16 (discharge via Artesian Slough) and three levee breaches in Ponds 19, 20, and 21. The breaches will occur several years after the initiation of the ISP.

Changes in Salinity in the Receiving Waters Near Baumberg Complex

This segment of the receiving waters includes San Francisco Bay proper between the Dumbarton Bridge and the San Mateo Bridge. The salinity of this segment will be affected primarily by the circulation from five discharge points i.e., Pond 2 (direct discharge to bay), Pond System 11 (direct discharge to bay through bidirectional gate in Pond 10 during IRP), Pond 2C (discharge via Alameda Flood Control Channel), Pond 8A (discharge via Old Alameda Creek, and Pond 6A (discharge via Old Alameda Creek).

Changes in Salinity in the Receiving Waters Near West Bay Complex

This segment of the receiving waters includes the San Francisco Bay proper at the Dumbarton Bridge. The salinity of this segment will be affected primarily by the circulation from three discharge points i.e., Pond 4 (discharge via Ravenswood Slough), Pond 1 (discharge via Ravenswood Slough), and Pond SF2 (direct discharge to the Bay).

Changes in Salinity in the Creek and Slough Areas

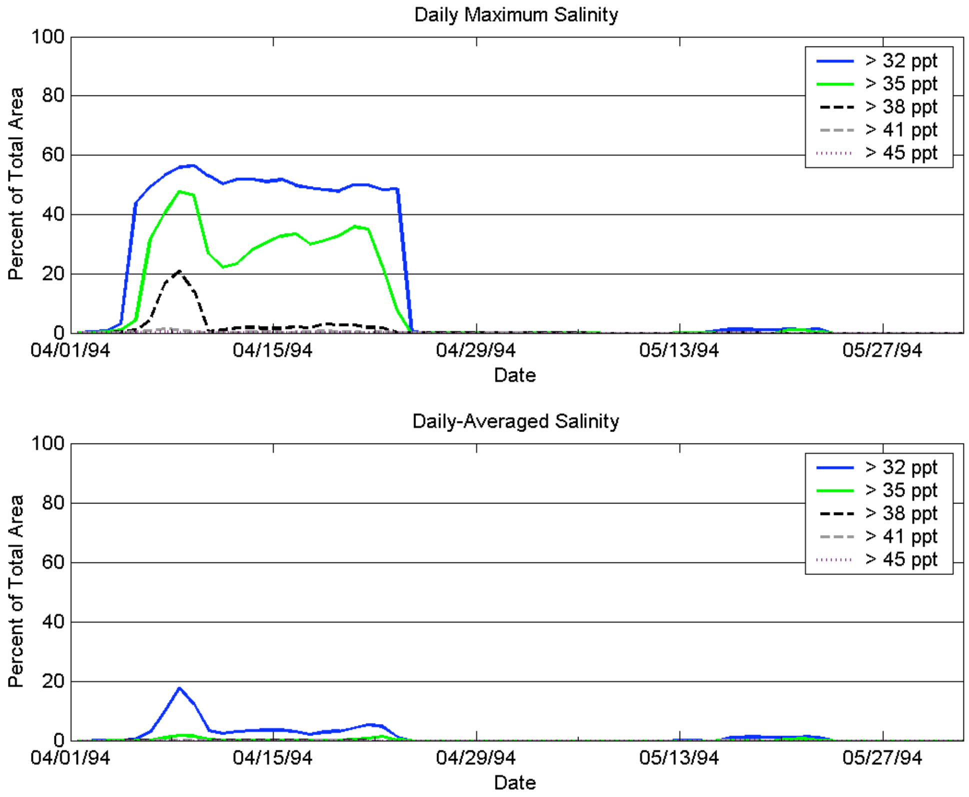
This segment of the receiving waters includes Coyote Creek, Alviso Slough, Guadalupe Slough, Alameda Flood Control Channel, and Old Alameda Creek. The existing salinity conditions within the creek and slough areas near the proposed discharge locations are highly variable. Average salinities near the bay are generally close to the bay salinity, which may vary from as low as 10 ppt in winter to as high as 33 ppt in late summer. Average salinities upstream at the limit of tidal influence may be as low as 0 ppt. In addition, the salinity at a single location can vary by 10 ppt or more between high and low tides. This variability is shown in the sample profiles in Figure 4-3.

The proposed ISP discharges would add to the existing salinity in the creek and slough areas. Since the discharge flow would generally occur at low tide, the higher salinity discharge would not immediately flow out the bay, but would contribute to the incoming tidal flow and raise the overall salinity in the creek or slough channel. In all the creeks and sloughs, the higher salinity discharge would increase low tide salinities near the outlet and increase the daily average salinities upstream and downstream of the outlet. The magnitude of the potential increase would be greatest at the outlet location and less upstream and downstream, depending on the mixing within the channel. For locations with a high freshwater inflow, such as Coyote Creek, the ISP discharge would have little effect on the daily maximum salinities.

The estimated salinity increases in the creeks and sloughs are greater during the IRP due to the higher initial release salinities. The potential magnitude of the salinity increases is a result of both the initial pond salinity values, and the discharge flow rates during the IRP.

Figure 4-3 shows representative graphs of the area of Alviso Slough with daily average and daily maximum salinity greater than 32 ppt during the Initial Release Period for the Simultaneous April Initial Release. The graphs show that the pond discharge effects increase to a maximum after approximately one week, as the general salinity levels in the slough increase due to the discharge. For approximately one week, the area with daily maximum salinity greater than 38 ppt was predicted to be greater than 10 percent of the overall slough and the area with daily averaged salinity greater than 32 ppt was predicted to be greater than 10 percent. As stated previously, the daily average values are averaged over 24 hours, the daily maximum values represent the maximum salinity averaged over 2 hours.

Within the period of maximum effect, the one day with the maximum areas was evaluated to analyze the extent of the increased salinity. This is termed the maximum day, and was used to generate the areas listed in Table 4-5. The area on the maximum day is not representative of the entire IRP, but is the single day with the greatest area of salinity effects. For the example of Alviso Slough for Alternative 2, the maximum day is April 8.



Note: Predicted based on 1994-1995 weather and tidal conditions.

Figure 4-3 - Percent of Alviso Slough Area in which the Predicted Depth-Averaged Salinity Is Greater than Category Minimums during the IRP for the Alternative 2, Simultaneous Initial Release

4.3.1.3 Significance Evaluation for Salinity Impacts to Water Quality

The data from modeling of salinities in each of the receiving water bodies during the Initial Release Phase (IRP) were used to evaluate the significance of the temporary (short-term) impacts of pond discharges. This evaluation process is described below.

There is no quantitative water quality objective for salinity in the bay and sloughs. The narrative objective indicates that changes in salinity should not adversely affect beneficial uses in the receiving waters. Uses of receiving waters that could be adversely affected by elevated salinity are limited to those that are aquatic-life based, most notably, Estuarine Habitat (EST). Therefore, the criteria for the significance evaluation were based on the potential response of existing benthic communities in the receiving waters. Benthic species were considered indicators of the habitat quality because many species are food sources for other species and may be sessile and cannot move away from areas with high salinity.

The project would have a significant impact on benthic populations if it would:

- Have the potential to substantially reduce habitat, cause a population to drop below self-sustaining levels, or threaten to eliminate a community;
- Conflict with the provisions of an approved local, regional or state policy or ordinance protecting biological resources;
- Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional or state Habitat Conservation Plan

The term “substantial” (applied to populations, habitat, or range), has not been quantitatively defined in CEQA or NEPA. What is considered substantial may vary with each species and with the particular circumstances pertinent to a particular geographic area.

Significance Evaluation for Short-term Salinity Impacts to Water Quality

The significance of short-term impacts to each of the receiving waters in the project area was evaluated by examining the percentage of receiving waters predicted to fall into several salinity classes, or stages, during the IRP. Each stage represents a salinity range that is expected to correspond with a different benthic response. Predictions of benthic responses to different levels of salinity were based on an extensive review of the available literature (see Section 6.2 Benthic Organisms). The salinity ranges in these stages are intended as a qualitative tool to categorize possible impacts to aquatic communities. It is not known how each species or aquatic community may respond to a particular salinity range; only that the potential for impacts would increase with higher stages. In addition, the potential for impacts would increase with longer durations of exposure (e.g., the same elevated salinity range experienced for 2 hours would be expected to produce a significantly smaller effect than if the exposure were for 24 hours).

A scale of salinity categories was developed to assess potential impacts to resident aquatic communities. This scale is based on available data from laboratory testing, field observations in the San Francisco Bay during drought years, and field observations of the salt ponds. Salinity ranges, benthic responses, and significance levels that correspond to each of the stages are as follows (see Section 6.1 for a complete discussion of the response stages):

- Ambient conditions–less than 33 ppt salinity; benthic species population may vary depending upon species salinity preferences; impacts less than significant.
- Drought conditions–33 to 35 ppt salinity. If exposure is chronic, benthic community changes to salinity tolerant species similar to drought years; effects quickly reversed with normal salinity regime. If exposure is acute (i.e., a few hours per day), less of a shift in species composition. In either case, impacts less than significant.
- Stage 1–36 to 38 ppt salinity. If exposure is chronic, benthic community may lose most sensitive species during initial release period. If exposure is acute (i.e., lasting a few hours per day), less impact on community. With chronic exposure, impacts considered potentially significant. With acute exposure, impacts considered less than significant.
- Stage 2–39 to 41 ppt. If exposure is chronic, benthic community may lose larger number of species during the initial release period. If exposure is acute (i.e., lasting a few hours per day), less impact on community. With chronic exposure impacts considered significant. With acute exposures, impacts considered potentially significant.
- Stage 3 – 42 to 45 ppt. If exposure is chronic, community may be limited to most salinity tolerant species. If exposure is acute, less impact on community but still loss of large number of species. In either case, impacts considered significant.
- Stage 4–greater than 45 ppt. For both chronic and acute exposures, community would be severely reduced. In either case, impacts considered significant.

The significance of the short-term impacts to each of the receiving water bodies was determined by analyzing the intensity of the impact and the context of the impact.

The intensity of the impact is characterized by the duration of the exposure and the salinity range of the impact.

- For a chronic exposure, a water body receiving a Stage 1 impact (some acreage of that water body would have salinities in the Stage 1:36 to 38 ppt range) would be considered to experience a potentially significant impact. A water body that would receive Stage 2 to 4 impacts (salinities greater than 39 ppt) would be considered to have experienced a significant impact. Impacts to water bodies that are predicted to have salinities of 35 ppt or less (ambient or drought conditions) would be considered to be not significant or less than significant. In terms of intensity any Stage 1 impact (between 36 to 38 ppt) would be potentially significant.
- For an acute exposure, a water body receiving a Stage 1 impact (some acreage of that water body would have salinities in the Stage 1: 36 to 38 ppt range) would be considered to have experienced no significant impact. A water body that would receive Stage 2 (salinities in the 39-41 ppt range) would be considered to have experienced a potentially significant impact. A water body that would receive Stage 3 to 4 impacts (salinities greater than 41 ppt) would be considered to have a significant impact. To summarize, impacts to water bodies that are predicted to have salinities of 38 ppt or less (ambient, drought, or Stage 1 conditions) would

be considered to be not significant or less than significant. In terms of intensity, any Stage 2 impact (between 39 to 41 ppt) would be potentially significant.

For the IRP conditions, all discharge locations would undergo periods with discharge salinities greater than 45 ppt in the immediate vicinity of the discharge point. Therefore all discharges were considered potentially significant based on the intensity of the potential salinity.

The context of the impact is characterized by the percentage of the water body that would fall into a significant salinity range. There is not enough information about the ecology of the South Bay to determine the exact percentage of habitat affected above which impacts should be considered significant. For the purposes of this analysis, a conservative approach was taken. Ten percent was chosen as the threshold for the spatial component of impact assessment. This number is somewhat arbitrary, but is well below the 30 percent threshold used in many habitat assessments. Additionally, the duration of the impacts assessed is very short (ranges from 24 hours to several weeks). The area of each receiving water was calculated using an upstream boundary of estuarine environment (2 to 4 ppt salinity). For chronic exposures (i.e., based on 24-hr daily average conditions), impacts that would result in 10 percent or more of a water body falling into Stages 2 through 4 are considered significant. For acute exposures (i.e., based on 2-hr daily maximum conditions), impacts that would result in 10 percent or more of a water body falling into Stages 3 through 4 are considered significant.

These two significance thresholds, based on impact intensity and impact context, were combined qualitatively to arrive at an overall significance rating for short-term (Initial Release Period) impact for each receiving water body. The data used to determine the significance of short-term salinity impacts to receiving water bodies are presented in summary form in Table 4-5. As shown in Table 4-5, for each water body, the analysis looked at modeled daily maximum and daily average salinities under the Simultaneous April-March Initial Discharge Scenario (Alternative 2) and Phased Initial Discharge Scenario (Alternative 3). In addition, the analysis looked at short-term salinity impacts to Coyote Creek of breaching the Island Ponds.

For those areas with potentially significant temporary impacts affecting greater than 10 percent of a water body, preventative mitigation measures are proposed, even though the overall project impacts are predicted to be less than significant. In these cases, the results of monitoring efforts will be carefully scrutinized and operational changes made if necessary to minimize temporary adverse effects on benthic communities.

Significance Evaluation for Long-term Salinity Impacts to Water Quality

The data from modeling of salinities in each of the receiving water bodies during the Continuous Circulation Phase (CCP) were used to evaluate the significance of the long-term impacts of pond discharges. The significance of the long-term impacts to each of the receiving water bodies was determined by analyzing the intensity of the impact and the context of the impact, using the same salinity categories and significance criteria as for the short-term impacts.

The data used to determine the significance of long-term salinity impacts to receiving water bodies are presented in summary form in Table 4-6. The analysis looked at modeled daily maximum and daily average salinities under the ISP for each receiving water body during the late summer (September) when ambient salinities in the bay are at the annual maximums.

Table 4-5
Summary of Short-term (Temporary) Salinity Impacts for Maximum Day During IRP

			Acres By Salinity Class[1]								
Receiving Water and Alternatives	**Date[2]**	**Total Acres**	**Ambient Conditions**	**Drought Conditions**	**Stage 1**	**Stage 2**	**Stage 3**	**Stage 4**	**Duration[3]**	**Context[4] – Percent of Area**	**Impact Significance**
SF Bay - Alviso											
Alternative 2	4-Apr										
Daily Maximum (2-hr)[5]		29,536	27,869	849	316	198	256	48		1.0	LTS
Daily Average (24-hr)[6]		29,546	28,775	385	198	168	10	10		0.6	LTS
Alternative 3	4-Jul										
Daily Maximum (2-hr)[5]		29,536	22,120	5,387	1,384	376	206	63		0.9	LTS
Daily Average (24-hr)[6]		29,546	25,108	3,341	603	119	336	40		1.7	LTS
SF Bay - Baumberg											
Alternative 2	23-Apr										
Daily Maximum (2-hr)[5]		11,868	11,495	304	49	10	5	5		0.1	LTS
Daily Average (24-hr)[6]		11,868	11,631	168	49	0	10	10		0.2	LTS
Alternative 3	4-Jul										
Daily Maximum (2-hr)[5]		11,868	10,885	563	306	99	10	5		0.1	LTS
Daily Average (24-hr)[6]		11,868	11,186	385	208	89	0	0		0.7	LTS
Coyote Creek											
Alternative 2	5-May										
Daily Maximum (2-hr)[5]		1,232	1,212.5	1.7	0.9	0.3	0.2	4.2		0.4	LTS
Daily Average (24-hr)[6]		1,232	1,226.4	1.1	0.8	0.0	0.2	3.2		0.3	LTS
*Island Ponds***											
Breach		1,236	1,233	3	0	0	0	0		0.0	LTS
Alviso Slough											
Alternative 2	8-Apr										
Daily Maximum (2-hr)[5]		273	120.5	21.8	73.5	54.2	2.5	0.3		1.0	LTS
Daily Average (24-hr)[6]		273	224.7	43.2	4.6	0	0.2	0.0		0.0	LTS
Alternative 3	16-Jul										
Daily Maximum (2-hr)[5]		273	151.5	19.6	67	28.0	5.6	1.1		2.4	LTS
Daily Average (24-hr)[6]		273	271.0	1.5	0.2	0.0	0.0	0.0		0.0	LTS
Guadalupe Slough											
Alternative 2	22-Apr										
Daily Maximum (2-hr)[5]		376	368.3	4.0	1.7	1.4	0.2	0.2		0.1	LTS
Daily Average (24-hr)[6]		376	369.9	3.6	1.7	0.5	0.2	0.0		0.2	LTS

			Acres By Salinity Class[1]								
Receiving Water and Alternatives	**Date[2]**	**Total Acres**	**Ambient Conditions**	**Drought Conditions**	**Stage 1**	**Stage 2**	**Stage 3**	**Stage 4**	**Duration[3]**	**Context[4] – Percent of Area**	**Impact Significance**
Alternative 3	24-Jul										
Daily Maximum (2-hr)[5]		376	158.3	92.4	121.3	3.3	0.3	0.2		0.1	LTS
Daily Average (24-hr)[6]		376	299.5	75.1	1.2	0.0	0.0	0.0		0.0	LTS
Alameda FCC											
Alternative 2	2-May										
Daily Maximum (2-hr)[5]		254	132.0	15.5	17.9	60.2	28.3	0.2	1 day	11.2	S
Daily Average (24-hr)[6]		254	187.1	64.7	2.1	0.1	0.0	0.1		0.0	LTS
Old Alameda Creek*											
Alternative 2											
Daily Maximum (2-hr)[5]		70						70	2 weeks	100	S
Daily Average (24-hr)[6]		70						70	2 weeks	100	S
Alternative 3											
Daily Maximum (2-hr)[5]		70						70	2 weeks	100	S
Daily Average (24-hr)[6]		70						70	2 weeks	100	S
Ravenswood Slough	3-Mar										
Daily Maximum (2-hr)5		116	20	58	15	15	4	4		6.9	PS
Daily Average (24-hr)6		116	104	8	4	0	0	0		0	LTS
All Sloughs (Total)											
Alternative 2	varies										
Daily Maximum (2-hr)5		2,321	1,853	101	111	131	35	79		4.8	LTS
Daily Average (24-hr)6		2,321	2,112	121	13	1	1	73		3.4	LTS
Alternative 3	varies										
Daily Maximum (2-hr)5		2,321	1,674	1987	222	107	39	80		5.1	LTS
Daily Average (24-hr)[6]		2,321	2,088	150	8	0	0	73		3.3	LTS

Notes:

[1] Ambient Conditions = <33ppt salinity; Drought Conditions = 33-35 ppt salinity; Stage 1 = 36-38 ppt salinity; Stage 2 = 36-38 ppt salinity; Stage 3 = 42-45 ppt salinity; Stage 4 = >45 ppt salinity

[2] Date of maximum day of areal impact during IRP.

[3] Duration of period with 10% or more of area within significant category.

[4] Context – Areal extent of significant intensity classes; greater than 10% considered significant.

[5] Daily maximum salinity predicted for approximately 2 hours of maximum day of IRP.

[6] Daily average salinity over 24 hours of maximum day of IRP.

*** Old Alameda Creek was not modeled in the same detail as the other receiving waters.**

**** Island Ponds – notes that the Island Pond breach would not ccur at the same time as any other initial release.**

Table 4-6
Summary of Long-term (Permanent) Salinity Impacts for Late Summer Conditions During CCP

			Acres By Salinity Class[1]								
Receiving Water and Alternatives	**Date[2]**	**Total Acres**	**Ambient Conditions**	**Drought Conditions**	**Stage 1**	**Stage 2**	**Stage 3**	**Stage 4**	**Duration[3]**	**Context[4] – Percent of Area**	**Impact Significance**
SF Bay – Alviso											
Daily Maximum (2-hr)[5]		11,868	11,243	620	5	0	0	0		0	LTS
Daily Average (24-hr)[6]		11,868	11,598	270	0	0	0	0		0	LTS
SF Bay – Baumberg											
Daily Maximum (2-hr)[5]		29,536	7,386	22,150	20	0	0	0		0	LTS
Daily Average (24-hr)[6]		29,536	11,816	17,720	0	0	0	0		0	LTS
Coyote Creek											
Daily Maximum (2-hr)[5]		1,232	1,168	61	3.2	0	0	0		0	LTS
Daily Average (24-hr)[6]		1,232	1,202	30	0	0	0	0		0	LTS
Alviso Slough											
Daily Maximum (2-hr)[5]		273	270	3	0.1	0	0	0		0	LTS
Daily Average (24-hr)[6]		273	271	2	0	0	0	0		0	LTS
Guadalupe Slough											
Daily Maximum (2-hr)[5]		376	372	4	0.2	0	0	0		0	LTS
Daily Average (24-hr)[6]		376	373	3	0	0	0	0		0	LTS
Alameda FCC											
Daily Maximum (2-hr)[5]		254	102	152	0.2	0	0	0		0	LTS
Daily Average (24-hr)[6]		254	164	80	0	0	0	0		0	LTS
Old Alameda Creek*											
Daily Maximum (2-hr)[5]		70	0	70	0.1	0	0	0		0	LTS
Daily Average (24-hr)[6]		70	0	70	0	0	0	0		0	LTS
Ravenswood Slough											
Daily Maximum (2-hr)[5]		116	0	56	25	25	10	0		8.6	PS
Daily Average (24-hr)[6]		116	0	116	0	0	0	0		0	LTS
All Sloughs (Total)											
Daily Maximum (2-hr)[5]		2,341	1,911	346	28.8	25	10	0		0.4	LTS
Daily Average (24-hr)[6]		2,341	2,020	201	0	0	0	0		0	LTS

Notes:

[1] Ambient Conditions = <33ppt salinity; Drought Conditions = 33-35 ppt salinity; Stage 1 = 36-38 ppt salinity; Stage 2 = 36-38 ppt salinity; Stage 3 = 42-45 ppt salinity; Stage 4 = >45 ppt salinity

[2] Date of maximum day of areal impact during IRP.

[3] Duration of period with 10% or more of area within significant category.

[4] Context – Areal extent of significant intensity classes; greater than 10% considered significant.

[5] Daily maximum salinity predicted for approximately 2 hours of maximum day of IRP.

[6] Daily average salinity over 24 hours of maximum day of IRP.

4.3.1.4 Salinity Impacts to Water Quality By Alternative

Salinity Impacts to Water Quality—No Project/No Action Alternative

Under the No Project/No Action alternative, no waters would be let into or out of the ponds and the levees would not be maintained. Most of the existing open water habitats currently used by wildlife would be greatly reduced, significantly changing the character of the South Bay salt ponds. The duration and depth of water in the ponds would be reduced in most years, and the open water character of the salt ponds would be lost. The existing intake structures for each pond complex would be closed. Intake ponds would no longer be present, so the pond systems would not support fish and bay invertebrates, resulting in reduced foraging habitat for piscivorous (fish-eating) birds.

> *WATER QUALITY (SALINITY) IMPACT-1*: *Salinity in ponds could be concentrated by evaporation. Unplanned breaches of ponds could result in water quality impacts from increased salinity in receiving waters.*

Under the No Project/No Action Alternative, bay water would not be let into the ponds and salinity levels would not be managed. Additionally, levees would not be maintained and unplanned breaches of the ponds would be more likely to occur. Depending on the salt mass remaining in the ponds, salinity levels in the pond discharge after a breach may be greater than bay conditions at the time. Any breach of the project ponds would have potentially significant impacts on water quality and biota due to elevated salinity.

Significance: Potentially significant. Since this alternative would result in no project being implemented, no mitigation measures are required.

Alternative 1 – Seasonal Pond Alternative

This alternative minimizes impacts from uncontrolled discharge of pond contents into the bay. Maintenance of the levees and water control structures would prevent their deterioration and prevent the accidental breaching of the ponds and release of pond contents to the bay. Since pond levees would be maintained under this alternative, water quality impacts from unplanned levee breaches are not anticipated. Under this alternative, most of the existing open water habitats currently used by wildlife would be greatly reduced, significantly changing the character of the South Bay salt ponds. The duration and depth of water in the ponds would be reduced in most years, and the open water character of the salt ponds would be lost. The existing intake structures for each pond complex would be closed. Intake ponds would no longer be present. so the pond systems would not support fish and bay invertebrates, resulting in reduced foraging habitat for piscivorous (fish-eating) birds.

The Seasonal Pond Alternative would have minimal impacts on receiving waters, but existing, in-pond open water habitat values would decline because of the temporary seasonal water levels each year. The alternative would not meet project objectives of maintaining existing open water and wetland habitat for the benefit of wildlife, including habitat for migratory shorebirds and waterfowl and resident breeding species or maintaining ponds in a restorable condition to facilitate future long-term restoration.

WATER QUALITY IMPACT (CONSTRUCTION) 2-: Impacts from contaminants and/or suspended sediments could result from the mobilization of construction equipment to repair breached levee sites.

This Seasonal Pond Alternative would require the maintenance of the levees. Contaminants (e.g., petroleum products) associated with the operation of equipment and other construction activities may enter the receiving waters. The contaminants could adversely affect fish and macroinvertebrates by affecting their growth, reproduction, and overall survival. In addition, sediment would be mobilized during repair activities. The increased suspended sediment could adversely affect benthic and planktonic organisms, including fish. The effect, however, would likely be minimal because of the relatively small area affected and the high rates of sediment mobility in the South Bay and associated creeks and sloughs.

Significance: Potentially Significant

WATER QUALITY (CONSTRUCTION) MITIGATION MEASURE-2A: Best management practices.

As part of this alternative, best management practices (BMPs) for construction and levee repair and maintenance would be followed. A hazardous spill prevention and response plan would be prepared and incorporated as part of the alternative. In addition, an erosion control and sediment management plan would be developed and included as part of the alternative. Management plans (including emergency response, routine maintenance activity, and preventative maintenance activities) would be prepared and implemented as part of the levee repair and maintenance activities. Plans would be provided to NOAA Fisheries, CDFG, USFWS, and the RWQCB for review and comment.

Post Mitigation Significance: Less than significant.

Alternative 2-Simultaneous March-April Initial Release

Since pond levees would be maintained under this alternative, water quality impacts from unplanned levee breaches are not anticipated. In Alternative 2 (Simultaneous Initial Release), the contents of most of the Alviso and Baumberg Ponds would be released simultaneously in March and April. The ponds would then be managed as a mix of continuous circulation ponds, seasonal ponds and batch ponds, though management of some ponds could be altered through adaptive management during the continuous circulation period. Higher salinity ponds in Alviso and in the West Bay would be discharged in March and April in a later year when salinities in the ponds have been reduced to appropriate levels. The Island Ponds (A-19, 20, and 21) would be breached and open to tidal waters.

WATER QUALITY IMPACT (CONSTRUCTION)-2: Impacts from contaminants and/or suspended sediments could result from the mobilization of construction equipment to repair breached levee sites.

The Simultaneous Initial Discharge Alternative would require the construction of intake and outlet structures and ongoing maintenance of the levees. Contaminants (e.g., petroleum products) associated with the operation of equipment and other construction activities may enter the receiving waters. The contaminants could adversely affect fish and macroinvertebrates by affecting their growth, reproduction, and overall survival. In addition, sediment would be mobilized during repair activities. The increased suspended sediment could adversely affect benthic and planktonic organisms, including fish. The effect, however, would likely be minimal because of the relatively small area affected and the high rates of sediment mobility in the South Bay and associated creeks and sloughs.

Post Mitigation Significance: Less than significant.

WATER QUALITY (CONSTRUCTION) MITIGATION MEASURE-2A: *Best management practices.*

As part of this alternative, best management practices (BMPs) for construction and levee repair and maintenance would be followed. A hazardous spill prevention and response plan would be prepared and incorporated as part of the alternative. In addition, an erosion control and sediment management plan would be developed and included as part of the alternative. Management plans (including emergency response, routine maintenance activity, and preventative maintenance activities) would be prepared and implemented as part of the levee repair and maintenance activities. Plans would be provided to NOAA Fisheries, CDFG, USFWS, and the RWQCB for review and comment.

Significance: Less than significant.

WATER QUALITY (SALINITY) IMPACT-3: *Discharges from ISP ponds could result in water quality impacts from increased salinity inputs to the South Bay.*

During the Continuous Circulation Period, increases in average salinities in the South Bay proper are expected to be virtually nonexistent. For daily-averaged salinity, it is predicted that any increases will be 1 ppt or less and occur in very localized areas near discharge points and at the mouths of sloughs.

The predicted daily maximum salinity at the Alviso A2W discharge and Baumberg pond 2 and 10 discharges may exceed 35 ppt at low tide in September and October when pond and bay salinities reach their annual maximums. For the modeled dry year conditions, approximately 40 acres of the bay mudflats near the discharges could have daily maximum salinities in the range of 36 to 41 ppt. This estimate is based on sheet flow from discharge points without any channel formation. However, past experience indicates that at predicted average discharge flowrates of approximately 30 cubic feet per second (cfs) channels will form through the mudflats over time and this acreage would be greatly reduced. Approximately 43,000 acres, or 60 percent of the South San Francisco Bay south of the San Mateo Bridge, would have daily maximum salinities in the range of 33 to 35 ppt for the same period without the project discharges. Consequently, impacts to aquatic life in South Bay proper, resulting from elevated salinity, are not expected during the long-term Continuous Circulation Period.

For Alternative 2, during the Initial Release Period the increase in depth-averaged, daily-averaged salinity is predicted to be less than 3 ppt except in localized areas near discharge points and at the mouths of sloughs where increases may be as high as 4 ppt. The salinity increases are predicted to be less for Alternative 3. Based on the available literature, these small increases in salinity are unlikely to adversely impact the estuarine species that are resident in the affected segments of South San Francisco Bay. The resident organisms in the South Bay normally experience variations of several ppt on a daily basis and up to 10 ppt daily on a seasonal basis. The predicted maximum daily average salinity in the South Bay proper is less than the recorded drought conditions.

On the maximum day during the Initial Release Period, the daily maximum salinities in the mud flat areas near the discharges at Alviso A2W discharge and Baumberg Ponds 2 and 10 discharges would be close to the maximum discharge salinity of 65 ppt. The actual area of high salinity at low tide was assumed to be a shallow flow path through the mudflats, approximately 100 ft wide, from the discharge location to the deeper area of the bay. However, with deeper channel formation, the acreage would be less, with a mudflat channel on the order of 30 feet in width at the predicted discharge rates. This would correspond to approximately 15 acres of mudflat at Baumberg Pond 2 and less than 5 acres of mudflat at Alviso A2W and Baumberg Pond 10.

Significance: Short-term impact (IRP) - Less than Significant
Long-term impact (CCP) - Less than Significant

> *WATER QUALITY (SALINITY) IMPACT-4:* Discharges from ISP ponds could result in water quality impacts from increased salinity inputs to Coyote Creek (Alviso Complex)

The total area of the portion of Coyote Creek and Artesian Slough considered in the impact analysis is 1,232 acres. Discharges are proposed from ponds A14 and A16 into the creek and slough. Both discharges have been evaluated for Alternative 2.

During the Continuous Circulation Period, elevated salinities in Coyote Creek are expected to be quite low. For daily-averaged salinity, it is predicted that any increases will be 3 ppt or less and will occur in creek segments in the immediate vicinity of the Pond A14 discharge point. The area of Coyote Creek is directly affected by the freshwater discharge from the San Jose WPCP (Water Pollution Control Plant), so additional salinity inputs would likely be beneficial to this creek section. The predicted daily maximum salinity at the Alviso A14 discharge may exceed 35 ppt at low tide in September and October when pond and bay salinities reach their annual maximums. For the modeled dry year conditions, only an approximate 3.2 acres of Coyote Creek in the immediate discharge channel would have daily maximum salinities in the range of 36 to 41 ppt. Consequently, impacts to aquatic life in Coyote Creek as a whole resulting from elevated salinity are not expected during the long-term Continuous Circulation Period.

For the maximum day during the Initial Release Period, for Alternative 2, the maximum increase in salinity in the creek is predicted to be 14 ppt near the Pond A14 discharge. Salinity increases will be lower in other segments of the creek, and nowhere in the creek away from the outlet will depth-averaged and daily-averaged salinities exceed approximately 32 ppt. At the end of the Initial Release Period, a maximum salinity increase of 6 ppt will occur near the Pond A14 discharge point, and lower salinity increases will occur in other segments of the creek.

During the maximum day during the Initial Release Period for the Alternative 2, a very limited area of Coyote Creek and Artesian Slough would have average daily salinity greater than 35 ppt (approximately 3.4 acres). There are 1,226 acres that would not exceed the ambient salinity category. The higher salinity areas include 3.2 acres greater than 45 ppt, which corresponds to salinity category Stage 4. This area primarily includes the access channel cut to the A15 dredge lock near the A14 discharge to the Coyote Creek.

Approximately 4.2 acres near the discharge outlet would have daily maximum salinity greater than 45 ppt. The daily maximum salinity would occur for a few hours of the day, with the estimate based on the highest twohours during the day. In these very limited areas, Coyote Creek may reach salinities in a range to affect sensitive species on the day with the highest salinity during the entire Initial Release Period.

Coyote Creek was not included in the Alternative 3 Phased Initial Release Alternative evaluation. If Alternative 3 is implemented, the pond A14 and A16 systems circulation would not occur in the first year, but would occur the following March/April. In that case, the predicted salinities in Coyote Creek and Artesian Slough would be similar to Alternative 2, which is based on a March/April Initial Release. The Coyote Creek salinities for the Phased Initial Release would be lower than the Simultaneous Initial Release Alternative because the other pond systems in Alviso (A2W, A3W, and A7) would not be in the same Initial Release Period.

Island Ponds Breach Conditions –The Island Ponds (A19, A20, and A21) will be breached as part of the ISP, though after the initial releases of the other ponds. The Island Pond Breach effects would be the same for both Alternative 2 and Alternative 3. It is anticipated that the Island Ponds breach construction would be completed after the Initial Release Period has been completed for all the other pond systems in the Alviso Unit. Until that time,the Island Ponds are necessary for operation of the existing salt pond system. The Island Ponds were evaluated for two conditions: a long-term operation condition with large established levee breaches and an Initial Release Period condition with restricted breach opening during the first few weeks of the breach condition.

The pond elevations is the Island Ponds are high enough to affect the timing and magnitude of tidal circulation. The existing pond bottoms for the Island Ponds are near elevation 2 feet NGVD, approximately 2 feet below mean higher high water. During the long-term operation of the Island Ponds with the breaches during the Continuous Circulation Period, the ponds (except for the perimeter borrow ditches) would only contain water for a few hours at high tide. Therefore, the ponds would not contain water with higher salinity than the inflow from Coyote Creek. Initially, there may be some limited saltpans on the pond bottom due to low areas, which do not drain. The effect of the Island Ponds on the salinity in Coyote Creek will be to increase the tidal prism entering Coyote Creek from the bay, and therefore to increase the minimum salinities in the creek. Based on the hydrodynamic model, it is predicted that the daily averaged salinities in Coyote Creek will increase by 4 ppt or less. These increases in salinity are unlikely to adversely affect the estuarine species, that are resident in the impacted segments of Coyote Creek. The resident organisms in Coyote Creek normally experience variations of 15-20 ppt on a daily basis and up to 30 ppt on a seasonal basis. However, since this area of Coyote Creek is predominantly affected by freshwater flowed from the San Jose WPCP, this long-term salinity increase would likely beneficially affect the benthic and vegetative communities in the area by restoring more natural conditions.

During the Initial Release Period, the maximum discharge salinity from the Island Ponds would be 135 ppt for all three ponds. The proposed Initial Breach Scenario included a restricted initial breach into each pond, with a bottom width of 25 m and the bottom of the breach at the bottom of the pond. Based on the rate of breach erosion observed at two breach locations in Napa, the assumed initial breaches are oversized and would result in conservatively high estimates for the discharge from the Island Ponds during the Initial Release. The maximum increase in salinity is predicted to be 12 ppt near the Island Pond discharges. Salinity increases will be lower in other segments of the creek, and nowhere in the creek will depth-averaged and daily-averaged salinities exceed approximately 30 ppt. At the end of the Initial Release Period, a maximum salinity increase of 4 ppt will occur near Pond A19 breaches and lower salinity increases will occur in other segments of the slough.

On the maximum day during the Initial Release Period for the Island Pond breach condition, an extremely small area (approximately 1 acre) of Coyote Creek Slough would have average daily salinity greater than 32 ppt. Approximately 2 acres near the discharge outlet would have daily maximum salinity greater than the drought salinity category.

These increases in salinity are unlikely to adversely impact the estuarine species, that are resident in the impacted segments of Coyote Creek. The resident organisms in Coyote Creek normally experience variations of 15-20 ppt on a daily basis and up to 30 ppt on a seasonal basis.

Significance: Short-term impact (IRP)-Less than Significant
Long-term impact (CCP)-Less than Significant

> BENEFICIAL WATER QUALITY (SALINITY) IMPACT-1: Discharges from ISP ponds could result in beneficial water quality impacts from increased salinity inputs to Coyote Creek, which would help mitigate releases of fresh water from the San Jose WPCP.

Releases of fresh water from the San Jose WPCP have caused salinity in Coyote Creek to be lower than it would be under natural conditions. During the CCP, salinity input from the ISP ponds could cause a beneficial impact by raising salinity to more natural levels. No mitigation required for beneficial impacts.

> *WATER QUALITY (SALINITY) IMPACT-5: Discharges from ISP ponds could result in water quality impacts from increased salinity inputs to Alviso Slough (Alviso Complex)*

The total area of the portion of Alviso Slough considered in the model is 273 acres. Discharge is proposed from pond A7 into the slough. Alviso Slough has been evaluated for the Alternative 2 Simultaneous March/April Initial Release and the Alternative 3 Phased July Initial Release.

During the Continuous Circulation Period, elevated salinities in Alviso Slough are expected to be moderate. For daily-averaged salinity, it is predicted that any increases will be 8 ppt or less and will occur in slough segments near the Pond A7 discharge point. The predicted daily maximum salinity at the Alviso A7 discharge may exceed 35 ppt at low tide in September and October when pond and bay salinities reach their annual maximums. For the modeled dry-year conditions, approximately 0.1 acres of Alviso Slough in the immediate vicinity of the discharge would have daily maximum salinities in the range of 36 to 41 ppt. Consequently, impacts to aquatic life in Alviso Slough resulting from elevated salinity are not expected during the Continuous Circulation Period. However, some benthic community changes could occur near the discharge location.

During the Initial Release Period for Alternative 2 Simultaneous Initial Release, the maximum daily averaged increase in salinity is predicted to be 20 ppt near the Pond A7 discharge. Salinity increases will be lower in other segments of the slough and nowhere in the slough away from the outfall will depth-averaged and daily-averaged salinities exceed approximately 37 ppt. At the end of the Initial Release Period, a maximum salinity increase of 8 ppt will occur near the Pond A7 discharge point, and lower salinity increases will occur in other segments of the slough.

On the maximum day during the Initial Release Period for the Alternative 2 Simultaneous Initial Release, approximately 0.2 acres of Alviso Slough would have average daily salinity greater than 39 ppt which would be greater than the drought salinity category.

Approximately 3 acres would have daily maximum salinity greater than 42 ppt and would be in the Stage 3 salinity category or greater. The daily maximum salinity would occur for a few hours of the day, with the estimate based on the highest 2 hours during the day. Localized impacts to resident aquatic species may include temporary loss of the most sensitive benthic species. Fish may migrate out of the higher salinity slough segments during the period of highest salinity.

The area of significant salinity intensity for both the daily averaged and daily maximum salinity is less than 10 percent of the overall slough area. However, the area with potentially significant salinity does exceed 10 percent on the maximum day within the IRP. For approximately one week during the two-month IRP, the daily maximum salinity would be in the potentially significant category or above.

Significance: Short-term impact (IRP) – Potentially Significant
Duration approximately one week
Long-term impact (CCP) - Less than Significant

> *WATER QUALITY (SALINITY) MITIGATION MEASURE-1A*: *Conduct pre-discharge and post-discharge monitoring.*
>
> *WATER QUALITY (SALINITY) MITIGATION MEASURE-1B:* If monitoring identifies the potential for significant impacts to benthic invertebrates, operational changes in releases, such as slowing the rate of discharge, will be made. Reduced discharge flow rates may extend the period of increased salinity during the initial release. However, pond operation plans evaluated in the hydrodynamic models have not included adaptive management of the pond discharge during the IRP. The discharge culverts include control gates which were assumed partially open, but not adjusted during the IRP. Because the predicted salinity impacts for Alviso Slough occur for an estimated one week during the IRP it would be feasible to reduce the discharge for a portion of the IRP, and increase the discharge flow later. The modified operation would decrease the maximum predicted salinity conditions, but may extend the period with more moderate increased salinity.

Post-Mitigation Significance: Less than significant (short-term and long-term impacts)

WATER QUALITY (SALINITY) IMPACT-6: Discharges from ISP ponds could result in water quality impacts from increased salinity inputs to Guadalupe Slough (Alviso Complex)

The total area of the portion of Guadalupe Slough considered in the impact assessment is 376 acres. Discharge is proposed from pond A3W into the slough. Guadalupe Slough has been evaluated for Alternative 2 Simultaneous March/April Initial Release and Alternative 3 Phased July Initial Release.

During the Continuous Circulation Period, elevated salinities in Guadalupe Slough are expected to be moderate. For daily-averaged salinity, it is predicted that any increases will be 8 ppt or less and will occur in slough segments near the Pond A3W discharge point. The predicted daily maximum salinity at the A3W discharge may exceed 35 ppt at low tide in September and October when pond and bay salinities reach their annual maximums. For the modeled dry-year conditions, approximately 0.2 acres of Guadalupe Slough in the immediate vicinity of the discharge would have daily maximum salinities in the range of 36 to 41 ppt. Consequently, impacts to aquatic life in Guadalupe Slough resulting from elevated salinity are not expected during the Continuous Circulation Period. However, some benthic community changes could occur near the discharge location.

During the Initial Release Period for Alternative 2, the increase in daily averaged salinity in the slough is predicted to be 18 ppt near the Pond A3W discharge. Salinity increases will be lower in other segments of the slough and nowhere in the slough away from the outlet will depth-averaged and daily-averaged salinities exceed approximately 37 ppt. At the end of the Initial Release Period, a maximum salinity increase of 14-16 ppt will occur near the Pond A3W discharge point, and lower salinity increases will occur in other segments of the slough.

On the maximum day during the Initial Release Period for Alternative 1 Maximum Salinity Scenario, approximately 0.4 acres of Guadalupe Slough would have average daily salinity greater than 39 ppt.

On the maximum day, the daily maximum salinity in Guadalupe Slough would exceed 42 ppt (Stage 3 or greater) for approximately 0.4 acres. The daily maximum salinity would occur for a few hours of the day, with the estimate based on the highest 2 hours during the day. In these limited areas, Guadalupe Slough may reach salinities in a range to affect sensitive species on the day with the highest salinity during the entire Initial Release Period.

Significance: Short-term impact (IRP) Less than Significant
Long-term impact (CCP) Less than Significant

WATER QUALITY (SALINITY) IMPACT-7: Discharges from ISP ponds could result in water quality impacts from increased salinity inputs to Alameda Flood Control Channel (AFCC) (Baumberg Complex)

The total area of the portion of Alameda Flood Control Channel considered in the impact assessment is 254 acres. The only ISP discharge is proposed from pond 2C into the channel. The AFCC has been evaluated for the Alternative 2 Simultaneous March/April Initial Release.

During the Continuous Circulation Period, elevated salinities in the AFCC are expected to be quite low. For daily-averaged salinity, it is predicted that any increases will be in the range of 1-4 ppt and occur in channel segments near the Pond 2C discharge point. The predicted daily maximum salinity at the Pond 2C discharge may exceed 35 ppt at low tide in September and October when pond and bay salinities reach their annual maximums. For the modeled dry year conditions, approximately 0.2 acres of the AFCC in the immediate vicinity of the discharge would have daily maximum salinities in the range of 36 to 41 ppt. Consequently, impacts to aquatic life in the AFCC resulting from elevated salinity are not expected during the long-term Continuous Circulation Period.

During the Initial Release Period, for Alternative 2, the maximum increase in daily average salinity is predicted to be 14 ppt near the Pond 2C discharge. Salinity increases will be lower in other segments of the channel, and nowhere in the channel will depth-averaged and daily-averaged salinities exceed approximately 41 ppt. At the end of the Initial Release Period, a maximum salinity increase of 6 ppt will occur near the Pond 2C discharge point, and lower salinity increases will occur in other segments of the channel.

On the maximum day during the IRP, average daily salinity would exceed 39 ppt (Stage 2 or greater) for approximately 0.1 acres. The average daily salinity in 99 percent of AFCC is in the ambient or drought salinity categories.

On the maximum day during the IRP, the daily maximum salinity in AFCC would exceed 42 ppt (Stage 3 or greater) for approximately 28 acres. Daily maximum salinities may exceed 42 ppt for 10 percent of the channel for less than one day during the Initial Release Period. The daily maximum salinity would occur for a few hours of the day, with the estimate based on the highest 2 hours during the day. Impacts to aquatic species may include temporary loss of the most sensitive benthic species. Fish may migrate out of the higher salinity or stream segments during this period.

The AFCC channel was not included in the Alternative 3 Phased Initial Release. If the phased scenario is implemented, the pond 2C circulation would not occur in the first year but would occur the following March/April. In that case, the predicted salinities in AFCC would be similar to Alternative 2, which is based on an March/April Initial Release.

Significance: Short-term impact (IRP) –Significant, mitigated (see below)
Duration approximately 1 day
Long-term impact (CCP) - Less than Significant

> *WATER QUALITY (SALINITY) MITIGATION MEASURE-2A:* Conduct pre-discharge monitoring.
>
> *WATER QUALITY (SALINITY) MITIGATION MEASURE-2B:* If monitoring identifies the potential for significant impacts to benthic invertebrates, operational changes in releases, such as slowing the rate of discharge, will be made. Reduced discharge flow rates may extend the period of increased salinity during the initial release. However, pond operation plans evaluated in the hydrodynamic models have not included adaptive management of the pond discharge during the IRP. Because the predicted salinity impacts for AFCC occur for an estimated one day during the IRP it would be feasible to reduce the discharge for a portion of the IRP, and increase the discharge flow later. The modified operation would

decrease the maximum predicted salinity conditions, but may extend the period with more moderate increased salinity.

Post-Mitigation Significance: Less than significant (short-term and long-term impacts)

WATER QUALITY (SALINITY) IMPACT-8: Discharges from ISP ponds could result in water quality impacts from increased salinity inputs to Old Alameda Creek (Baumberg Complex)

The total area of the portion of Old Alameda Creek Slough considered in the impact assessment is 70 acres. Discharge is proposed from pond 8A into the creek. Old Alameda Creek has been evaluated for Alternative 2 and Alternative 3.

Due to the size of the Old Alameda Creek channel, the creek was not modeled using the 3-dimensional hydrodynamic model used for AFCC and the Alviso Region sloughs. The existing creek channel has two separate flow paths, a north channel and a south channel. The existing deposited silt between the two is higher than mean higher high water in most areas. The north channel, which would include the proposed 8A discharge, is less than 200 feet wide overall, with a typical low flow channel about 40 feet wide. Due to the size of the channel, it was not considered feasible to model salinity in three dimensions.

Old Alameda was analyzed using a one-dimensional hydraulic model, the Corps of Engineers HEC-RAS computer model. The channel hydraulics were evaluated to estimate dilution ratios for the proposed pond 8A discharges. The dilution ratios were used to estimate the approximate salinity conditions in the creek. The hydraulic model included calculated tide and discharge estimates from the South San Francisco Bay modeling.

For the Continuous Circulation Period, the increase in salinity in Old Alameda Creek is expected to be minimal. The estimated dilution for long-term conditions in the pond is less than 15 percent pond discharge and 85 percent bay water. For late summer in a dry year with 28 ppt in the bay and 40 ppt discharge from pond 8A, the estimated salinity in the majority of Old Alameda Creek would be approximately 30 ppt. Consequently, impacts to aquatic life in Old Alameda Creek resulting from elevated salinity are not expected during the long-term Continuous Circulation Period.

The estimated dilution in the Continuous Circulation Period was based on existing channel and hydrology conditions in the north channel of Old Alameda Creek. However, the Eden Landing Restoration Project has started construction of the new North Creek and the Eden Landing Marsh. The project will increase the tidal prism and may increase the channel cross section over time. Therefore the Eden Landing Restoration Project will increase the estimated percentage of bay water available for dilution of the 8A discharge.

For Alternative 2 the maximum discharge salinity from pond 8A is 135 ppt. The estimated dilution ratio for the north channel of Old Alameda Creek is approximately 40 percent pond discharge and 60 percent bay inflow. This includes the estimated dilution of the average flood tide prism, the estimated pond discharge volume during the flood tide, and an allowance for "recycling" of the pond discharge. Recycling represents the portion of the pond discharge, that either would not reach the bay on the ebb tide or might be drawn back into the channel from the bay on a succeeding flood tide.

Based on a dilution ratio of 40 percent pond water, pond discharge salinity of 135 ppt, and average bay salinity of 22 ppt, the average salinity of Old Alameda Creek would be approximately 67 ppt. The majority of the north channel of Old Alameda Creek would be in the salinity category of Stage 4. This condition would occur for less than one week during the Initial Release Period. The pond discharge salinity would be less than 70 ppt within one week and less than 40 ppt within one month. The predicted salinity in Old Alameda Creek would be in the Stage 4 salinity category for one to two weeks during the initial discharge. This may result in potential impacts to resident aquatic species, including losses to most benthic, invertebrate, and fish communities.

The salinity evaluations for the Initial Release Scenarios were based on existing conditions in the north channel of Old Alameda Creek. The DFG has started construction of the Eden Landing Restoration Project, which includes construction of North Creek to connect the project area to Old Alameda Creek upstream of pond 8A. Completion of the North Creek channel would increase the daily tidal prism in Old Alameda Creek and would increase the potential dilution of the initial release discharges from Pond 8A. Beginning the Old Alameda Creek initial release after completion of channel improvements for the Eden Landing Restoration may reduce the predicted creek salinity and potential habitat impacts to near drought conditions.

Significance: Short-term impact (IRP) – Significant, mitigated (see below)
Duration approximately 2 weeks
Long-term impact (CCP) - Less than Significant

> *WATER QUALITY (SALINITY) MITIGATION MEASURE-2A:* Conduct pre-discharge monitoring.
>
> *WATER QUALITY (SALINITY) MITIGATION MEASURE-2B:* If monitoring identifies the potential for significant impacts to benthic invertebrates, operational changes in releases, such as slowing the rate of discharge, will be made. Reduced discharge flow rates may extend the period of increased salinity during the initial release. However, pond operation plans evaluated in the hydrodynamic models have not included adaptive management of the pond discharge during the IRP. Because the predicted salinity impacts for Old Alameda Creek occur for an estimated one day during the IRP it would be feasible to reduce the discharge for a portion of the IRP, and increase the discharge flow later. The modified operation would decrease the maximum predicted salinity conditions, but may extend the period with more moderate increased salinity.

Post-Mitigation Significance: Less than significant (short-term and long-term impacts)

Pond Management Alternative 3 (Phased Initial Release)

In Alternative 3 (Phased Initial Discharge), many of the lower salinity ponds in Alviso and Baumberg would be discharged in July, and the medium salinity ponds would be discharged the following March and April. These ponds would then be managed in the same manner as in Alternative 2 during the continuous circulation period. The higher salinity ponds would also be managed as in Alternative 2.

Note: Only the differences in impacts between Alternative 2 and 3 discussed below.

WATER QUALITY (SALINITY) IMPACT-5: Discharges from ISP ponds could result in water quality impacts from increased salinity inputs to Alviso Slough (Alviso Complex)

For the Alternative 3 Phased Initial Release the maximum increase in daily average salinity is predicted to be 18 ppt near the Pond A7 discharge. Salinity increases will be lower in other segments of the slough, and nowhere in the slough away from the outlet will depth-averaged and daily-averaged salinities exceed approximately 37 ppt. At the end of the Initial Release Period, a maximum salinity increase of 10 ppt will occur near the Pond A7 discharge location, and lower salinity increases will occur in other segments of the slough.

For the maximum day during the IRP for Alternative 3, no portion of Alviso Slough would have average daily salinity greater than 39 ppt (Stage 2 or greater).

For the maximum day during the IRP for Alternative 3, approximately 7 acres would have daily maximum salinity greater than 42 ppt (Stage 3 or greater). The daily maximum salinity would occur for a few hours of the day, estimated based on the highest 2 hours during the day. Localized impacts to resident aquatic species near the discharge location may include temporary loss of the most sensitive benthic species.

The area of significant salinity intensity for both the daily averaged and daily maximum salinity is less than 10 percent of the overall slough area. However, the area with potentially significant salinity does exceed 10 percent on the maximum day within the IRP. For approximately one week during the two-month IRP, the daily maximum salinity would be in the potentially significant category or above.

Significance: Short-term impact (IRP) – Potentially Significant
Duration approximately one week
Long-term impact (CCP) - Less than Significant

*WATER QUALITY (SALINITY) MITIGATION MEASURE-1A***:** Conduct pre-discharge and post-discharge monitoring.

WATER QUALITY (SALINITY) MITIGATION MEASURE-1B: If monitoring identifies the potential for significant impacts to benthic invertebrates, operational changes in releases, such as slowing the rate of discharge, will be made. Reduced discharge flow rates may extend the period of increased salinity during the initial release. However, pond operation plans evaluated in the hydrodynamic models have not included adaptive management of the pond discharge during the IRP. The discharge culverts include control gates which were assumed partially open, but were not adjusted during the IRP. Because the predicted salinity impacts for Alviso Slough occur for an estimated one week during the IRP it would be feasible to reduce the discharge for a portion of the IRP, and increase the discharge flow later. The modified operation would decrease the maximum predicted salinity conditions, but may extend the period with more moderate increased salinity. Based on the modeled operation plan, the entire slough would have daily maximum salinity less than 32 ppt after 6 weeks of the IRP.

Post-Mitigation Significance: Less than significant (short-term and long-term impacts)

WATER QUALITY (SALINITY) IMPACT-6: Discharges from ISP ponds could result in water quality impacts from increased salinity inputs to Guadalupe Slough

For Alternative 3 Phased July Initial Release, the maximum increase in daily averaged salinity in Guadalupe Slough is predicted to be 14 ppt near the Pond A3W discharge. Salinity increases will be lower in other segments of the slough. At the end of the Initial Release Period, a maximum salinity increase of 8 ppt will occur in the vicinity of the Pond A3W discharge location, and lower salinity increases will occur in other segments of the slough.

On the maximum day during the IRP for Alternative 3, approximately 1 acre of Guadalupe Slough would have average daily salinity greater than 35 ppt.

Approximately 4 acres of Guadalupe Slough would have daily maximum salinity greater than 39 ppt (Stage 2 or greater) for the maximum day of the Initial Release Period. The daily maximum salinity would occur for a few hours of the day, estimated based on the highest 2 hours during the day.

Significance: Short-term impact (IRP) – Less than Significant
Long-term impact (CCP) - Less than Significant

WATER QUALITY (SALINITY) IMPACT-8: Discharges from ISP ponds could result in water quality impacts from increased salinity inputs to Old Alameda Creek

For Alternative 3 Phased July Initial Release,the maximum discharge salinity from pond 8A is 135 ppt. The estimated dilution ratio for the north channel of Old Alameda Creek is approximately 60 percent pond discharge and 40 percent bay inflow. The pond dilution ratio is lower (increased fraction of pond discharge) than Alternative 2 because the Phased July Initial Release has increase initial discharge flow rates to avoid higher pond salinities during the summer season's increased evaporation. Based on a dilution ratio of 60 percent pond water, pond discharge salinity of 135 ppt, and average bay salinity of 22 ppt, the average salinity of Old Alameda Creek would be approximately 90 ppt. The majority of the north channel of Old Alameda Creek would be in the salinity category of Stage 4. This condition would occur for less than one week during the Initial Release Period. The pond discharge salinity would be less than 50 ppt within one week. The predicted salinity in Old Alameda Creek would be in the Stage 4 salinity category for one to two weeks during the Phased Initial Release Alternative. This may result in potential impacts to resident aquatic species, including severe losses to most benthic, invertebrate, and fish communities.

Significance: Short-term impact (IRP) – Significant, mitigated (see below)
Duration approximately 2 weeks
Long-term impact (CCP) - Less than Significant

WATER QUALITY (SALINITY) MITIGATION MEASURE-2A: Conduct pre-discharge monitoring.

WATER QUALITY (SALINITY) MITIGATION MEASURE-2B: If monitoring identifies the potential for significant impacts to benthic invertebrates, operational changes in releases, such as slowing the rate of discharge, will be made. Reduced discharge flow rates may extend the period of increased salinity during the initial release. However, pond operation plans evaluated in the hydrodynamic models have not included adaptive management of the pond discharge during the IRP. Because the predicted salinity impacts for Old Alameda Creek occur for an estimated one day during the IRP it would be feasible to reduce the discharge for a portion of the IRP, and increase the discharge flow later. The modified operation would decrease the maximum predicted salinity conditions, but may extend the period with more moderate increased salinity.

Post-Mitigation Significance: Less than significant (short-term and long-term impacts)

WATER QUALITY (SALINITY) IMPACT-9: Discharges from ISP ponds could result in water quality impacts from increased salinity inputs to Ravenswood Slough (West Bay Complex).

The total area of Ravenswood Slough considered in the impact assessment is approximately 116 acres. There are four West Bay pond systems proposed to discharge to Ravenswood Slough. Ponds 1 and 4 would intake and discharge to lower Ravenswood Slough near San Francisco Bay, and Ponds 2 and 3 would intake and discharge farther upstream. The remaining West Bay pond, Pond SF2, would intake and discharge directly to the Bay south of the Dumbarton Bridge and is discussed separately in Water Quality (Salinity) Impact – 10. Based on the proposed transfer schedule, the West Bay ponds will likely not be transferred for 5 or more years, due to salt pond operations to reduce the existing salinities in the West Bay Complex. Therefore, the initial release for West Bay Complex ponds would not be coincident with systems in the Alviso or Baumberg Complexes.

During the Continuous Circulation Period, salinities in Ravenswood Slough are expected to be elevated above existing conditions. For daily-averaged salinity, it is predicted that increases will be in the range of 5-10 ppt and occur in channel areas in the vicinity of the Pond 2 and 3 discharge locations. The predicted daily maximum salinity near the discharge locations may exceed 42 ppt at low tide in September and October, when pond and bay salinities reach their annual maximums, if the discharge salinities are also near the maximum salinity of 44 ppt. Based on limited dilution for Pond 2 and 3 discharges at low tide, approximately 10 acres of Ravenswood Slough in the vicinity of the discharges may have daily maximum salinities greater than 42 ppt for September of the modeled dry year. Approximately 35 acres of Ravenswood Slough may have daily maximum salinities greater than 36 ppt at low tide. Consequently, impacts to aquatic life in Ravenswood Slough resulting from elevated salinity may be potentially significant during the long-term Continuous Circulation Period.

The proposed initial release operation for the West Bay complex ponds includes staged initial releases. The initial release would occur in March/April several years after initial releases from the Alviso or Baumberg systems. The first stage would include initial releases from Ponds 1 and 4 to lower Ravenswood Slough near the bay. The first two weeks would include reduced flows to limit the potential impact within the slough. After the first month, when the salinity in Ponds 1 and 4 have been reduced to approximately 50 ppt, the connections from Pond 2 to Pond 1, and from Pond 3 to Pond 4 would be opened and the initial release from Ponds 2 and 3 would be diluted within Ponds 1 and 2 before discharge to Ravenswood Slough. The proposed initial release operation was not described in the Initial Stewardship Plan. The proposed initial release operation was designed to minimize initial releases into upper Ravenswood Slough which has limited tidal flows or freshwater flows.

During the Initial Release Period for the West Bay Complex, the maximum increase in daily average salinity is predicted to be 5 ppt near the Pond 4 discharge. Salinity increases will be lower in other segments of the channel, and nowhere in the channel will depth-averaged and daily-averaged salinities exceed approximately 36 ppt. At the end of the Initial Release Period, a maximum salinity increase of 1 to 2 ppt will occur near the Ponds 2 and 3 discharge locations, and lower salinity increases will occur in other segments of the channel.

On the maximum day during the IRP, average daily salinity would be in the range 33 to 35 ppt (Drought Conditions) for approximately 4 to 8 acres near the Pond 4 discharge location.

On the maximum day during the IRP, the daily maximum salinity in Ravenswood Slough would exceed 42 ppt (Stage 3 or greater) for approximately 8 acres, and would exceed 38 ppt (Stage 2 or greater for approximately 23 acres. Impacts to aquatic species may include temporary loss of the most sensitive benthic species. Fish may migrate out of the higher salinity or stream segments during this period. Daily maximum salinities may exceed 38 ppt for 10 percent or more of the channel for approximately one week during the Initial Release Period. The daily maximum salinity would occur for a few hours of the day, with the estimate based on the highest 2 hours during the day. Impacts to aquatic life in Ravenswood Slough resulting from elevated salinity may be potentially significant during the Initial Release Period.

Significance: Short-term impact (IRP) –Potentially Significant, mitigated (see below), Duration 1 week.
Long-term impact (CCP) – Potentially Significant, mitigated (see below)

WATER QUALITY (SALINITY) MITIGATION MEASURE-3A: Conduct pre-discharge and discharge monitoring.

WATER QUALITY (SALINITY) MITIGATION MEASURE-3B: During the IRP, if monitoring identifies the potential for significant impacts to benthic invertebrates in Ravenswood Slough, operational changes in releases will be made to reduce discharge flow from Ponds 1 and 4. Reduced discharge flow rates may extend the period of increased salinity during the initial release. Because the predicted salinity impacts occur for an estimated 3 weeks during the IRP it would be feasible to reduce the discharge for a portion of the IRP, and increase the discharge flow later. The modified operation would decrease the

> maximum predicted salinity conditions in the slough, but may extend the period with more moderate increased salinity.
>
> During the CCP, if monitoring during the fall identifies the potential for significant impacts to benthic invertebrates, operational changes in releases will be made to reduce salinities in Ponds 2 and 3 or limit releases to Ravenswood Slough from Ponds 2 and 3. These operational changes may include pumping lower salinity water from Pond 1 to Ponds 2 and 3 using the existing siphons and the Ravenswood pump, or stopping discharge from Ponds 2 and/or 3 to the slough and releasing water from Ponds 2 and 3 to Ponds 1 and/or 4 to dilute the higher salinity water before discharge to the slough. Releases from Ponds 2 and 3 into Ponds 1 and 4 would be similar to the proposed initial release operation, but would be at lower salinity that the initial release conditions. Alternatively, the higher salinity water could be held in Ponds 2 and 3 for later discharge to Ponds 1 and 4 in the winter when the ambient salinity in the Bay, slough and ponds would be lower.

Post-Mitigation Significance: Less than significant (short-term and long-term impacts)

> *WATER QUALITY (SALINITY) IMPACT-10:* Discharges from West Bay Pond SF2 could result in water quality impacts from increased salinity inputs South San Francisco Bay south of Dumbarton Bridge (West Bay Complex)

West Bay Pond SF2 is proposed to discharge to South San Francisco Bay near the west end of the Dumbarton Bridge. The discharge would be from an intake/outlet structure south of the bridge. Based on the proposed transfer schedule, the West Bay Complex may not be transferred for 5 or more years, due to salt pond operations to reduce the existing salinities in the West Bay Complex. Therefore, the initial release for West Bay Complex ponds would not be coincident with systems in the Alviso or Baumberg Complexes.

During the Continuous Circulation Period, salinities in South San Francisco Bay are expected to be elevated above existing conditions only in the immediate vicinity of the Pond SF2 discharge. For daily-averaged salinity, it is predicted that increases will be approximately 1 ppt and occur in the mud flat area at the pond discharge location. The predicted daily maximum salinity near the discharge location may exceed 42 ppt at low tide in September and October when pond and bay salinities reach their annual maximums if the discharge salinities are near the maximum salinity of 44 ppt. Based on limited dilution within the mud flats near Pond SF2 at low tide, approximately 0.4 acres of mud flat in the vicinity of the discharge may have daily maximum salinities greater than 42 ppt for September of the modeled dry year. Consequently, impacts to aquatic life in South San Francisco Bay resulting from elevated salinity are not expected to be significant during the long-term Continuous Circulation Period.

During the Initial Release Period for West Bay Pond SF2, the maximum increase in daily average salinity is predicted to be 2 to 4 ppt near the Pond SF2 discharge. Depth-averaged, daily-averaged salinities would not exceed approximately 36 ppt. At the end of the Initial Release Period, a maximum salinity increase of 1 to 2 ppt will occur near the SF2 discharge location.

On the maximum day during the IRP, average daily salinity would be in the range 33 to 35 ppt (Drought Conditions) for approximately 0.4 acres near the Pond SF2 discharge location.

On the maximum day during the IRP, the daily maximum salinity in the Bay would exceed 42 ppt (Stage 3 or greater) for approximately 0.8 acres at low tide. The daily maximum salinity would occur for a few hours of the day, with the estimate based on the highest 2 hours during the day. Impacts to aquatic species may include temporary loss of the most sensitive benthic species. Fish may migrate out of the higher salinity or stream segments during this period.

Significance: Short-term impact (IRP) –Less than Significant
Long-term impact (CCP) – Less than Significant

4.3.2 Metals and Organic compounds

4.3.2.1 Regional Water Quality Setting-Priority Trace Metal and Organic Compounds

Water and sediment contamination from priority trace metal and synthetic organic compounds in the San Francisco Bay area largely reflects the influence of past and present agricultural and mining activities, industrial uses, and urban development (San Francisco Estuary Institute, 1999). Contaminants known to be present in waters and sediments of the South San Francisco Bay include heavy metals (lead, copper, aluminum, mercury, nickel, vanadium, chromium, silver, zinc), polycyclic aromatic hydrocarbons (PAHs), PCBs, chlorinated hydrocarbon pesticides, and tributyltin (RMP, 1999, 2000a, San Francisco Bay RWQCB 1998).

Within the South Bay region, constituents of concern that routinely exceed numeric guidance levels, human health guidelines, and/or regulatory concentration criteria in water samples collected for the RMP monitoring program include copper, mercury, and PCBs (RMP, 2000a).

The sources and magnitude of contaminant loading to San Francisco Bay have been recently characterized as consisting primarily of the following categories:

- Local runoff of rivers and storm water runoff,
- Point-source discharges to the bay from municipal and industrial facilities,
- Atmospheric deposition, and
- Dredged material disposal (RMP, 2000b).

Atmospheric deposition and dredged material disposal are small contributions. The magnitude of contaminant loading from local watershed sources and point-source discharges depends on the chemical constituent in question. Point-source discharges comprise the majority of inorganic nutrient (nitrogen [N] and phosphorus [P]) loading to San Francisco Bay, whereas trace metals inputs are primarily associated with local watershed sources. Relative source contributions of organic compounds have not been determined.

4.3.2.2 Overview of Potential Water Quality Impacts from Metals and Organic Compounds

Available data indicate that concentrations of all organics and of all inorganics except nickel and mercury are present in the ISP ponds at concentrations well below applicable WQOs. Elevated detections of mercury and nickel in pond samples indicate that these metals may be present in some of the ISP ponds at concentrations exceeding applicable WQOs and could result in water quality impacts under the ISP.

Water Quality Impacts from Organic Compounds

Considering the source of the discharge water, it is unlikely that organic contamination will be high. Existing concentrations of organic compounds in the South Bay salt ponds were evaluated based on available surface water quality data from the Alviso, Baumberg, and West Bay Complexes. Available organics data for surface water include petroleum hydrocarbons, dioxins/furans, and SVOCs. These chemicals were detected in surface water at concentrations similar to ambient conditions in uncontaminated areas of San Francisco Bay. Based on these results and the low concentrations of these and other organics (including semi-volatile organic compounds and polynuclear aromatic hydrocarbons) observed in water samples collected for the ISP and by others (see Appendix A), organics are unlikely to be present in ISP ponds in excess of background conditions or applicable WQOs. Therefore, the organic contaminant data are not discussed in detail.

Water Quality Impacts from Inorganic Compounds

Saline waters that will be circulated to South San Francisco Bay and its tributaries from the salt ponds during the Initial Stewardship Period will contain measurable concentrations of heavy metals. Using analytical data collected from a subset of these ponds, estimates were made of the range of concentrations that would likely occur in the proposed discharges during the initial release and the continuous circulation phases of the Interim Stewardship Period. Comparisons were made between these estimated discharge concentrations and applicable water quality objectives.

The results of these comparisons clearly indicate that, for every proposed discharge, during both the initial release and continuous circulation phases, the maximum predicted concentrations of arsenic, cadmium, chromium, copper, lead, selenium, silver, and zinc will not exceed the applicable water quality objectives. Therefore, for all the proposed discharges, these metals are not considered a threat to aquatic life in the receiving waters.

On the other hand, based on the aforementioned comparisons, both nickel and mercury were predicted to exceed their applicable water quality objectives under some circumstances:

- Dissolved nickel concentrations might exceed objectives applicable to discharges from ponds in the Alviso Unit during the Initial Release Period.

- Total nickel concentrations might exceed objectives applicable to discharges from the Baumberg and West Bay Complexes during both the Initial Release Period and the Continuous Circulation Period.
- Total mercury concentrations might exceed objectives applicable to discharges from the Baumberg and West Bay Complexes during the Initial Release Period.

To determine the significance of these potential exceedences, evaluations were performed to estimate how these discharges would alter concentrations in the receiving waters and how these alterations would impact aquatic life. The results of these evaluations are based on initial comparisons conducted by Stephen Hansen (2003) and are summarized below.

Samples Used for Inorganic Analysis—Estimates of the concentrations of dissolved and total metals that are expected to occur in each of the discharges are made based on the analysis of surrogate samples that match the salinity ranges predicted for each of the discharge points. It was assumed that an existing pond at a given salinity would have a representative metals concentration to an ISP discharge pond with a similar salinity. To cover a range of potential discharge salinities, the following two sets of surrogate samples were considered:

1. The major set of samples was collected from the salt ponds in October 2002 and covers the range of salinities from 31.6 to 279 ppt. The results of these analyses are summarized in the ISP (see Appendix A). These surrogates are clearly relevant since they come from salt ponds in the system to be discharged.
2. Since salt ponds could not be located that had salinities at the lower end of the predicted discharge range (i.e., 12 – 20 ppt), data for the years 1997-99 were retrieved from the Regional Monitoring Program for the two southernmost San Francisco Bay stations (i.e., South Bay and Dumbarton Bridge). The results of these analyses are available on-line at the San Francisco Bay Estuary Institute website. These results are relevant because the bay water will be the intake during the ISP. Low salinity discharges should be essentially the same (i.e., little or no evaporative concentration has occurred).

Analytical Results for Inorganics—Analytical results for inorganics are presented in Table 4-6. The salinity of each sample is presented along with the dissolved and total recoverable concentrations of each of the ten metals of interest (arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, and zinc). Table 4-6 also provides applicable WQOs for the Alviso and Baumberg Complexes. WQOs applicable to the Baumberg Complex are listed in the most recent version of the Water Quality Control Plan, San Francisco Bay Basin (Region 2) (RWQCB, 1995), including a May 22, 2002 amendment adopting site-specific WQOs for the South Bay. WQOs applicable to the Alviso Complex are listed in the Water Quality Standards; Establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California; Rule. Federal Register, Volume 65, No. 97. May 18 (40 CFR Part 131) (California Toxics Rule [CTR]; USEPA, 2000) and are specified as dissolved concentrations, except for mercury and selenium, which are specified as total recoverable concentrations.

Table 4-7
Dissolved Concentrations of Inorganics in ISP and Adjacent Salt Ponds[a]

		Dissolved Concentration (ug/l)									
Pond No.	**Salinity (g/l)**	**Arsenic**	**Cadmium**	**Chromium**	**Copper**	**Lead**	**Mercury**	**Nickel**	**Selenium**	**Silver**	**Zinc**
Alviso Complex											
A2W	31.6	6.27	0.049	1.22	1.06	0.264	0.00126	8.05	0.199	0.012	1.21
A3W	42.0	10.7	0.044	1.22	1.10	0.307	0.00126	7.45	0.128	0.010	0.65
A15	89.4	14.0	0.077	1.12	0.86	0.313	0.00138	10.8	0.094	0.021	1.29
A14	92.6	18.3	0.039	1.35	0.97	0.309	0.00221	11.0	0.111	0.055	1.15
A16	109	14.4	0.053	1.27	1.07	0.446	0.00398	12.8	0.141	0.040	2.25
A18*	146	48.3	0.899[b]	1.35	1.92	0.748	0.00114	19.7	0.224	0.023	2.88
A15	89.8	14.5	0.067	1.16	0.89	0.330	0.00128	10.6	0.124	0.027	1.83
I-3*	194	3.52	0.096	1.16	0.57	0.572	0.00056	10.8	0.304	0.015	2.87
I-3B*	224	3.14	0.124	1.47	2.64	1.33	0.00069	13.3	0.142	0.039	4.02
Baumberg Complex											
B2C	54.6	1.14	0.054	1.24	1.29	0.280	0.00036	4.96	0.055	0.016	1.18
B9	279	30.9	0.423	1.34	2.21	7.18	0.00041	14.5	0.140	0.028	3.80
WQOs – Alviso Complex (California Toxics Rule)											
Continuous		36	9.3	50	9[c]	8.1	-	8.2	-	1.9	81
Maximum		69	42	1100	5.3[c]	210	-	74	-	-	90
WQOs – Baumberg Complex (Basin Plan)											
4-hour Average		36	9.3	50	6.9[d]	5.6	-	11.9	-	1.9	58
1-hour Average		69	43	1100	10.8[d]	140	-	62.4	-	-	170

Notes:

WQO = Water Quality Objective; µg/l = micrograms per liter

[a] Source: Frontier Geosciences (November 11, 2002). Samples collected October 26, 2002

[b] Possible contamination of sample suspected; results unreliable

[c] Values shown are site-specific criteria obtained from the RWQCB

[d] Values shown are site-specific criteria for the South Bay adopted on May 22, 2002 as an amendment to the Bay Plan

shaded cell = Exceedence of applicable WQO

* Adjacent Salt Ponds. I3 and I3B are in Cargill Plant 1

Table 4-7
Total Recoverable Concentrations of Inorganics in ISP and Adjacent Ponds[a]

		Total Recoverable Concentration (ug/l)									
Pond No.	**Salinity (g/l)**	**Arsenic**	**Cadmium**	**Chromium**	**Copper**	**Lead**	**Mercury**	**Nickel**	**Selenium**	**Silver**	**Zinc**
Alviso Complex											
A2W	31.6	6.36	0.063	2.36	2.15	0.843	0.012	11.8	0.274	0.022	1.80
A3W	42.0	11.9	0.045	0.67	1.24	0.324	0.0048	8.42	0.173	0.015	0.79
A15	89.4	15.1	0.054	0.83	1.37	0.351	0.032	14.3	0.160	0.030	1.82
A14	92.6	20.1	0.053	1.17	2.04	0.395	0.044	13.5	0.220	0.063	3.16
A16	109	17.1	0.062	1.23	2.01	0.619	0.039	18.1	0.159	0.150	3.38
A18*	146	56.2	0.119	1.30	3.39	1.37	0.050	21.8	0.310	0.045	4.49
A15*	89.8	15.7	0.054	1.07	1.59	0.371	0.032	15.7	0.135	0.020	3.07
I-3*	194	4.28	0.119	1.47	2.07	0.892	0.036	9.73	0.295	0.128	6.77
I-3B*	224	5.18	0.136	1.38	2.45	1.15	0.041	12.3	0.352	0.044	7.22
Baumberg Complex											
B2C	54.6	1.00	0.050	0.67	1.59	0.392	0.0034	7.09	0.092	0.013	1.28
B9	279	33.1	0.123	1.12	2.61	6.48	0.030	15.1	0.143	0.416	4.28
WQOs – Alviso Complex (California Toxics Rule)											
Continuous		-	-	-	-	-	0.051	-	5	-	-
Maximum		-	-	-	-	-	-	-	-	-	-
WQOs – Baumberg Complex (Basin Plan)											
4-hour Average		-	-	-	-	-	0.025	-	5	-	-
1-hour Average		-	-	-	-	-	-	-	-	-	-

Notes:

WQO = Water Quality Objective; µg/l = micrograms per ;iter

[a] Source: Frontier Geosciences (November 11, 2002). Samples collected October 26, 2002

[b] Possible contamination suspected

[c] Values shown are site-specific criteria obtained from the RWQCB

[d] Values shown are site-specific criteria for the South Bay adopted on May 22, 2002 as an amendment to the Bay Plan
shaded cell = Exceedence of applicable WQO
* Adjacent Salt Ponds. I3 and I3B are in Carill Plant 1

Comparison of Metals in Sampled Ponds to WQOs—To assess metals impacts on potential water quality when discharging water from ISP ponds, a comparison was made between the detected concentrations of each of the metals of concern in the sampled ponds and the WQOs applicable to each area. All detected concentrations of arsenic, cadmium, chromium, copper, selenium, silver, and zinc were well below applicable WQOs. Only nickel and mercury were detected at concentrations exceeding WQOs. These exceedances are described below. The West Bay ponds are not included in this analysis because these ponds are currently high-salinity ponds and will be low-salinity ponds when they are discharged, thus representative ponds are not available for sampling and analysis at this time.

Exceedances of Nickel WQOs—Concentrations of nickel in eight of the sampled ponds exceeded applicable water quality criteria. The lowest concentrations were detected in the lower salinity Alviso ponds (A2W, A3W, and B2C); nickel was detected in these ponds at concentrations from 4.96 to 8.05 µg/l; these values are below the CTR limit of 8.2 µg/l. Concentrations of nickel detected in the remaining Alviso ponds exceeded the CTR limit; those concentrations ranged from 10.6 µg/l (slightly above the CTR limit) to 19.7 µg/l (more than twice the CTR limit). Nickel concentrations may be correlated with salinity. At higher salinities (89.4 to 279 ppt), detected concentrations of nickel were generally higher (10.6 to 19.7 µg/l), while in lower-salinity ponds (31.6 to 54.6 ppt), nickel concentrations were lower (4.96 to 8.05 µg/l).

Exceedances of Mercury WQOs—Detected concentrations of total mercury ranged from 0.0034 to 0.050 µg/l. Detected concentrations in the Alviso Complex were below the CTR limit of 0.051 µg/l. In ponds I-3, I-3B, and the Baumberg Complex, detected concentrations of mercury slightly exceed the Water Quality Control Plan San Francisco Bay Basin (Region 2) Board (SFBRWQCB, 1995) limit of 0.021 µg/l. Concentrations of mercury may be correlated with salinity. Detected concentrations in the ponds with lower salinity (31.6 to 54.6 ppt) ranged from 0.0034 to 0.12 µg/l, close to an order of magnitude lower than concentrations detected in ponds with salinities of 89.4 ppt and greater (0.032 to 0.050 µg/l). All of the samples which show WQO's exceedances come from ponds with salinities greater than the proposed discharge salinities.

Metal Impacts to Receiving Waters for Managed Pond Alternatives—Dissolved Nickel

Alviso Complex

Dissolved nickel concentrations in several of the discharges from the Alviso Complex might exceed the applicable water quality objective for water bodies south of the Dumbarton Bridge of 11.9 ug/l dissolved nickel. These exceedences are predicted to occur only when ponds are discharging at their maximum proposed salinities and would be limited to the Initial Release Period. The discharges that might exceed water quality objectives (from ponds A7, A14, and A16) have the potential to impact waters in Alviso Slough, Coyote Creek, and portions of South Bay.

Dissolved Nickel Impacts to Coyote Creek (Alviso Complex)—Another of the proposed discharges that might exceed the nickel objective of 11.9 ug/l is from Ponds

A14 and A16 into Coyote Creek and Artesian Slough. These exceedences would be limited to the Initial Release Period and were only predicted to occur if A14 and A16 were discharging at their maximum proposed salinities. An in-depth evaluation indicated that after initial mixing, there would be no predicted exceedences of the nickel objective in either Coyote Creek or Artesian Slough and, consequently, no expected impact to aquatic life.

Dissolved Nickel Impacts to Alviso Slough—One of the proposed discharges that might exceed the nickel objective of 11.9 ug/l is from Pond A7 into Alviso Slough. These exceedences would be limited to the Initial Release Period and were only predicted to occur if A7 was discharging at its maximum proposed salinity. An in-depth evaluation indicated that after initial mixing, there would be no predicted exceedences of the nickel objective in Alviso Slough and, consequently, no expected impact to aquatic life.

Dissolved Nickel Impacts to the South Bay near the Alviso Complex—All of the discharges in the Alviso Unit eventually enter South S.F. Bay. Three of these (A7, A14, and A16) are predicted to exceed the nickel objective of 11.9 ug/l. These exceedences would be limited to the Initial Release Period and were only predicted to occur if the subject ponds were discharging at their maximum proposed salinities. An in-depth evaluation indicated that after initial mixing, there would be no predicted exceedences of the nickel objective in South South Francisco Bay and, consequently, no expected impact to aquatic life.

Baumberg Complex

The initial comparisons indicated that total nickel concentrations in all of the discharges from the Baumberg Unit might exceed the applicable water quality objective for water bodies north of the Dumbarton Bridge of 7.1 ug/l total nickel. These exceedences have the potential to occur during all phases of the Initial Stewardship Period and over a wide range of discharge salinities. During both the Initial Release and Continuous Circulation Periods, these discharges have the potential to impact waters in the Alameda Flood Control Channel (AFCC), Old Alameda Creek, and portions of South Bay.

Dissolved Nickel Impacts to Alameda Flood Control Channel (AFCC)—Two of the proposed discharges that might exceed the nickel objective of 7.1 ug/l are Ponds 2 and 2C. The Pond 2C discharge will flow directly into the AFCC, and the Pond 2 discharge will be circulated into the AFCC by tidal action. It is predicted that the exceedences of the nickel objective in these discharges might occur during both the Initial Release and Continuous Circulation Periods and might occur regardless of the salinity of the discharges. An in depth evaluation indicated that, after initial mixing, these discharges would have limited impacts on compliance with the nickel water quality objective in the AFCC. During the Initial Release Period, compliance with the nickel objective in the AFCC would depend upon both the ambient concentrations of nickel in the AFCC and the salinity of the discharges. If the ambient waters contain average concentrations of nickel, impacts on compliance of the nickel objective would be minimal. With average ambient nickel concentrations and discharge salinities at 2002 levels, there are no predicted exceedences of the nickel objective anywhere in the AFCC. With average ambient nickel concentrations and discharge salinities at their proposed maximum levels, exceedences of the objective are predicted for 3 kilometers of the AFCC. However, these exceedences would disappear at the end of the Initial Release Period.

During the Initial Release Period, if the ambient waters contain maximum concentrations of nickel, predicted impacts on compliance with the nickel objective would be somewhat greater, but still relatively limited in magnitude and scope. Under such conditions, it is predicted that, even without any discharges from the Baumberg Ponds, 3 kilometers of the AFCC would exceed the nickel objective. With the addition of the discharges at salinities near those observed in 2002, total nickel in most segments of the AFCC would increase slightly (i.e., generally by less than 1 ug/l), but exceedences of the objective are predicted to remain at 3 kilometers of the AFCC. With the addition of the discharges at salinities near the proposed maximum values, exceedences of the objective (by up to 3 ug/l) are predicted to increase to 4 kilometers of the AFCC. However, at the end of the Initial Release Period, the area of the AFCC exceeding the nickel objective would be reduced to 3 km; the same area that is predicted to be out of compliance under existing conditions.

During the Continuous Circulation Period, compliance with the nickel objective in the AFCC would depend upon the ambient concentrations of nickel in the AFCC. If the ambient waters contain average concentrations of nickel, it is predicted that after initial mixing, three of the AFCC segments would slightly exceed the nickel objective in May and five would slightly exceed the objective in September. If the ambient waters contain maximum concentrations of nickel, it is predicted that even without any discharge from the Baumberg ponds, the nickel objective would be exceeded in 4 kilometers of the AFCC in May and 5 kilometers in September. With the addition of the discharges, total nickel concentrations in all segments of the AFCC are predicted to increase by less than 1 ug/l, but the number of segments of the AFCC exceeding the nickel objective would not increase.

To further assess the potential for nickel exceedances during continuous circulation, a site-specific translater study was conducted. This study showed that nickel levels in AFCC during CCP will not adversely affect beneficial uses.

Dissolved Nickel Impacts to the South Bay near the Baumberg Complex—During the Initial Release Period, all of the discharges in the Baumberg Complex have the potential to exceed the nickel of objective of 7.1 ug/l and all of these discharges eventually enter the South San Francisco Bay. It is predicted that the exceedences of the nickel objective in these discharges might occur during both the Initial Release and Continuous Circulation Periods and might occur regardless of the salinity of the discharges. An in-depth evaluation indicated that, after initial mixing, these discharges would have no effect on compliance with the nickel water quality objective in the South Bay in the vicinity of the Baumberg Complex. When the waters in the South Bay contain average concentrations of total nickel, the discharges from the Baumberg ponds would increase total nickel in ambient bay water by 0.5 ug/l or less and would not cause an exceedence of the nickel objective. When the waters of South Bay contain maximum concentrations of total nickel, the discharge from the Baumberg ponds would have essentially no effect on compliance with the nickel objective. Under such conditions, the nickel objective would be exceeded throughout the South Bay by 1 to 3 ug/l and the input from the ponds would not cause measurable changes in these concentrations.

Metal Impacts to Receiving Waters for Managed Pond Alternatives—Total Mercury Discharged

Total Mercury Discharged from Ponds in the Baumberg Complex—The initial comparisons indicated that total mercury concentrations in all of the discharges from the Baumberg Complex might exceed the applicable water quality objective for water bodies north of the Dumbarton Bridge of 25 ng/l total mercury. These exceedences were predicted to occur only when ponds are discharging at their maximum proposed salinities and would be limited to the Initial Release Period. Under these conditions, these discharges have the potential to impact waters in the Alameda Flood Control Channel (AFCC), Old Alameda Creek, and portions of South Bay.

Total Mercury Discharged to Alameda Flood Control Channel (AFCC)—Two of the proposed discharges that might exceed the mercury objective of 25 ng/l are Ponds 2 and 2C. The Pond 2C discharge will flow directly into the AFCC and the Pond 2 discharge will be circulated into the AFCC by tidal action. It is predicted that the exceedences of the mercury objective in these discharges will be limited to the Initial Release Period and will only occur if the discharges are at their maximum proposed salinity. An in-depth evaluation indicated that, after initial mixing, these discharges would have minimal impact on compliance with the mercury water quality objective in the AFCC. When the waters in the AFCC contain average concentrations of total mercury, the discharge from Ponds 2 and 2C would at worst raise the ambient concentrations in the AFCC by approximately 10% and would result in equaling the objective in 3 to 4 kilometers of the channel. This condition would last for less than 8 weeks; disappearing at the end of the Initial Release Period. When the waters in the AFCC contain maximum concentrations of total mercury, the discharge from Ponds 2 and 2C would have essentially no effect.

Under existing conditions, the mercury objective would be exceeded throughout the creek by between 7 and 10 ng/l and the input from the ponds would increase these concentrations by less than 1 ng/l. Any increases due to the pond discharges would last for less than 8 weeks; disappearing at the end of the Initial Release Period.

Total Mercury Discharged to the South Bay near the Baumberg Complex—During the Initial Release Period, all of the discharges in the Baumberg Complex have the potential to exceed the mercury of objective of 25 ng/l and all of these discharges eventually enter South S.F. Bay. It is predicted that these exceedences would occur during the Initial Release Period only if the Baumberg ponds were discharging at their maximum proposed salinities. An in-depth evaluation indicated that, after initial mixing, these discharges would have no impact on compliance with the mercury water quality objective in the South Bay near the Baumberg Complex. When the waters in the South Bay contain average concentrations of total mercury, the discharges from the Baumberg ponds would increase total mercury in ambient bay water by less 1 ng/l and would not cause an exceedence of the mercury objective. When the waters of South Bay contain maximum concentrations of total mercury, the discharge from the Baumberg ponds would have essentially no effect. Under existing conditions, the mercury objective would be exceeded throughout the South Bay by approximately 11 ng/l and the input from the ponds would actually decrease these concentrations.

Metals Potentially Discharged to the South Bay near the West Bay Complex-As mentioned above, sampling and analysis have not been performed on the West Bay Ponds. It is anticipated that metals levels in discharge will be similar to those at the Baumberg Complex, because complexes are intaking from similar location in the South Bay, and both have the same metals WQOs.

4.3.2.3 Metals Impacts to Water Quality By Alternative

No Project/No Action Alternative

> *WATER QUALITY (METALS) IMPACT-1*: *Metals in pond sediments could be released or chemically changed by cycles of wetting and drying. Unplanned breaches of ponds could result in increased metals concentrations in the ponds and localized areas of the Bay.*

Under the No Project/No Action Alternative, bay water would not be let into the ponds and water levels would not be managed. Ponds would dry down seasonally. Fluctuating oxidation of the sediments may increase methyl-mercury in ponds when they fill up with winter rains. Additionally, levees would not be maintained, and unplanned breaches of the ponds would be more likely. Given the impacts of this alternative on the concentration of metals in discharge, any breach of the project ponds could have significant impacts on water quality and biota.

Significance: Potentially significant. Since this alternative will result in the project not being implemented, no mitigation measures are proposed.

Alternative 1 - Seasonal Ponds

This alternative minimizes impacts in the receiving waters from discharge of pond contents into the bay. Maintenance of the levees and water control structures would prevent their deterioration and minimize the potential for the accidental breaching of the ponds and release of pond contents to the bay. Since pond levees would be maintained under this alternative, impacts to water quality from unplanned levee breaches are not anticipated. Under this alternative, most of the existing open water habitats currently used by wildlife would be greatly reduced, significantly changing the character of the South Bay salt ponds. The duration and depth of water in the ponds would be reduced in most years, and the open water character of the salt ponds would be lost. The existing intake structures for each pond complex would be closed. Intake ponds would no longer be present. so the pond systems would not support fish and bay invertebrates, resulting in reduced foraging habitat for piscivorous (fish-eating) birds.

The Seasonal Pond Alternative appears to have the least water-quality impacts to the bay and other receiving waters with respect to metals compared to all other project alternatives. However, this alternative would not meet project objectives of maintaining existing open water and wetland habitat for the benefit of wildlife, including habitat for migratory shorebirds and waterfowl and resident breeding species or maintaining ponds in a restorable condition to facilitate future long-term restoration.

Alternative 2 - Simultaneous March/April Initial Release

Since pond levees would be maintained under this alternative, impacts to water quality from unplanned levee breaches are not anticipated. In Alternative 2, the contents of most of the Alviso and Baumberg Ponds would be released simultaneously in March and April. The ponds would then be managed as a mix of continuous circulation ponds, seasonal ponds and batch ponds, though management of some ponds could be altered through adaptive management during the continuous circulation period. Higher salinity ponds in Alviso and in the West Bay would be discharged in March and April in a later year when salinities in the ponds have been reduced to appropriate levels. The Island Ponds (A-19, 20, and 21) would be breached and open to tidal waters.

> *WATER QUALITY (METALS) IMPACT-2:* Exceedances of the nickel WQOs at the point of discharge may occur during the IRP only.

The project is not predicted to raise nickel concentrations above pre-project levels in the receiving waters and, consequently, is not expected to significantly impact water quality.

Significance: Less than Significant

> *WATER QUALITY (METALS) IMPACT-3*: Under some circumstances, total mercury in discharged water and receiving water will exceed total mercury WQOs and may have temporary impacts on water quality.

In all cases, the potential exceedances will be either at or below current conditions or will be limited to the Initial Release Period.

Significance: Potentially Significant

> *WATER QUALITY (METALS) MITIGATION MEASURE-1A*: Monitor the discharges and receiving waters for exceedances of the mercury objective.
>
> *WATER QUALITY (METALS) MITIGATION MEASURE-1B:* If mercury exceeds predicted levels in the receiving waters by more than 10%, the RWQCB will be contacted and an adaptive management strategy will be devised to reduce mercury levels. Mitigation measures may include temporarily slowing discharge or additional dilution.

Post-mitigation Significance: Less than significant

Alternative 3-Phased July Initial Release

In Alternative 3, many of the lower-salinity ponds in Alviso and Baumberg would be discharged in July, and the medium salinity ponds would be discharged the following March and April. These ponds would then be managed in the same manner as in

Alternative 2 during the continuous circulation period. The higher-salinity ponds would also be managed as in Alternative 2.

Based on the evaluation of Alternative 2, the lower salinity ponds proposed for discharge in the first stage of Alternative 3 would not represent any significant trace metals impacts. The medium-salinity ponds that may have potential trace metals impacts would be discharged beginning in March/April, as in Alternative 2. Therefore the potential receiving waters impacts of Alternative 3 would be the same as or similar to the impacts described for Alternative 2.

4.3.3 Dissolved Oxygen

4.3.3.1 Regional Water Quality Setting - Dissolved Oxygen (DO)

The majority of species in the bay require oxygen to sustain metabolic processes. Oxygen is supplied to the bay water by photosynthesis (performed by plants which take up carbon dioxide and release oxygen) and from the atmosphere (whose primary gases are nitrogen and oxygen). Oxygen is depleted during organism respiration and by decomposition of organic matter. Biochemical oxygen demand (BOD) is a measure of the amount of oxygen used per unit volume of water at a given temperature for a given time. In essence, it is the combined respiratory needs (demands) of the pelagic, benthic and epibenthic organisms, principally algae and aerobic bacteria contained in the water. BOD is often negatively correlated with dissolved oxygen (DO); the greater the BOD the lower the DO is likely to fall during non daylight hours when photosynthetic production drops and respiration usually exceeds the “demand”.

Water temperature affects the metabolic rate of aquatic organisms, the tolerance of aquatic organisms to other environmental stressors, and other physical and chemical water-quality processes. The solubility of dissolved oxygen (DO) in water is a direct function of water temperature, with maximum possible DO values being greatest at lower water temperatures. This is why the period of greatest oxygen stress is during the warmer summer months when water temperatures are high, the oxygen solubility is low, and because of their cold-blooded metabolism, the biota need the most oxygen. The most extensive information for conventional constituents of concern in the salt ponds comes from recent data collected for temperature, DO, pH, and turbidity (Takekawa et al. 2000)

Light levels have an impact on DO as well. When plants and algae are actively photosynthesizing, they produce more oxygen than they consume, which often raises DO levels. At night, when plants and algae are not photosynthesizing the balance changes and plants and algae use oxygen and thus lower DO levels. This is why diurnal fluctuations in DO are common.

The USGS measures DO concentration as an indicator of water quality and of the activity level of the plants and animals living in the bay. When the oxygen content of water is under-saturated (less than the temperature equilibrium would allow), it indicates that oxygen is being consumed by either pelagic or benthic organisms faster than it is produced by the phytoplankton or rooted aquatic plants. Conversely, when the oxygen concentration is greater than saturation, oxygen is being produced by plant photosynthesis (mostly phytoplankton) faster than it is consumed by other organisms.

Thus, oxygen concentration is an index of the balance between processes of food production and food consumption. This balance is a key descriptor of the changing status of the ecosystem. When the balance is disrupted, the oxygen concentration can fall to low levels.

Regions of San Francisco Bay experienced episodes of severe oxygen depletion (with fish kills) during the 1950s and early 1960s, before the era of advanced sewage treatment. South Bay again experienced a catastrophic episode of oxygen depletion in the early 80s following failures of a local sewage treatment plant. The oxygen content of bay waters is now generally high enough to supply the oxygen demands of aquatic life, reflecting a positive water-quality response to improved sewage treatment techniques. Although nutrient concentrations (e.g., phosphates and nitrates) are very high in San Francisco Bay, the bay does not have the noxious or toxic blooms of algae that are observed in many other estuaries that receive large inputs of nutrients from waste and land runoff.

Source: http://squall.sfsu.edu/courses/geol103/labs/estuaries/partVIIE.html

The oxygen content of bay water is not always uniform from surface to bottom. The surface water may have oxygen concentrations of about 9 milligrams per liter, while bottom waters more commonly have oxygen concentrations somewhat less. These kinds of vertical variations often occur as a result of salinity stratification, which slows the rate of vertical mixing of the water. Oxygen is added to the surface layers by atmospheric exchange and photosynthesis. Oxygen is mixed to the bottom waters by tidal and wind-driven stirring. This mixing is rapid in the absence of salinity stratification (ibid).

The distribution of oxygen differs from that of conservative properties such as salinity and temperature in that oxygen is biologically active: it is closely associated with changes in carbon and plant-nutrient concentrations (Conomos et al, 1979). DO is influenced by a variety of important processes:

- Exchange of oxygen across the water surface through atmospheric invasion (gain) and out-gassing (loss);
- Photosynthesis;
- Respiration by plants and animals, decomposition of organic matter by bacteria and chemical oxidation; and
- Advection and diffusion.

DO levels also interact with salinity and temperature. The amounts of oxygen or carbon dioxide present in water are proportional to the partial pressures exerted by these two gases. The solubility of oxygen and carbon dioxide, and, consequently, the absolute amount held in solution, decrease with increasing salinity (Kinne, 1964).

Studies in Mowry Slough, Newark Slough and Faber Tract Marsh (Smith, 1977) indicated that the DO levels were reduced to 3.5 ppm during time of tidal change. The data also indicate that vertical stratification of DO occurred in Newark Slough during August 1977. It was evident that there was a separate DO and salinity regime occurring in each of the three marsh areas studied. As part of the study, benthal demand analysis (oxygen uptake), which is a measure of the oxygen uptake by biological communities and chemical in the substrate, was conducted. Based on laboratory results, the chemical and biological demand in these slough channels or marshes could at times reduce the DO levels to below 1 ppm within the interstitial waters below the water-substrate interface.

4.3.3.2 Overview of Potential Water Quality Impacts from Reductions in Dissolved Oxygen (DO)

Reductions in dissolved oxygen (DO) have been identified as a concern in several locations where circulated pond waters would enter receiving water bodies during the ISP. This concern arises from the potential that pond water may have high productivity during warmer times of the year, and the resultant biological oxygen demand (BOD) may affect DO in sloughs, creeks, and portions of the bay proper.

To quantify potential increased BOD from proposed discharges in the receiving waters a detailed evaluation of ISP pond contents was performed. Samples were collected in the discharge ponds and in several segments of each receiving creek or slough. Complete results of this study are shown in Appendix C. The results indicate that, with the exception of the Guadalupe Slough segments, the BOD increases slightly under ISP conditions. For the Guadalupe Slough segments BOD actually decreases under ISP conditions.

In response to a Regional Board request, a study was performed in early September 2003 to evaluate diurnal patterns of dissolved oxygen (DO) in South Bay salt ponds (S.R. Hansen & Associates). Five ponds were selected for evaluation – i.e., Ponds 2 and 4 in the Baumberg Unit and Ponds A3W, A2E, and A13 in the Alviso Unit. Four of the ponds (i.e., Baumberg 2 and 4 and Alviso A2E and A3W) had salinities in the range of 32 to 43 ppt and were considered to be representative of the upper salinity conditions that might occur in discharge ponds during the Continuous Circulation Period in late summer. The fifth pond (i.e., Alviso A13) had a salinity of 63 ppt and was considered to be representative of the upper salinity conditions that might occur in discharges from Ponds A2W and A3W in the Alviso Unit and Ponds 2 and 11 in the Baumberg Unit during Phased Initial Release Periods commencing in July.

In each pond, the study consisted of measuring a number of parameters (i.e., temperature, specific conductivity, total dissolved solids, salinity, dissolved oxygen, pH, oxidation-reduction potential, and barometric pressure) at several stations over a 24-hr period. Measurements were typically made in mid-afternoon (when the DO would be expected to be the highest due to several hours of high algal photosynthesis), at dusk (when photosynthesis would be expected to have ceased and DO may have started to decrease), and at dawn (when the DO would be expected to be the lowest due to several hours of algal respiration but no photosynthesis due to the darkness). Sites in the ponds were selected to include those areas that had the maximum algal densities. However, in most ponds, large differences in algal density were not visually apparent between sites.

The results show that 7 of 16 of the dawn samples at the Alviso Complex showed DO under 5 mg/l over the study period and 13 of 20 of the dawn samples at the Baumberg Complex showed DO under 5 mg/l (20 out of 36 samples).

The results of this study show that at dawn, DO does drop below 5 mg/l in many of the ponds. However, this study presents the worst case scenario in that the current pond contents are in a static condition and the fall temperatures maximize algal productivity. Dissolved oxygen rises to its highest levels throughout the day within 6 hours of the low

DO levels. It is likely that any excursions of the DO WQOs will be ephemeral.

4.3.3.3 Dissolved Oxygen Impacts to Water Quality by Alternative

No Project/No Action Alternative

Under the No Project/No Action Alternative, bay water would not be let into the ponds and water levels would not be managed. Ponds would dry down seasonally, levees would not be maintained, and unplanned breaches of the ponds would be more likely.

> *WATER QUALITY (DISSOLVED OXYGEN) IMPACT-1:* Increased algal activity in ponds leads to decreased dissolved oxygen in receiving waters. The potential for excursion from the basin plan standards are most likely to occur during the warmer summer and fall months, especially on windless days.

Significance: Potentially significant. Since this alternative will result in the project not being implemented, no mitigation measures are proposed.

Alternative 1 Seasonal Ponds

This alternative minimizes impacts from discharge of pond contents into the bay. Maintenance of the levees and water control structures would prevent their deterioration and prevent the accidental breaching of the ponds and release of pond contents to the bay. Under this alternative, most of the existing open water habitats currently used by wildlife would be greatly reduced, significantly changing the character of the South Bay salt ponds. The duration and depth of water in the ponds would be reduced in most years, and the open water character of the salt ponds would be lost. The existing intake structures for each pond complex would be closed. Intake ponds would no longer be present. The pond systems would not support fish and bay invertebrates, resulting in reduced foraging habitat for piscivorous (fish-eating) birds.

The Seasonal Pond Alternative appears to have the most minimal water quality impacts to the Bay and receiving waters with respect to DO compared to all other project alternatives. DO levels in the ponds could be impacted; however, decreased DO in ponds would not impact receiving waters since there would be on discharge. Therefore, this impact is considered less than significant. This alternative would not meet project objectives of maintaining existing open water and wetland habitat for the benefit of wildlife, including habitat for migratory shorebirds and waterfowl and resident breeding species or maintaining ponds in a restorable condition to facilitate future long-term restoration.

Alternatives 2 Simultaneous March/April Initial Release

> WATER QUALITY (DO) IMPACT 1- Increased algal activity in ponds could lead to decreased dissolved oxygen in the ponds relative to the receiving waters. Under existing conditions DO does drop below the WQO in some ponds at night in September. The DO sags were ephemeral. If pond DO does not meet the Basin plan water quality objective of 5 mg/l, and the discharge causes receiving water DO concentrations to be below the WQO, then the discharge would cause a potentially significant impact. Such a significant impact could occur during the

CCP in late summer with drought conditions, or in the event of equipment disrepair or malfunction.

Significance: Potentially Significant

WATER QUALITY (DISSOLVED OXYGEN) MITIGATION MEASURE 1A: The ponds, effluent, and receiving waters will be monitored to determine if excursions from the WQOs are occurring.

WATER QUALITY (DISSOLVED OXYGEN) MITIGATION MEASURE 1B: If monitoring shows excursions from the WQOs, one of the following mitigation measures will be implemented: supplemental aeration using a solar powered aerator and timer to be actuated during non-daylight hours will be installed at discharge outlet, or discharge ponds can be operated as muted tidal ponds for the duration of the DO excursion from the WQO.

Post-mitigation Significance: Less than Significant.

Alternative 3 - Phased July Initial Release

In Alternative 3, many of the lower-salinity ponds in Alviso and Baumberg would be discharged in July, and the medium-salinity ponds would be discharged the following March and April. These ponds would then be managed in the same manner as in Alternative 2 during the continuous circulation period. The higher salinity ponds would also be managed as in Alternative 2.

Based on the proposed initial release operations, the ponds proposed for discharge in Alternative 3 would not represent any significant difference from the dissolved oxygen conditions in Alternative 2. Therefore the potential receiving waters impacts of Alternative 3 would be the same as or similar to the impacts described for Alternative 2.

4.3.4 Suspended Sediment and Turbidity

4.3.4.1 Regional Water Quality Setting—Suspended Sediment and Turbidity

Turbidity is the characteristic of water that relates to its clarity or cloudiness and is derived optically in the laboratory by measuring the amount of light scatter within a sample. Turbidity is an important factor, as it plays a vital role in aquatic productivity. The South San Francisco Bay estuary has high concentrations of particles suspended in the water. The following water characteristics are related to turbidity:

- Suspended particles reduce the clarity of the water and give it color.
- Both planktonic algae and suspended sediments affect turbidity.
- The suspended particles absorb sunlight, warming the water and reducing sunlight penetration into the water, which is necessary for algal photosynthesis.

Suspended particulates consist of sediments (primarily clay), detritus, and phyto and zooplankton. Sediments are carried from the surrounding land surfaces into the bay by rivers and streams. Once in the bay they either settle onto the bottom or are carried through the bay into the open ocean. Strong tidal currents and wind waves can re-suspend these sediments into the water column. Most trace elements, such as lead, copper, and zinc, are associated with the surfaces of sediment particles and are transported, deposited, and eventually buried with the bay sediments. Many trace elements are toxic to marine life in very small quantities. Human activities have accelerated the cycling of trace elements and increased deliveries of these substances to the marine environment.

The concentration of particles is measured as either total suspended solids (TSS) or nephelometric turbidity units (NTU).

When there are low suspended solids the concentration and uniform distribution from the surface to bottom depths occurs; this is observed when tidal currents are weak and winds are calm, and thus the current stresses applied to the seafloor are not strong enough to suspend bottom sediments. When tidal currents are rapid enough, sediments are eroded from the bottom and move up into the water column. During periods of high stream inflow large quantities of suspended sediments are also carried into the bay. The water can become very turbid during these periods of rapid sediment input.

During years of low stream and river inflow sediment inputs are reduced, and the concentrations of suspended sediments are smaller. So the turbidity and the color of bay waters changes over time, because the concentrations of suspended solids change from season to season and from year to year.

During intense winter storms, tributary stream inputs greatly increase the concentrations of suspended solids in the South Bay, especially in the region below the San Mateo Bridge.

During very wet years, such as 1995, the bay waters may remain turbid during much of the year because of sustained riverine inputs of suspended sediments.

Suspended sediment concentration is controlled by:

- Loading from inland streams;
- Tidal influences on dilution and mass loading of biotic suspended matter (algae, zooplankton); and
- Re-suspension of previously deposited sediments within the bay.

Re-suspension of sediments within the bay is a function of tidal currents, wind strength and direction (i.e., the strength of wind-driven wave currents), and freshwater inputs. Freshwater influx shows a strong seasonal variation, with a peak during the winter (November–April) rainy season; land-derived sediment loading shows a corresponding peak in the winter. Tidal currents vary on a semi-monthly basis from neap tides to spring tides, with the greatest sediment mobility at spring tides. In general, TSS concentrations are highest in the San Pablo Bay region and at the southern end of San Francisco Bay. TSS concentrations are typically lower in central San Francisco Bay.

Measured TSS concentrations in the South Bay range from relatively low values (less than 50 mg/l TSS) to very turbid conditions exceeding 1,000 mg/l TSS. Seasonal RMP grab samples also indicate that TSS concentrations are somewhat elevated in the Coyote Creek area.

4.3.4.2 Overview of Potential Water Quality Impacts from Suspended Solids and Turbidity

Turbidity is a measure of the cloudiness of water and is a function of the amount of suspended material present. This material includes both organics, such as algae, and inorganics such as silt particles. Data available on the turbidity of receiving waters in the project area is limited to the Alviso Complex and includes only the winter months of January and February. This data is summarized in Table 4-7.

Table 4-8
Turbidity of receiving waters in the Alviso Complex. Values are averages (*n* >100) (City of San Jose).

	Turbidity (NTU)	
Receiving water body	**January 2000**	**February 2000**
Guadalupe Slough	75.7	135.2
Mud Slough	120.1	337

Mud Slough is located in the eastern portion of the Alviso ponds, and samples were collected from the north side of pond 21 near Drawbridge. Guadalupe Slough runs through the center of the Alviso portion of the project, and samples were collected from between ponds A3W and A5. This limited data suggests that in the winter Mud Slough tends to have greater turbidity relative to Guadalupe Slough.

Measurements of turbidity in Alviso ponds are shown in Table 4-9. Data are limited to one full year from July 2002 to May 2003. Of the ponds listed, only Alviso Ponds A14 and A16 are discharge (outlet) ponds under the ISP.

Table 4-9
Turbidity of Selected Alviso ponds. Values are averages (*n*=1-6) USGS Preliminary Data.

	Turbidity (NTU)						
Pond	**July '02**	**Sept '02**	**Oct '02**	**Dec '02**	**Feb '03**	**March '03**	**May '03**
A9	68.14	32.10	72.03	22.23	120.98	59.25	51.15
A10	20.28	30.93	45.48	28.34	183.57	59.45	53.75
A11	69.56	115.70	136.76	59.50	36.43	271.67	55.35
A12	64.32	57.23	67.88	35.56	136.70	172.53	51.07
A13	67.50	88.85	47.30	22.70	115.08	133.13	53.65
A14	248.60	182.00	116.55	64.70	51.55	76.65	66.45
A15	111.53	170.00	63.18	28.86	33.86	52.93	86.80
A16	165.00	102.55	82.93	169.20	38.38	47.03	70.70
Average:	101.87	97.42	79.01	53.89	89.57	109.08	61.12
SE	25.72	20.34	11.43	17.44	20.13	28.04	4.48

Table 4-8 indicates that variation in pond turbidity exists both among ponds and among months, with no clear trends evident. In February, the month in which turbidity values are available for both ponds and receiving waters, nearly all ponds had significantly lower turbidity relative to receiving waters. Turbidity of receiving waters may decrease in summer with decreasing sediment load.

A direct comparison of pond water turbidity with that of receiving waters must be made cautiously for several reasons. First, data were collected during different years, and between-year differences in weather conditions may be significant. Second, the receiving waters that were sampled are not adjacent to sampled ponds and therefore function primarily as examples of turbidity ranges that may occur in receiving waters during months for which data are available. Third, turbidity is strongly but indirectly affected by salinity, as algal communities that inhabit highly saline ponds increase turbidity relative to those present in lower salinity ponds.

In general, there are no strong indications that discharge from the ponds will contribute to higher turbidity in the sloughs, creeks, and bay. In contrast to receiving waters, pond sediments are well flocculated due to the high ionic strength of the pond solution. In addition, velocities of water movement through the pond systems are too low to suspend and transport appreciable quantities of sediment. It is also expected that pond water turbidity will decrease under ISP conditions, as most ponds will be managed for lower salinities than exist currently.

4.3.4.3 Turbidity Impacts to Water Quality By Alternative

No Project/No Action Alternative

> *WATER QUALITY (TURBIDITY) IMPACT-1:* Unplanned breaches of ponds could result in significant water quality and wildlife impacts from increased turbidity.

Under the No Project/No Action Alternative, bay water would not be let into the ponds and water levels would not be managed. Ponds would most likely be shallower and warmer which could lead to increased algal activity and turbidity. Additionally, levees would not be maintained and unplanned breaches of the ponds would be more likely. Given the impacts of this alternative on the turbidity of discharge, any breach of the project ponds could have temporary significant impacts on water quality and biota.

Significance: Potentially significant. Since this alternative will result in the project not being implemented, no mitigation measures are proposed.

Alternative 1 Seasonal Ponds

This alternative minimizes impacts from discharge of pond contents into the bay. Maintenance of the levees and water control structures would prevent their deterioration and prevent the accidental breaching of the ponds and release of pond contents to the bay. Thus, under this alternative WQ (T)-1 would not apply. Under this alternative, most of the existing open water habitats currently used by wildlife would be greatly reduced, significantly changing the character of the South Bay salt ponds. The duration and depth of water in the ponds would be reduced in most years, and the open water character of the salt ponds would be lost. The single intake pond for each pond complex would be closed. Intake ponds would no longer be present, so the pond systems would not support fish and bay invertebrates, resulting in reduced foraging habitat for piscivorous (fish-eating) birds.

The Seasonal Pond Alternative appears to have the fewest water quality impacts to the bay with respect to turbidity compared to all other project alternatives. However, this alternative would not meet project objectives of maintaining existing open water and wetland habitat for the benefit of wildlife, including habitat for migratory shorebirds and waterfowl and resident breeding species or maintaining ponds in a restorable condition to facilitate future long-term restoration.

Alternative 2 Simultaneous March/April Initial Release

Maintenance of the levees and water control structures would prevent their deterioration and prevent the accidental breaching of the ponds and release of pond contents to the bay. Thus, under this alternative WQ (T)-1 would not apply.

> *WATER QUALITY (TURBIDITY) IMPACT-2*: Discharge of pond water could lead to a greater than 10% increase in turbidity of receiving water and may adversely affect water quality and biota in adjacent waterways.

Significance: Potentially Significant

> *WATER QUALITY (TURBIDITY) MITIGATION MEASURE-1A:* Monitor discharged water at discharge points of pond systems with known elevated turbidity.
>
> *WATER QUALITY (TEMPERATURE) MITIGATION MEASURE-1B:* Slow the discharge of water when the turbidity variance between the discharging water and the receiving water exceeds 10%.

Post-mitigation Significance: Less than significant

Alternative 3 - Phased July Initial Release

In Alternative 3, many of the lower salinity ponds in Alviso and Baumberg would be discharged in July, and the medium salinity ponds would be discharged the following March and April. These ponds would then be managed in the same manner as in Alternative 2 during the continuous circulation period. The higher salinity ponds would also be managed as in Alternative 2.

Based on the proposed initial release operations, the ponds proposed for discharge in Alternative 3 would not represent any significant difference from the turbidity conditions in Alternative 2. *Therefore the potential receiving waters impacts of Alternative 3 would be the same as or similar to the impacts described for Alternative 2.*

4.3.5 Temperature

4.3.5.1 Regional Water Quality Setting—Temperature

As mentioned in the DO section above, temperature is an important factor in the regional setting because of its influence upon chemical equilibria such as dissolved oxygen, and pH in the ponds and receiving waters, as well as metabolism of cold-blooded fish and aquatic invertebrates upon which they feed.

Like salinity, the temperature of bay water varies spatially and temporally and is an indicator of mixing and the relative contributions of fresh and salt water. The issue is somewhat more complicated because sometimes during the year the coldest water comes from the ocean and sometimes it comes from stream and creek runoff. Colder water is denser (heavier) than warm water and tends to sink to the bottom. This effect is very strong in the open ocean, where salinity variations are small. In the San Francisco Bay, where salinity variations are large, salinity has a greater impact on water mass sinking and mixing than temperature.

Water temperature is measured by the USGS because it is an indicator of mixing and because many biological processes (including fish migrations) respond to temperature changes. The seasonal range of water temperature in the bay is from about 8°C to about 23°C (USGS data, July 1996).

Temperature varies both spatially, along the length of the bay, and temporally, from season to season and year to year. Water temperature changes with season, and is warmest in August when temperatures reach 23°C (73° F). Bay waters are coldest in December and January, reaching minimum temperature of about 8°C (46° F). In summer, the water is warmer in the South Bay than in the Central Bay (Bay Bridge)due to mixing of warmer bay waters and colder waters from the Pacific Ocean.

Sometimes there are sharp temperature gradients. These gradients suggest regions of slow horizontal mixing. For example, a bump in the sea floor at the San Bruno Shoal, acts to slow mixing between the South Bay and Central Bay, allowing the South Bay waters to warm up faster than the Central Bay waters that are close to the colder Pacific Ocean.

During the summer, bay water is coldest near the Golden Gate, where colder ocean water enters, while during the winter, the water near the bay entrance is slightly warmer than in the rest of the bay, particularly the North Bay.

As discussed in Section 4.3.1.5, pond water temperature during the Initial Release and Continuous Circulation Periods is anticipated to be similar or less than existing conditions, though variation may occur in ponds that are managed shallower or deeper than present conditions. Discharge of pond water is proposed for low tide periods; therefore the time of day that discharges occur will vary. Some discharges will occur during daytime when pond temperatures are higher, while others will occur when pond temperatures are lower, during the night or very early morning.

During the Continuous Circulation Period, it is estimated that it would take 15 to 50 days for a complete exchange of water to occur within a pond system. Because the exchange is faster than under commercial salt pond operations, pond temperatures may be less than those that occur under present conditions. Clearly there will be a great deal of variation in pond water temperatures during release periods depending on the management of individual ponds, seasonal climate changes, and levels of solar exposure. Given these variables, temperatures in some ponds may be elevated above the receiving water during some scheduled, low tide release periods.

Available data indicate that only during the summer months is the temperature of discharged pond water likely to be higher than receiving waters.

4.3.5.2 Overview of Potential Water Quality Impacts from Temperature

Temperature is a factor that can influence how well fauna tolerate changes in salinity, and their possible responses to combined changes in salinity and temperature range widely. In San Francisco Bay, water temperature varies more widely than salinity. Bay temperatures are influenced by several factors, including local weather conditions and local discharge of waste heat, as well as by rivers and the ocean (Conomos, 1979). In the summer, salinity levels in the South Bay match that of the ocean, but water temperatures increase by 4-5°C as a result of solar heating in shallow water. This warming is enhanced by the long residence time of water in the South Bay and is especially evident during dry summers, when a warm-water lens forms and is maintained at the water surface despite vertical mixing (Conomos, 1979).

Available data indicate that only during the summer months is the temperature of discharged pond water likely to be higher than receiving waters. Table 4-10 shows water temperature data for ponds in the Alviso Complex and for receiving sloughs and creeks for 2003. Of the ponds listed, only Alviso Ponds A14 and A16 are discharge (outlet) ponds under the ISP. In the months of March and May, pond temperatures were similar to those of potential receiving waters. In the summer months of June and July, pond temperatures rose above those of receiving waters by a maximum of 4.6°C, although at most locations, temperatures were similar to receiving waters. Temperature data for receiving waters are not available for the months of August and September. However, pond temperatures did not increase further in August and September, suggesting that significant differences in temperature between pond water and receiving waters may not occur during these months.

Table 4-10
Water Temperatures for Alviso Ponds and Potential Receiving Water Bodies

Month	Pond	Ave. temp (ºC)	Receiving water body[1]	Ave temp (ºC)
March	A9	18.10	Coyote Creek	17.99
	A10	18.07	Alviso Slough	16.78
	A11	17.93	Guadalupe Slough	16.09
	A12	17.16		
	A13	16.65		
	A14*	17.33		
	A15	16.95		
	A16*	16.37		
May	A9	20.28	Coyote Creek	22.16
	A10	20.13	Alviso Slough	20.85
	A11	21.00	Guadalupe Slough	19.76
	A12	19.86		
	A13	22.57		
	A14*	19.90		
	A15	20.23		
	A16*	20.33		
June	A9	25.16	Coyote Creek	23.70
	A10	24.13	Alviso Slough	23.24
	A11	25.60	Guadalupe Slough	23.04
	A12	24.64		
	A13	23.65		
	A14*	25.13		
	A15	23.83		
	A16*	23.75		
July	A9	24.18	Coyote Creek	21.83
	A10	23.10	Alviso Slough	21.16
	A11	22.88	Guadalupe Slough	20.62
	A12	23.36		
	A13	23.94		
	A14*	23.36		
	A15	25.15		
	A16*	25.20		
August	A9	21.23	Coyote Creek	22.83
	A10	22.50	Alviso Slough	21.57
	A11	28.60	Guadalupe Slough	21.87
	A12	24.90		
	A13	22.50		
	A14*	20.40		
	A15	22.20		
	A16*	23.90		
September	A9	21.60	Coyote Creek	22.98
	A10	21.30	Alviso Slough	22.04
	A11	22.20	Guadalupe Slough	22.07
	A12	21.90		
	A13	23.80		
	A14*	24.70		
	A15	26.50		
	A16*	23.10		

* Pond proposed for discharge into adjacent slough or creek under ISP.

[1] Alviso Slough and Guadalupe Slough data provided for information only. Coyote Slough is the receiving water body for discharges from Ponds A9-16.

4.3.5.3 Temperature Impacts to Water Quality by Alternative

No Project/No Action Alternative

> *WATER QUALITY (TEMPERATURE) IMPACT-1:* Unplanned breaches of ponds could result in significant water quality and wildlife impacts from increased temperature.

Under the No Project/No Action Alternative, bay water would not be let into the ponds and water levels would not be managed. Ponds would most likely be shallower and warmer. Additionally, levees would not be maintained and unplanned breaches of the ponds would be more likely. Given the impacts of this alternative on the temperature discharge, any breach of the project ponds could have temporary significant impacts on water quality and biota.

Significance: Potentially significant. Since this alternative will result in the project not being implemented, no mitigation measures are proposed.

Alternative 1 Seasonal Ponds

This alternative minimizes impacts from discharge of pond contents into the bay. Maintenance of the levees and water control structures would prevent their deterioration and prevent the accidental breaching of the ponds and release of pond contents to the bay. Maintenance of the levees and water control structures would prevent their deterioration and prevent the accidental breaching of the ponds and release of pond contents to the bay. Thus, under this alternative WQ (Temperature)-1 would not apply. Under this alternative, most of the existing open water habitats currently used by wildlife would be greatly reduced, significantly changing the character of the South Bay salt ponds. The duration and depth of water in the ponds would be reduced in most years, and the open water character of the salt ponds would be lost. The single intake pond for each pond complex would be closed. Intake ponds would no longer be present, so the pond systems would not support fish and bay invertebrates, resulting in reduced foraging habitat for piscivorous (fish-eating) birds.

The Seasonal Pond Alternative appears to have the fewest water-quality impacts to the bay with respect to temperature compared to all other project alternatives. However, this alternative would not meet project objectives of maintaining existing open water and wetland habitat for the benefit of wildlife, including habitat for migratory shorebirds and waterfowl and resident breeding species, or maintaining ponds in a restorable condition to facilitate future long-term restoration.

Alternative 2 Simultaneous March/April Initial Release

Maintenance of the levees and water control structures would prevent their deterioration and prevent the accidental breaching of the ponds and release of pond contents to the bay. Thus, under this alternative WQ (Temperature)-1 would not apply.

> *WATER QUALITY (TEMPERATURE) IMPACT-2*: Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of California (Thermal Plan) states: for discharges to enclosed bays, the Thermal Plan indicates that maximum temperature of waste

discharges shall not exceed the natural temperature of receiving waters by 20°F and the discharge shall not cause temperatures to rise greater than 4°F above the natural temperature of the receiving water at any time or place. Discharge of pond water at temperatures more than 20º degrees Fahrenheit above the temperature of the receiving water may adversely affect water quality and biota in adjacent waterways.

Significance: Potentially Significant

WATER QUALITY (TEMPERATURE) MITIGATION MEASURE-1A: Monitor discharged water at discharge points of pond systems with known elevated temperatures.

WATER QUALITY (TEMPERATURE) MITIGATION MEASURE-1B: Slow the discharge of water when the temperature variance between the discharging water and the receiving water exceeds 20º degrees Fahrenheit.

Post-mitigation Significance: Less than significant

Alternative 3 - Phased July Initial Release

In Alternative 3, many of the lower salinity ponds in Alviso and Baumberg would be discharged in July, and the medium salinity ponds would be discharged the following March and April. These ponds would then be managed in the same manner as in Alternative 2 during the continuous circulation period. The higher salinity ponds would also be managed as in Alternative 2.

Based on the proposed initial release operations, the ponds proposed for discharge in Alternative 3 would not represent any significant difference from the temperature conditions in Alternative 2. *Therefore the potential receiving waters impacts of Alternative 3 would be the same as or similar to the impacts described for Alternative 2.*

4.3.6 PH

4.3.6.1 Regional Water Quality Setting –pH

As mentioned in both the DO and temperature sections above, pH is an important factor in the regional setting because of its influence upon chemical equilibria; it is intimately involved with solubility of metals in the ponds and receiving waters as well as having direct impacts on aquatic organisms. Like salinity and temperature, the pH of bay water varies spatially and temporally and is an indicator of mixing and the relative contributions of fresh and salt water.

pH is the measure of the acidity or alkalinity (basicity) of water (pH 7 is neutral, increasing values indicate alkalinity and decreasing value indicate acidity). In most natural systems, the pH of waters is primarily determined by balance between the dissolution of weakly acidic carbon dioxide and basic rocks and carbonates. pH in water systems in contact with the atmosphere is heavily influenced by anything that affects the concentration of carbon dioxide in the water. For example, the solubility of carbon dioxide increases as temperature decreases; temperature affects the pH. As described in the section on DO, the balance between photosynthesis and respiration by organisms affects the concentration of carbon dioxide in water and thus the pH. In general, as DO levels rise and carbon dioxide levels decrease with photosynthesis, pH will increase. Water turbulence can affect the amount of dissolved carbon dioxide.

The pH of a system is also controlled by how well “buffered” (resistant to change) the system is. Some systems have a large capacity to neutralize additions of acidic or basic materials and thus maintain a steady pH. pH levels fluctuate over time in an estuary like the San Francisco Bay. Estuarine pH levels generally average from 7.0 to 7.5 in the fresher sections to between 8.0 and 8.6 in the more saline areas. The slightly alkaline pH of seawater is due to the natural buffering from the carbonate and bicarbonate dissolved in the water.

4.3.6.2 Overview of Potential Water Quality Impacts from pH

Water pH is a factor that can both directly affect fauna and indirectly affect them through its role in many key chemical equilibria. In San Francisco Bay, water pH varies from 7.0 to 8.6. Available data indicate that only during the summer months is the pH of discharged pond water likely to be higher than receiving waters. Table 4-11 shows pH data for ponds in the Alviso Complex and for receiving sloughs and creeks for 2003. In the month of March, pond pH values were similar to those of potential receiving waters. In the warmer months of May, June and July, pond pH rose above those of receiving waters by a maximum of 1.16 pH units, although at most locations the difference was less. The pH data for receiving waters are not available for the months of August and September. However, pond pH did not increase further in August and September, suggesting that significant differences in pH between pond water and receiving waters may not occur during these months. Additional in pond pH data was taken in September which suggest that pH may occasionally be significantly higher than the receiving waters. On that day, average pH at the Alviso Complex was 9.86 with a range of 9.68 to 10.03 and the average pH at the Baumberg Complex was 8.17 with a range of 8.07 to 8.27.

Table 4-11
Water pH for Alviso Ponds and potential receiving water bodies

Month	Pond	Ave. pH	Receiving water body[1]	Ave pH
March	A9	8.2	Coyote Creek	8.25
	A10	8.07	Alviso Slough	8.84
	A11	8.5	Guadalupe Slough	8.71
	A12	8.38		
	A13	8.4		
	A14*	8.4		
	A15	8.4		
	A16*	8.23		
May	A9	8.58	Coyote Creek	7.57
	A10	8.13	Alviso Slough	7.73
	A11	8.73	Guadalupe Slough	7.70
	A12	8.42		
	A13	8.43		
	A14*	8.47		
	A15	8.40		
	A16*	8.30		
June	A9	8.42	Coyote Creek	7.52
	A10	8.20	Alviso Slough	7.65

Month	Pond	Ave. pH	Receiving water body[1]	Ave pH
	A11	8.90	Guadalupe Slough	7.72
	A12	8.34		
	A13	8.38		
	A14*	8.40		
	A15	8.40		
	A16*	8.31		
July	A9	8.03	Coyote Creek	7.69
	A10	8.43	Alviso Slough	7.75
	A11	8.70	Guadalupe Slough	7.73
	A12	8.44		
	A13	8.40		
	A14*	8.35		
	A15	8.35		
	A16*	8.23		
August	A9	8.11	Coyote Creek	7.18
	A10	8.51	Alviso Slough	7.39
	A11	8.46	Guadalupe Slough	7.31
	A12	8.34		
	A13	8.45		
	A14*	8.48		
	A15	8.37		
	A16*	8.22		
September	A9	8.52	Coyote Creek	7.45
	A10	8.05	Alviso Slough	7.67
	A11	8.47	Guadalupe Slough	7.59
	A12	8.34		
	A13	8.37		
	A14*	8.46		
	A15	8.38		
	A16*	8.29		

* Pond proposed for discharge into adjacent slough or creek under ISP.

[1] Alviso and Guadalupe Slough data provided for information only. Coyote Slough is the only receiving water body for Ponds A9-16.

4.3.6.3 Suspected pH Impacts to Water Quality by Alternative

No Project/No Action Alternative

WATER QUALITY (PH) IMPACT-1: Ponds will be seasonally filled; at some times of the year waters could have a very high algal and bacterial biomass. Resultant diurnal fluctuations in DO could result in fluctuations in pH. Unplanned breaches of ponds could result in significant water quality and wildlife impacts from deteriorating water quality. Under the No Project/No Action Alternative, bay water would not be let into the ponds and water levels would not be managed. Ponds would dry down seasonally, levees would not be maintained, and unplanned breaches of the ponds would be more likely. Given the impacts of this alternative on the concentration of metals in discharge, any breach of the project ponds could have significant impacts on water quality and biota.

Significance: Potentially significant. Since this alternative will result in the project not being implemented, no mitigation measures are proposed.

Alternative 1 Seasonal Ponds

This alternative minimizes impacts from discharge of pond contents into the bay and receiving waters. Maintenance of the levees and water control structures would prevent their deterioration and prevent the accidental breaching of the ponds and release of pond contents to the bay. Maintenance of the levees and water control structures would prevent their deterioration and prevent the accidental breaching of the ponds and release of pond contents to the bay. Thus, under this alternative WQ (pH)-1 would not apply. Under this alternative, most of the existing open-water habitats currently used by wildlife would be greatly reduced, significantly changing the character of the South Bay salt ponds. The duration and depth of water in the ponds would be reduced in most years, and the open water character of the salt ponds would be lost. The single intake pond for each pond complex would be closed. Intake ponds would no longer be present, so the pond systems would not support fish and bay invertebrates, resulting in reduced foraging habitat for piscivorous (fish-eating) birds.

The Seasonal Pond Alternative appears to have the fewest water quality impacts on bay waters with respect to pH compared to all other project alternatives. However, this alternative would not meet project objectives of maintaining existing open water and wetland habitat for the benefit of wildlife, including habitat for migratory shorebirds and waterfowl and resident breeding species, or maintaining ponds in a restorable condition to facilitate future long-term restoration.

Alternative 2 Simultaneous March/April Initial Release

Maintenance of the levees and water control structures would prevent their deterioration and prevent the accidental breaching of the ponds and release of pond contents to the bay. Thus, under this alternative WQ (pH)-1 would not apply.

> *WATER QUALITY (PH) IMPACT-2*: Due to the lower temperatures during the initial release period and thus lower productivity of in pond biota, the effect on pond, and thus discharge pH should be minimal. The potential for excursion from the basin plan standards are most likely to occur during the warmer summer and fall months, especially on windless nights when DO sags may occur. Because pH and DO are intimately related in the salt ponds, mitigation measures designed to ameliorate DO sags will also act to reduce pH.

Significance: Potentially Significant

> *WATER QUALITY (PH) MITIGATION MEASURE 1A:* The ponds, effluent and receiving waters will be monitored to determine if excursions from the WQOs are occurring.
>
> *WATER QUALITY (PH) MITIGATION MEASURE 1B:* If monitoring shows excursions from the WQOs the one of the following mitigation measures will be implemented: supplemental aeration using a solar powered aerator and timer to be

actuated during non-daylight hours will be installed at discharge outlet, discharge ponds can be operated as muted tidal ponds for the duration of the pH excursion from the WQO.

Post-mitigation Significance: Less than significant

Alternative 3 - Phased July Initial Release

In Alternative 3, many of the lower salinity ponds in Alviso and Baumberg would be discharged in July, and the medium salinity ponds would be discharged the following March and April. These ponds would then be managed in the same manner as in Alternative 2 during the continuous circulation period. The higher salinity ponds would also be managed as in Alternative 2.

Based on the proposed initial release operations, the ponds proposed for discharge in Alternative 3 would not represent any significant difference from the pH conditions in Alternative 2. *Therefore the potential receiving waters impacts of Alternative 3 would be the same as or similar to the impacts described for Alternative 2.*

5.0 SEDIMENTS

This chapter describes existing sources and levels of contamination in pond sediments within the project area. Available sediment data from past sampling efforts are compared to various sediment screening criteria. The available sampling data are most abundant for the Alviso ponds and are more scant for the Baumberg and West Bay ponds.

The project is not anticipated to generate additional contaminants that could impact sediments; however, the proposed changes in pond hydrology could impact the mobility and bioavailability of sediments. These and other sediment-related impacts are addressed in this section. Since organic chemicals were either not detected in pond sediments, or were detected at very low concentrations and are not likely to pose any additional risk to human health or the environment, the analysis of impacts focuses on impacts related to inorganic chemical contamination. Sediments will also be impacted by and will cause impacts to water quality in the project area. Water quality impacts are addressed in Chapter 4. Biological impacts related to sediment contamination are also addressed in the Biological Resources section, Chapter 6.

5.1 Affected Environment

5.1.1 Sources of Sediment Contamination

The Cargill ponds were constructed for salt making purposes starting in the early 1900s by building levees around existing marshes, mudflats, and open water areas. Some of the Alviso ponds (A1 through A7) were constructed in the late 1940s. The sediments in the Alviso area have historically been subject to significant sources of contamination from historical mining activities (especially for mercury) in the Coastal Range and Guadalupe River watershed. These mining activities resulted in the mobilization of large amounts of mercury-rich sediment into these downstream, wetland areas. Since diking the areas into ponds for salt-making operations, the source of contaminant input into these areas has generally been restricted to what comes in with the intake water, including some suspended sediment. Some contamination may also originate from the large wastewater treatment plant located upstream from the salt ponds and from urban runoff from the heavily populated and industrialized watershed. Ponds A5, A7 and A8 are not fully isolated during flooding events in the Guadalupe River, and can receive suspended sediment in floodwaters. Suspended sediment in the ponds can then be transferred between ponds by an array of weirs and culverts.

5.1.2 Description of Available Pond Sediment Contamination

Assessment of sediment quality in the ISP ponds was based on available sediment analytical data. Sediment samples were collected from 19 of the 57 ponds that are included in the ISP. These ponds are generally representative of all the ponds addressed by the ISP because they reflect the range of water depths and salinities present throughout the ISP ponds. Sampled ponds ranged in average water depth between 0.7 feet and 4.1 feet; historic salinities in sampled ponds have ranged between 11 and 340 parts per thousand.

More specifically, the ISP pond sediments data set consists of:

- 18 samples collected by the U.S. Fish and Wildlife Service ("USFWS data") from Alviso ponds A1, B1, A5, A9, A10, and A16.

- 12 samples collected by Cargill in 2002 (“Hydroscience data”) from Alviso ponds A2W, A3W, A5, A9, A15, A16, and A17; Baumberg ponds 2C, 8A, and 10; and West Bay Pond 1. This data set also includes two samples collected from the Bay adjacent to the Alviso and Baumberg pond complexes.
- 59 samples from Pond A18 collected by the City of San Jose prior to purchase of that pond from Cargill (“A18 data”).
- 20 samples from Ponds A4 and A8 collected by the Santa Clara Valley Water District in 1997 and 2000 as part of Phase I and Phase II hazardous substance liability assessments (“A4 and A8 data”).
- 6 samples from Ponds A19, A20, and A21 collected by Cargill in 2002 (“Island Pond data”).

Pond A4 is owned by the Santa Clara Valley Water District and Pond A18 is proposed to be purchased by the City of San Jose. Although these ponds are not part of the ISP, they are part of the South Bay salt pond system and are illustrative of general sediment quality in the area. Therefore, the A4 and A18 data were included in this evaluation to maximize available data and facilitate evaluation of ISP pond sediments.

As noted above, most of the available data are from the Alviso ponds. The Alviso ponds are located near the mouths of Alviso Slough, Guadalupe Slough, and Coyote Creek. This area is more directly affected than other ISP pond complexes by contaminants associated with historic mercury mining in the Guadalupe River drainage, municipal and industrial wastewater discharge, and the outflow of contaminants from an urban watershed. The weighting of the data toward the ponds closer to contamination sources is environmentally conservative.

5.1.3 Sediment Criteria

Available sediment data were compared with a variety of screening criteria that are commonly used to assess the quality of San Francisco Bay Area sediment. Those screening criteria comprised the San Francisco Bay ambient values, the San Francisco Bay Regional Water Quality Control Board (RWQCB) cover and noncover criteria, Effects Range-Low and Effects Range-Median criteria (ER-Ls and ER-Ms), and local ambient data from the Guadalupe River and other areas in the vicinity of the ISP ponds. These screening criteria are described below.

San Francisco Bay Ambient Values The RWQCB developed the San Francisco Bay ambient values (SFBRWQCB 1998) to represent the typical range of concentrations currently found in Bay sediments located away from sources of contamination. These values are listed in Table 5-1.

Typical “ambient” concentrations in Bay sediments are distinguished from “background” values that are defined as pre-industrialization (i.e., before about 1850) or naturally occurring levels of chemicals. Sediment chemistry data were obtained from the 1991 Pilot Study, Regional Monitoring Program Data from 1992 through 1995, and the RWQCB Bay Protection and Toxic Cleanup Program’s 1995 Reference Site Study (as cited in RWQCB 1998). Sediment samples were collected from the spine (i.e., deep portions) of the Bay away from known sources of constituents of concern (COC) or “hot spots” and were compiled into a database representative of ambient conditions in open water areas of the Bay. Because these Bay sediment samples were collected from the deepest portions of the Bay away from contaminant sources, these values are widely used as "clean" background standards in place of other nationally based criteria, such as ER-Ls**.**

The data set was screened for statistical outliers, and the 85th percentile of the remaining data distribution for each chemical was selected to represent the upper bound or threshold value for ambient sediments. Increasing COC concentrations were found to be associated with increasing percentage of fine-grained sediments (fines; i.e., clays and silts). For some COCs, the distribution of the data indicated two subgroups (bi-modal) associated with sediment samples: a group above and a group below 40 percent fines. To take the two subgroups (bi-modal distribution) into account, the RWQCB calculated two upper-bound numbers: one for sediments containing less than 40 percent fines, and one for sediments containing 40 to 100 percent fines. Sediments at the project site are predominantly fine-grained (versus coarse-grained, sandy sediments); ambient values for 100 percent fines were used for comparison with ISP pond sediment data.

Table 5-1
San Francisco Bay Ambient Values

Constituent	San Francisco Bay Ambient Values (mg/kg)
Arsenic	15.3
Cadmium	0.33
Chromium, total	112
Copper	68.1
Lead	43.2
Nickel	112
Mercury	0.43
Selenium	0.64
Silver	0.58
Zinc	158
PAHs, total	3.39
DDT	0.007
PCBs, total	0.0148

Notes: mg/kg = milligrams per kilogram; PAH = polycyclic aromatic hydrocarbon; PCB = polychlorinated biphenols

ER-Ls and ER-Ms ER-Ls and ER-Ms are toxicity-based thresholds for sediment that were developed by the National Oceanic and Atmospheric Administration (Long et al. 1995). Although NOAA did not develop these values for use as regulatory criteria, they are commonly used by state and federal regulatory and resource agencies as screening guidelines for assessing the potential for biological effects associated with contaminants in San Francisco Bay sediments. ER-L and ER-M values for inorganics and organics are listed in Table 5-2.

It should be noted that some inorganics, including arsenic, chromium, copper, mercury, nickel, and zinc, are commonly detected in ambient Bay sediments at concentrations higher than ER-Ls. Therefore, while ER-L values are useful as a measure of predicted biological effects, they are not commonly used by the agencies for regulating sediment quality in and around the Bay.

These values were calculated by examining the range of chemical concentrations associated with observed adverse biological effects data from a nationwide database that included co-located samples of freshwater, estuarine, and marine sediments. Because the data set includes only data for which biological effects occur (i.e., no-effects data were not included), it is considered to be a relatively conservative approach for predicting biological effects. For each chemical, the ranges of chemical concentrations associated with observed biological effects were determined and sorted in ascending order, and two values were calculated for each chemical: an ER-L and an ER-M. The ER-L values represent the lower 10th percentile concentration of the data, which is considered to be concentrations where adverse biological effects are rarely expected to occur (less than 10 percent of the time). The ER-M values represent the 50th percentile of the data, which is considered to be concentrations below which biological effects may be expected to occur less than 50 percent of the time and above which adverse biological effects are expected to occur more than 50 percent of the time.

Table 5-2
NOAA ER-Ls and ER-Ms

Constituent	Effects Range-Low (ER-L) Criteria (mg/kg)	Effects Range-Median (ER-M) Criteria (mg/kg)
Arsenic	8.2	70
Cadmium	1.2	9.6
Chromium, total	81	370
Copper	34	270
Lead	46.7	218
Nickel	20.9	51.6
Mercury	0.15	0.71
Selenium	N/A	N/A
Silver	1.0	3.7
Zinc	150	410
PAHs, total	4.022	44.792
DDT	0.0016	0.046
PCBs, total	0.0227	0.18

Notes: mg/kg = milligrams per kilogram; PAH = polycyclic aromatic hydrocarbon; PCB = polychlorinated biphenols

RWQCB Wetland Cover and Noncover Criteria The San Francisco Bay RWQCB has promulgated sediment screening guidelines for use in evaluating the beneficial reuse of dredged sediment for wetland creation, levee repair, and landfill cover (SFBRWQCB 1992). The criteria are intended to facilitate the creation, enhancement, and restoration of wetlands in marine and estuarine environments. The criteria were developed in part based on NOAA's ER-L and ER-M criteria.

The RWQCB criteria specify the allowable use based on two categories: use for wetland noncover where exposure to the aquatic environment would be limited and wetland cover or levee construction where sediments would be exposed to the water. RWQCB has also begun to refer to noncover sediment as "foundation" sediment, since it essentially serves as the foundation of the marsh. Cover sediment contains lower chemical concentrations and must pass chronic and acute bioassay tests. Cover material is deemed suitable for placement in the surface of a wetland environment. Because noncover sediment is characterized by higher concentrations, it must be covered with 3 feet of cover sediment, and must not leach chemicals that could harm aquatic resources.

The RWQCB guidelines require evaluation of sediment chemical concentrations, leachability data, and bioassay results in comparison to reference data and applicable water quality criteria. Cover and noncover criteria have been commonly used over the past ten years by interagency task forces (including the Dredged Material Management Office) for making sediment disposal/reuse suitability determinations. The RWQCB has circulated a draft revision of the guidelines (SFBRWQCB 2000) that proposes use of "background" values for cover criteria, and Effects Range-Median (ER-M) values for noncover criteria. Unlike the 1992 guidelines, the recently proposed changes have not been formally adopted by the RWQCB; therefore, the 1992 values were used for comparison with ISP pond sediments. Table 5-3 shows the applicable (1992) criteria for trace metals and organic compounds.

Table 5-3
RWQCB Sediment Screening Criteria

Constituent	Wetlands Creation Noncover (mg/kg, dry weight)	Wetlands Creation Cover and Levee Restoration (mg/kg, dry weight)
Arsenic	33-85	<33
Cadmium	5-9	<5
Chromium, total	220-300	<220
Copper	90-390	<90
Lead	50-110	<50
Nickel	140-200	<140
Mercury	0.35-1.3	<0.35
Selenium	0.7-1.4	<0.7
Silver	1.0-2.2	<1.0
Zinc	160-270	<160
PAHs, total	4-35	<4
DDT	0.003-0.1	<0.003
PCBs, total	0.05-0.4	<0.05

Notes: mg/kg = milligrams per kilogram; PAH = polycyclic aromatic hydrocarbon; PCB = polychlorinated biphenols

Local Ambient Data, including Guadalupe River Data Available data from the Guadalupe River and other areas in the vicinity of the ISP ponds were compiled for the ISP in order to allow comparison of pond data with local ambient conditions. These values include mercury data obtained from USFWS and RWQCB. In addition, a large amount of data from inorganic analyses was obtained for Guadalupe River sediments.

These data include a number of values that appear to be "outliers" based on either unrealistically high detected concentrations (e.g. 600,000 mg/kg copper) or notably high concentrations that are more than an order of magnitude higher than ambient sediment concentrations normally encountered in the South Bay. Means and ranges for Guadalupe River sediments were calculated without these outliers. Additionally, calculation of mean concentrations did not include the non-detects for which detection limits were not available. While the determination of "outliers" was qualitative and no quality control/quality assurance information is currently available for these data, the means and ranges calculated without these apparent outliers are consistent with available means and ranges calculated for Guadalupe watershed sediment by other parties, including the RWQCB and USFWS. Local Guadalupe River data from upstream and near the mouth of Alviso Slough are provided in Table 5-4. The apparent outliers are indicated in the ISP tables.

Table 5-4
Local Ambient Data, Guadalupe River

Constituent	Guadalupe River Low (mg/kg)	Guadalupe River High (mg/kg)	Guadalupe River Mean (mg/kg)
Upstream of Alviso Slough			
Cadmium	0.25	4.5	0.88
Mercury	0.05	9.2	2.09
Selenium	0.16	3	0.52
Near the Mouth of Alviso Slough			
Mercury	0.8	1.2	

Notes: mg/kg = milligrams per kilogram; PAH = polycyclic aromatic hydrocarbon; PCB = polychlorinated biphenols

5.1.4 Pond Sediment Sampling Results

Available sediment data were compared with the screening values described above. These comparisons are useful because sediments contain a wide array of inorganic chemicals from natural geologic sources, as well as from anthropogenic activities like mining. The results of this evaluation are summarized below. Section 2.3 (Sediment Quality) in the ISP (Appendix A of this EIR/EIS) contains inorganic contaminant data for the ponds and a detailed discussion of these data. Appendix B in the ISP (Appendix A of this EIR/EIS) contains tables with organic contaminant data for the ponds.

Sediment in the ponds would be expected to have similar characteristics to ambient conditions in the vicinity of each pond system, including elevated concentrations of some inorganics (e.g mercury). Available sediment data from the ponds generally support this premise. The concentrations of contaminants in the ponds taken as a whole are similar to San Francisco Bay ambient concentrations and within the range of concentrations found within the Guadalupe River. In the Alviso ponds, the concentrations of some inorganics (notably arsenic, mercury, and selenium) are elevated over some reported San Francisco Bay ambient concentrations, but are within the range of ambient concentrations found within the South Bay and associated watersheds.

Organic chemicals (i.e., petroleum-based chemicals, including PAHs, PCBs and pesticides) were either not detected in pond sediments, or were detected at very low concentrations similar to ambient concentrations found in the cleanest parts of the Bay. Therefore, organic chemicals in the ponds do not likely pose any additional risk to human health or the environment beyond that found in the cleanest parts of the Bay.

Alviso Complex Sediment Sampling Results Sampling has been most extensive in the Alviso Complex ponds, including the Island Ponds. Available sediment quality data indicate that concentrations of contaminants in the Island Ponds (Ponds A19, A20, and A21) are similar to ambient conditions in the cleaner portions of San Francisco Bay. Data is not available for Alviso Ponds A22 and A23.

In general, concentrations of inorganics were detected in Alviso pond sediments at levels similar to San Francisco Bay ambient concentrations. Arsenic, cadmium, mercury and selenium were detected in some ponds at concentrations elevated above Bay ambient concentrations, but within the concentration ranges observed within the Guadalupe River watershed. Detected concentrations of these chemicals in the Alviso Complex sediments are discussed further below.

Chromium, copper, lead, nickel, silver and zinc were detected in the Alviso ponds at relatively lower concentrations, very similar to Bay ambient conditions. Mean concentrations of these chemicals were approximately half San Francisco Bay ambient concentrations. Maximum detected concentrations of these chemicals were only about 20% to 30% higher than San Francisco Bay ambient values.

Arsenic—Arsenic was detected at low concentrations in all but one of the Alviso ponds sampled. Detected concentrations ranged from <5 mg/kg to 19 mg/kg. The mean detected concentration of arsenic in the USFWS and Hydroscience data sets (10.74 mg/kg and 11.21 mg/kg, respectively) were lower than the San Francisco Bay ambient concentration (15.3 mg/kg). The maximum detected concentrations in those data sets (19 mg/kg and 17.5 mg/kg, respectively) were slightly above the San Francisco Bay ambient concentration. Arsenic was detected at higher concentrations in Pond A4, but the Pond A4 arsenic data appear to be of questionable quality, and the Santa Clara Valley Water District, the owner of this pond, has indicated its intention to collect additional sampling for this data. With the exception of Pond A4, detected arsenic concentrations are similar to background values and are unlikely to adversely affect water quality or wildlife.

Cadmium—Cadmium concentrations detected in the Alviso ponds were generally low. The highest concentrations were detected in the USFWS samples; concentrations in that data set ranged from non-detectable (<0.2 mg/kg) to 1.5 mg/kg, with a mean concentration of 0.96 mg/kg. This mean concentration in that data set was somewhat elevated over San Francisco Bay ambient conditions (0.3 mg/kg), but was below the RWQCB 1992 wetland cover criterion (5 mg/kg) and the ER-L (1.2 mg/kg). The maximum detected concentration detected by USFWS (1.5 mg/kg) was below the RWQCB 1992 wetland cover criterion, only slightly higher than the ER-L, and significantly below the ER-M (9.6 mg/kg).

Available Guadalupe River background data indicate that cadmium is present at similar concentrations (0.25 to 4.5 mg/kg, with a mean of 0.88 mg/kg) to those detected in the Alviso Ponds, but higher maximum concentrations were detected in the Guadalupe River. These data indicate that concentrations of cadmium in the Alviso Ponds are slightly elevated over San Francisco Bay ambient conditions, but are very similar to local ambient conditions, and are below concentrations that are likely to cause adverse effects to aquatic organisms.

Mercury—The highest concentrations of mercury were detected in the Hydroscience and USFWS samples. Hydroscience detected concentrations of mercury ranging from 0.3 mg/kg to 1.92 mg/kg, with a mean of 0.55 mg/kg. USFWS detected concentrations ranging from 0.3 mg/kg to 1.2 mg/kg, with a mean concentration of 0.84 mg/kg. Those mean concentrations are elevated in comparison with the San Francisco Bay ambient value (0.43 mg/kg). The maximum detected concentrations are similar to the RWQCB noncover criterion and significantly above the ER-L (0.15 mg/kg), the ambient value (0.43 mg/kg), the wetland cover criterion (0.35 mg/kg), and the ER-M (0.71 mg/kg).

Concentrations of mercury appear to be mostly within the range of San Francisco Bay ambient values, but there are localized areas of elevated concentrations. The highest concentrations of mercury were detected in Ponds A5, A9, A10, A15, A16, and A17.

These ponds are all located adjacent to either Alviso Slough, Guadalupe Slough, or Coyote Creek, and are within the historic Guadalupe River delta. This area is characterized by elevated background concentrations of mercury as a result of mercury mining in the watershed. Based on available data, concentrations of mercury in the Guadalupe River upstream of Alviso Slough range from about 0.05 to 9.2 mg/kg with a mean of 2.09 mg/kg. Concentrations near the mouth of Alviso Slough are about 0.8 to 1.2 mg/kg. The concentrations of mercury detected in the ISP ponds are similar to current ambient sediment concentrations and consistent with the distribution of historically high levels of mercury in the watershed.

Selenium—The highest concentrations of selenium were detected in the USFWS and Hydroscience data sets. USFWS detected selenium at concentrations ranging from 0.5 mg/kg to 2.1 mg/kg, with a mean concentration of 0.77 mg/kg. Hydroscience detected selenium at concentrations ranging from 0.71 mg/kg to 1.17 mg/kg, with a mean concentration of 0.97 mg/kg. Those mean concentrations are similar to or slightly elevated in comparison with the San Francisco Bay ambient concentration (0.64 mg/kg) and the RWQCB wetland cover criterion (0.7 mg/kg), but significantly below the RWQCB noncover criterion (1.4 mg/kg). The maximum detected concentrations are somewhat higher than background values and the cover and noncover criteria. There are no ER-L or ER-M values for selenium.

The elevated selenium concentrations (i.e., 1.03 to 2.1 mg/kg) were detected in ponds A2W, A3W, A9, A10, and A17, all of which are within or very close to the historic delta of the Guadalupe River. Based on available data, selenium concentrations in the Guadalupe River range from 0.16 to 3 mg/kg, with a mean of 0.52 mg/kg. These data indicate that selenium concentrations in the Alviso ponds are within the range of concentrations observed in ambient sediments.

Alviso Complex Island Pond Sediment Sampling Results—Two composite samples are available for each of the three Island Ponds (A19, A20, and A21). One composite sample per pond represented surface sediments and one composite sample represented sediments at depth. Each composite sample comprised three discrete samples. Mean concentrations of detected inorganics were well below San Francisco Bay ambient conditions. Maximum concentrations were also below ambient concentrations for all inorganics, except mercury and selenium. The maximum detected concentration of mercury (0.48 mg/kg) was similar to the San Francisco Bay ambient concentration and RWQCB cover criterion (0.43 and 0.35 mg/kg, respectively), but above the ER-L (0.15 mg/kg). The maximum detected concentration of selenium (0.88 mg/kg) slightly exceeded the San Francisco Bay ambient concentration and RWQCB cover criterion. No ER-L or ER-M is available for selenium. With the exception of nickel, which exists naturally in the Bay at concentrations above its ER-L and ER-M, detected concentrations of inorganics were well below RWQCB noncover values and ER-Ms.

While available data are limited, they indicate that the Island Pond sediments are similar to San Francisco Bay ambient concentrations and are unlikely to pose a risk to water quality or wildlife above that found in background sediment.

Baumberg Complex Sediment Sampling Results Available sediment quality data indicate that concentrations of contaminants in the Baumberg Ponds are similar to ambient conditions in the cleaner portions of San Francisco Bay; however, extensive sediment sampling of these ponds has not been conducted. Assessment of sediment quality in the Baumberg ponds is constrained by the small amount of data available. Available data consist of four samples collected by Hydroscience. These samples represent three of the 23 ponds in the Baumberg system. However, the ponds for which data are available are generally representative of the range of water depths and salinities that characterize the Baumberg ponds. In the sampled ponds, average existing water depths range from 0.7 to 1.3 feet, and average salinities range from 16 to 265 parts per thousand (ppt). In comparison, average existing water depths for all the Baumberg ponds range from 0.6 to 2.7 feet; average salinities for all the Baumberg ponds range from 16 to 334 ppt. In general, lower concentrations of contaminants are expected in the Baumberg ponds based on their greater distance from known sources such as the Guadalupe River drainage.

With the exception of selenium, inorganics were detected in the Baumberg ponds at concentrations below San Francisco Bay ambient concentrations. Mean and maximum detected concentrations of arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, and zinc were below ambient values and wetland cover criteria. Mean concentrations of arsenic, cadmium, chromium, copper, lead, silver, and zinc were below ER-Ls. Maximum concentrations of silver and zinc were also below ER-Ls. With the exception of nickel, which exceeded the ER-M (51.6 mg/kg), detected concentrations of inorganics were well below the ER-M and wetland noncover values. It should be noted that the nickel ER-M is lower than the San Francisco Bay ambient concentration (112 mg/kg).

Selenium was detected at a mean concentration of 0.76 mg/kg and a maximum concentration of 0.87 mg/kg. These concentrations are slightly elevated compared to the San Francisco Bay ambient concentration of 0.64 mg/kg and the RWQCB wetland cover criterion of 0.7 mg/kg, but well below the wetland noncover criterion of 1.4 mg/kg. These minor exceedences are near the range of laboratory error (typically 10 to 20%, depending on analytical method). No ER-L or ER-M is available for selenium. One sample ("Bay") was collected from Bay sediments immediately adjacent to Pond 10 to characterize local background conditions. Selenium was detected in that sample at 0.68 mg/kg, which is similar to San Francisco Bay ambient and wetland cover criteria. The mean concentration of selenium in the sampled ponds is within 11% of the Bay sample, indicating that pond conditions are very similar to ambient conditions.

The number of samples makes it difficult to confirm that these exceedences are localized; but it appears that exceedences are slight, and that selenium in Baumberg sediments is unlikely to pose a higher risk to water quality or wildlife than Bay ambient conditions.

West Bay Complex Sediment Sampling Results Assessment of sediment quality in the West Bay Ponds has a high degree of uncertainty due to the fact that only one sample is available. However, concentrations of all inorganics in that sample were well below San Francisco Bay ambient conditions, RWQCB cover criteria, and RWQCB noncover criteria. With the exception of nickel, which exists naturally in the Bay at concentrations above its ER-L and ER-M, detected concentrations of inorganics were also below ER-Ls and ER-Ms. While it is not possible to characterize sediment definitively on the basis of a single sample, the available data for this single sample indicate that inorganics are present at concentrations below background conditions and are unlikely to pose risks to water quality or wildlife.

5.1.5 Fate/Transport and Toxicity of Inorganic Contaminants in Pond Sediments

Fate/Transport and Toxicity of Mercury— Mercury contamination is widespread in sediments and waters of the San Francisco Bay area (San Francisco Estuary Institute 2000, SFBRWQCB 2000). Mercury is a constituent of particular concern to wetland restoration projects because of its ability to convert to the methylated form of the metal, which is relatively more mobile in the aquatic environment than other forms. Data for total mercury in water and sediment from long-term monitoring data under the USGS and San Francisco Estuary Institute Regional Monitoring Program (RMP) has consistently shown elevated concentrations, primarily in the north and south bay areas and river tributaries. There is also a strong correlation between total mercury and suspended sediment transport in the water (SFEI, 2000).

Elevated mercury levels are in large part a legacy of the California gold mining era, when mercury was used in the gold refining process. Mines such as south San Francisco Bay's New Almaden Mine, which operated for many years in the upper Guadalupe River watershed extracting the mercury ore cinnabar, are known to be a source of mercury in the bay system. Over time, leaching of mine tailings and overland transport of mercury-bearing sediments have resulted in the downstream accumulation of mercury in the watershed.

In aquatic environments, most mercury is chemically bound to suspended particles of soil or sediment; a smaller fraction is bound to dissolved organic carbon. Sediment-bound mercury may be available to aquatic organisms and is thus a pollutant of concern; the potential for adverse environmental effects from sediment-bound mercury depends primarily on transport and depositional characteristics (e.g., particle size) and on the physical and chemical properties of the sediment.

Additionally, sediment-bound mercury may be converted through both biotic and abiotic processes to its more bioavailable methylated form. Factors conducive to methylation of mercury include low-flow or stagnant waters, hypoxic or anoxic conditions in the water or sediment column, low pH ($pH<6$), and high concentrations of dissolved carbon. Most of these factors are in turn affected by biological processes such as metabolism, growth, and decay; for example, mercury methylation has been linked to the activity of sulfate-reducing bacteria in the shallow anoxic sediment column.

Aquatic plants, fish, and wildlife readily adsorb methylmercury. It can then accumulate in their tissues, creating contaminated food sources (plant or animal tissues) that transfer through the food web (Santa Clara Valley Water District and U.S. Army Corps of Engineers 2001). It is a mutagen, teratogen, and carcinogen, and has embryotoxicological, cytochemical, and histopathological effects. In aquatic organisms, concentrations of 0.1–200 micrograms per liter (µg/l) have been shown to produce adverse effects. Toxicity increases with age of the organism, exposure time, temperature, lowered salinities, and the presence of other metals.

Fate/Transport and Toxicity of Selenium—Concerns about the potential impacts of selenium in the San Francisco Estuary were raised in the mid-1980s when elevated selenium concentrations were detected in water and biota in the northern reaches of the Estuary, and in Kesterson Reservoir where the most dramatic evidence of selenium poisoning in waterfowl was observed (CDFG 1988, 1989; Ohlendorf et al. 1990).

A review of available South San Francisco Bay selenium data, collected primarily between 1995 and 2000, has shown the dominance of riverine sources in the overall selenium mass loading to the South Bay (LFR Levine-Fricke 2002). Estimates based on flow and dissolved selenium data indicated that the Guadalupe River is responsible for about 1/3 of the total selenium flow into the South Bay. The San Francisco Estuary Institute (SFEI 2000) also identified the Guadalupe River as a significant contributor of selenium to the South Bay. The LFR report estimated that all the creeks and rivers (including Guadalupe River, Alameda and Coyote Creeks) contributed more than 60% to the South Bay. Publicly-owned treatment works (POTWs) were estimated to contribute about 20% of the total selenium load, while stormwater runoff was estimated to contribute about 15%. Although the average daily water flow from the Guadalupe River is relatively low compared with Alameda Creek and the San Jose/Santa Clara POTW, it contained by far the highest selenium concentrations of any water body in the area, with an average selenium concentration of 4.7 μg/l.

The ultimate source of selenium in the South Bay watersheds is geologic. Although geologic formations containing naturally elevated selenium may be present, historical mining activities in the Santa Cruz Mountains have likely increased selenium concentrations in tributaries to the Guadalupe River that ultimately flow into the South Bay. Selenium is often associated with the types of geologic formations and mineral deposits found in the Santa Cruz Mountains, from which tributaries of both the Guadalupe River and Coyote Creek emerge.

The New Almaden region within the Santa Cruz Mountains contains well-known mercury ore deposits. The geologic processes responsible for the formation of mercury-rich deposits (cinnabar, a mercury sulfide) in this area are unrelated to the processes resulting in selenium enrichment; however, cinnabar is associated with pyrite and other sulfides (Bailey and Everhart 1964), which commonly contain selenium impurities. The high pyritic content of shales in the Coast Ranges is considered a major reason for their high selenium content (Martens and Suarez 1997). Therefore, it is quite likely that exposed and/or oxidized sulfide deposits in the New Almaden region are an important source of selenium to the Guadalupe River. In addition, Upper Cretaceous marine shales, often enriched with selenium, are also found near the headwaters of Alamitos Creek, a tributary to the Guadalupe River.

Concentrations of selenium in biota in the South Bay have been reported to be elevated relative to average levels in the North and Central Bays (SWRCB 1988; CDFG 1989). However, there are no major industrial sources of selenium known in the South Bay, in contrast to the North Bay where oil refineries have historically discharged significant amounts of selenium in their wastewater.

POTWs have been identified as a potential source of selenium to the South Bay (SFBRWQCB 1997). Selenium in POTW effluent has been assumed to be “strongly influenced by selenium levels in groundwater,” which are in turn a result of “naturally-high (Se) concentrations in local geology and evaporative concentration” (SFBRWQCB 1997). Cutter and San Diego-McGlone (1990) reported that selenium concentrations in South Bay POTW discharges in March 1988 were as high as 1.43 μg/l, and generally higher than those from San Francisco or East Bay POTWs. However, according to a review conducted by LFR in 2002, most reported POTW discharge data revealed less than 1 μg/l selenium in samples. Based on 27 measurements collected between December

1987 and March 1988, Cutter and San Diego-McGlone (1990) estimated that the total selenium flux from South Bay, East Bay, and San Francisco POTWs was approximately 400 kilograms per year (kg/yr). This estimated flux is five times smaller than the total selenium flux from North Bay refineries prior to selenium reduction efforts carried out by the refineries in the 1990s.

The hydrology of the South Bay differs from the other Bay regions in that it is enclosed on three sides, is much shallower, and has a longer water residence time than other parts of the Bay (San Francisco Estuary Project [SFEP] 1992). As such, the South Bay, and in particular the South Bay south of the Dumbarton Bridge, is relatively stagnant and subject to a higher evaporation rate, as manifested in the relatively higher concentrations of numerous constituents of South Bay water compared to other parts of the Bay (SFEI 1999).

Selenium mobility, bioavailability, and toxicity depend on the selenium species (i.e., its form) in the environment. Selenium chemistry is complex and the element exists in several different forms and oxidation states, including: the oxyanions selenate (Se [VI]) and selenite ([Se[IV]); and the more reduced forms of elemental selenium and inorganic and organic selenides.

Selenite is generally considered more harmful to biota than selenate because of its potential to bioaccumulate more readily (Ogle et al. 1988; Zhang et al. 1990), and tendency to adsorb to particulate matter, which can be ingested by bivalves (Luoma et al. 1992). Selenite is strongly adsorbed by soil surfaces (especially iron hydroxides) at acid to near-neutral pHs; alkaline conditions can release selenite from soil surfaces. Selenate, the most oxidized and most common form in natural waters, is not adsorbed strongly by soil and is consequently the selenium form most readily taken up by plants. Selenate is readily reduced to selenite under common wetland conditions, which can then be adsorbed and/or precipitated by a number of soil solid phases, including iron hydroxides, carbonates, and organic materials. Alternatively, selenite can be oxidized under drying conditions to selenate, thus becoming more mobile in the environment. Under anaerobic conditions, which can readily occur in wetland environments, selenite can be further reduced to elemental selenium and into selenides (e.g., FeSe). Although these reduced forms of selenium are typically less bioavailable than the oxyanionic forms (e.g., selenate and selenite), microbial transformations and uptake of these reduced forms are known to occur (Oremland 1994).

Like mercury, selenium can be methylated by a variety of microorganisms, generally producing dimethyl-selenides (DMSe). Unlike mercury, however, methylated selenium is believed to be less toxic than the oxyanions, and because of its high volatility, has received a lot of attention for its potential use as a remediation technique to lower selenium concentrations in contaminated soil and sediment. Addition of carbonaceous materials to soil has been reported to enhance formation of DMSe, especially under aerobic conditions.

5.2 CRITERIA FOR DETERMINING SIGNIFICANCE OF EFFECTS

Potential effects of the various project alternatives (including No Project/No Action and Alternatives 1, 2, and 3) on sediments were assessed qualitatively and quantitatively based on a comparison between existing conditions and projected post-implementation conditions with regard to contaminant mobility, exposure, and bioavailability. Criteria based on CEQA and NEPA guidelines were used to determine the significance of potential impacts of sediment-associated contaminants on biota or water quality. Under NEPA, analysis of significance requires considerations of both the context and intensity of an impact. Consideration of context means the significance of an action must be analyzed within the appropriate temporal, geographic, and ecological scale, while intensity refers to the severity of the impact. Impact intensity and context were fundamental to the development of RWQCB screening criteria for wetlands cover materials, which are included in the significance thresholds for sediment impacts (below). As discussed above (see Section 5.1.3), these criteria are based partly on NOAA ER-Ls and ER-Ms, which are themselves based on observed toxicity responses in organisms (intensity). The RWQCB criteria take into consideration the particular situation of the San Francisco Bay region (context).

Sediment impacts were considered significant if they would reasonably be expected to:

- Result in substantial changes in the mobility or bioavailability of sediment-associated contaminants
- Increase exposure of wildlife to contaminants in excess of relevant regulatory criteria and guidelines (RWQCB screening criteria for wetlands cover materials)
- Increase exposure of listed species to bioaccumulatable contaminants
- Result in indirect impacts to water quality that could cause exceedances of water quality criteria (see Chapter 4 for water quality criteria)
- Result in impacts to potential future restoration of the project ponds

Since the process of freshening saline water bodies with sediments containing various levels of metals has never before been monitored, the actual potential for impacts is not known. Consistent with NEPA guidelines, impacts were considered significant if available information indicates potential adverse effects, but insufficient information is available to determine the severity of those effects.

5.3 IMPACTS

The discussion of impacts from sediments focuses on those ISP ponds that contain levels of inorganic contaminants that exceed RWQCB screening criteria for wetland cover materials, based on available sediment sample data (see Section 5.1). A total of 11 ponds, all located in the Alviso Complex, contain levels of mercury or selenium that exceed the screening criteria. These ponds include A1 (mercury), A2W (selenium), B1 (mercury), A3W (selenium), A3N (mercury), A5 (mercury), A9 (mercury and selenium), A10 (mercury and selenium), A15 (mercury), A17 (mercury and selenium) and A16 (mercury). The elevated concentrations of selenium and mercury detected in sediment and/or tissue samples from these Alviso ponds indicate that potential oxidation or wetting/drying cycles in these ponds would be of particular concern.

As discussed in Section 5.1.4.1, sampling has been most extensive in the Alviso Complex ponds, including the Island Ponds. Available sediment quality data indicate that concentrations of contaminants in the Island Ponds (Ponds A19, A20, and A21) are similar to ambient conditions in the cleaner portions of San Francisco Bay. Data is not available for Alviso Ponds A22 and A23. Available sediment quality data indicate that concentrations of contaminants in the Baumberg Ponds are similar to ambient conditions in the cleaner portions of San Francisco Bay (see Section 5.1.4.2); however, extensive sediment sampling of these ponds has not been conducted. Only one sediment quality sample is available to assess sediment quality in the West Bay Ponds (see Section 5.1.4.3). Concentrations of all inorganics in that sample were well below ambient conditions in the cleaner portions of San Francisco Bay.

Changing the depths of water levels in the ponds in the project area could cause impacts to water quality and biota, particularly in those ponds that contain elevated levels of inorganic contaminants by: 1) creating acidic conditions in sediments and soils; 2) increasing the mobility, availability, and concentration of contaminants (through oxidation, acidification, freshening and methylation of mercury); 3) increasing the opportunities for wildlife contact with contaminants in exposed sediments; and 4) impacting vegetation growth in gypsum/salt-affected soils. These types of impacts are discussed generally first and then in relationship to each of the proposed project alternatives below.

Impacts from Oxidation—Oxidation of exposed sediments can increase the mobility and bioavailability of inorganic contaminants. Drying of ponds can expose sediments to air and can result in oxidation of sulfides and organic matter that are known to bind inorganic contaminants strongly, making the inorganic contaminants more mobile and bioavailable. Oxidation can also generate acid conditions in sediment and levee soil which can further increase the mobility of inorganic contaminants, especially the cationic heavy metals (e.g., copper, lead, mercury). Impacts to water quality and biota could occur indirectly from the increased mobility of inorganic contaminants following oxidation reaction.

Impacts from Acidification— Oxidation of exposed sediments can generate low pH (acidic) conditions in sediments and levee soil, which can further increase the mobility and bioavailability of inorganic contaminants. If the pH should drop into the acid range (e.g., below pH 6), adsorption of inorganics by clays and iron hydroxides would be depressed and inorganics could be released from the sediment. The cationic heavy metals (e.g., copper, lead, mercury) are especially subject to this type of impact. Arsenic and selenium are exceptions to the rule. In their common anionic forms, selenite and arsenate are typically more strongly adsorbed and immobilized under acidic conditions. Impacts to water quality and biota from mercury could occur under these conditions, both indirectly from increased mobility of contaminants and directly through contact with low pH sediment and soil.

Impacts from Freshening Effects. The introduction of fresher water into saline ponds where salt precipitates exist may increase the release of contaminants. In higher salinity ponds, salts containing inorganic contaminants may precipitate out of the water column and/or become adsorbed on sediment surfaces. Introduction of fresher water into the ponds (freshening) may dissolve the precipitated salts, providing a source of inorganic contaminants in discharge water. This could be a problem in ponds that have consistently been managed at above 150 ppt, which is the point that gypsum (calcium sulfate) precipitates (i.e., Ponds A19-23, the West Bay ponds, and some Baumberg ponds. However, levels of mercury and selenium were not found to be high in those ponds. The extent and duration of the freshening effect is unknown. The magnitude of this impact would be dependent on a number of physiochemical factors, as well as the amount and types of contaminants in pond precipitates and sediment**.**

Impacts from Mercury Methylation. Drying/wetting cycles in ponds can promote methylation of mercury, increasing the mobility and bioavailability of mercury. Sediment-bound mercury released as a result of drying and oxidation could become available for methylation when the ponds are re-flooded by winter rains. As discussed in Section 5.1.5.1 above, the organic form of mercury, methylmercury, is more mobile and bioavailable than the inorganic form. In general, ponds with higher total mercury concentrations have greater potential for methylmercury production, although low concentrations of total mercury can also produce considerable concentrations of methylmercury under certain hydrologic and biogeochemical conditions.

Impacts from Gypsum/Salt-Affected Soils. Gypsum/salt affected soils may impede vegetation growth and impact habitat values. Long-term pond drying of sediment can result in gypsum/salt affected soils, which can impede the establishment and growth of wetland vegetation. Saline-sodic soils commonly have a pH of about 8.5, and freshening can create more alkaline sodic soils (e.g., with a pH above 9). These soils are typically very compact with poor hydraulic conductivity and tend to inhibit plant colonization and growth. These conditions may also limit restoration options in the future. Extremely saline and sodic conditions could also reduce the diversity and/or or biomass of invertebrates, thereby decreasing the value of certain ponds as foraging habitat for some other birds and fish. For some birds (e.g., snowy plover), unvegetated ponds actually provide better habitat, and in many cases can provide dense populations of certain invertebrates, such as brine flies and brine shrimp.

Impacts from Changes in Water Level. Changes in water levels can increase wildlife exposure to contaminants by introducing fish and other wildlife to ponds where they weren’t previously present and increasing the contact between wildlife and contaminants in exposed sediments**.** For example, changing water depths will change foraging opportunities for birds. Diving and dabbling waterfowl are exposed to different levels of contaminants in sediments than probing birds. Exposure may be through increased bioavailability of contaminants resulting from oxidation and methylation, and potential concentration of contaminants in diminishing overlying water. In general, more forms of wildlife could be exposed to contaminants as pond levels decrease.

5.3.1 No Project/No Action Alternative

> *SEDIMENTS IMPACT-1*: The mobility and bioavailability of inorganic contaminants may increase within project ponds.

Under the No Project/No Action Alternative, ponds would be operated as seasonal ponds and would dry down during the summer months. Drying of formerly inundated or saturated sediments under the No Project/No Action Alternative would result in oxidation of exposed sediments. As noted above, oxidation of sediments can increase the mobility and bioavailability of inorganic contaminants and can also result in acidic conditions in sediments and soils, which can further increase the mobility and bioavailability of inorganic contaminants. Drying/wetting cycles, which would occur in the ponds under the No Project/No Action Alternative, could also promote methylation of mercury, as discussed above.

Significance: Potentially significant. Since this alternative will result in the project not being implemented, no mitigation measures are proposed.

> *SEDIMENTS IMPACT-2*: Long-term pond drying may result in the formation and exposure of gypsum/salt-affected soils, decreasing the habitat value of ponds for some wildlife species and limiting future restoration options.

Under the No Project/No Action Alternative, some gypsum/salt-affected soils will be left or will develop on the sediment surface of some ponds. As discussed above, gypsum/salt-affected soils can impede growth of wetland vegetation and reduce the diversity and/or biomass of invertebrates, thereby decreasing the value of the ponds as foraging habitat for some species. Other species would benefit. Since there is presently little vegetation at the project ponds, the impact from the development of gypsum/salt-affected soils is primarily an impact to the potential for future restoration of ponds. That is, the presence of gypsum/salt-affected soils may limit future restoration options for certain ponds.

Significance: Potentially significant and unavoidable

Under the No Project/No Action Alternative, some gypsum/salt-affected soils will be left or will develop on the sediment surface of some ponds. As discussed above, gypsum/salt-affected soils can impede growth of wetland vegetation and reduce the diversity and/or or biomass of invertebrates, thereby decreasing the value of the ponds as foraging habitat for some species. Other species would benefit. The development of gypsum/salt-affected soils may also limit future restoration options for certain ponds.

> *SEDIMENTS IMPACT-3:* Changes in pond water levels may alter exposure of wildlife to contaminants in sediments.

Under the No Project/No Action Alternative, the dry-down cycles that would occur in seasonal ponds could create additional foraging opportunities for birds, where currently access is limited by deeper water levels. Additional foraging access could increase exposure of foraging birds to contaminants in sediments. While diving and dabbling waterfowl may be exposed to some contaminants in sediments covered with ponded water; in general, more forms of wildlife could be exposed to contaminants as pond levels decrease. Increased access to sediments, combined with potential increased mobility and bioavailability of contaminants, could impact foraging birds.

Significance: Potentially significant. Since this alternative will result in the project not being implemented, no mitigation measures are proposed.

> *SEDIMENTS IMPACT-4:* Unplanned breaches of ponds could result in significant water quality and wildlife impacts from contaminants in sediments.

Under the No Project/No Action Alternative, levees would not be maintained and unplanned breaches of the ponds would be more likely. Given the impacts of this alternative on the mobility, bioavailability, and concentration of inorganic contaminants bound in sediments, any breach of the project ponds could have significant impacts on water quality and biota.

Significance: Potentially significant. Since this alternative will result in the project not being implemented, no mitigation measures are proposed.

5.3.2 Alternative 1 (Seasonal Pond Alternative)

Impacts under this alternative are nearly the same as those under the No Project/No Action Alternative. The primary difference would be that the potential for sediment contaminant impacts on water quality and biota as a result of levee failure (see Sediments Impact-4 under No Project/No Action above) would be reduced since the infrastructure (levees, weirs, etc.) that separates the ponds from the Bay and sloughs would be maintained. Unlike Alternatives 2 and 3, Alternative 1 does not allow for flexibility and adaptability in the management of the ponds in response to project impacts that may be observed in the field in the future. Thus, Sediments Impacts-1 and -3, which are related to the management of the ponds as seasonal ponds with wetting and drying cycles, would be potentially significant and unavoidable under this alternative.

> *SEDIMENTS IMPACT-1:* The mobility and bioavailability of inorganic contaminants may increase within project ponds.

Under Alternative 1, ponds would be operated as seasonal ponds and would dry down during the summer months. Drying of formerly inundated or saturated sediments under this alternative would result in oxidation of exposed sediments. As noted above, oxidation of sediments can increase the mobility and bioavailability of inorganic contaminants and can also result in acidic conditions in sediments and soils, which can further increase the mobility and bioavailability of inorganic contaminants. Drying/wetting cycles, which would occur in the ponds under this alternative, could also promote methylation of mercury, as discussed above.

Significance: Potentially significant and unavoidable.

> *SEDIMENTS IMPACT-2*: Long-term pond drying may result in the formation and exposure of gypsum/salt-affected soils, decreasing the habitat value of ponds for some wildlife species and limiting future restoration options.

Under the No Project/No Action Alternative, some gypsum/salt-affected soils will be left or will develop on the sediment surface of some ponds. As discussed above, gypsum/salt-affected soils can impede growth of wetland vegetation and reduce the diversity and/or biomass of invertebrates, thereby decreasing the value of the ponds as foraging habitat for some species. Other species would benefit. Since there is presently little vegetation at the project ponds, the impact from the development of gypsum/salt-affected soils is primarily an impact to the potential for future restoration of ponds. That is, the presence of gypsum/salt-affected soils may limit future restoration options for certain ponds.

Significance: Potentially significant and unavoidable

> *SEDIMENTS IMPACT-3:* Changes in pond water levels may alter exposure of wildlife to contaminants in sediments.

Under Alternative 1, the dry-down cycles that would occur in seasonal ponds could create additional foraging opportunities for birds, where currently access is limited by deeper water levels. Additional foraging access could increase exposure of foraging birds to contaminants in sediments. While diving and dabbling waterfowl may be exposed to some contaminants in sediments covered with ponded water; in general, more forms of wildlife could be exposed to contaminants as pond levels decrease. Increased access to sediments, combined with potential increased mobility and bioavailability of contaminants, could impact foraging birds.

Significance: Potentially significant and unavoidable.

5.3.3 Pond Management Alternative 2: Simultaneous March/April Initial Discharge

Under Pond Management Alternative 2, potential sediment-related impacts include an increase in the mobility and bioavailability of contaminants in sediments, which could adversely impact water quality and biota; changes in hydrology that may increase wildlife exposure to contaminants in sediments; and an increase in the transport of suspended sediment, which could also adversely impact water quality and biota. Removal of brines in accordance with the terms of the Cargill Ponds Acquisition and the introduction of fresher water into highly saline ponds to dilute existing salts as proposed in the ISP would prevent the formation and exposure of gypsum/salt-affected soils that can result in adverse effects to habitat values. Since levees would be maintained, impacts from contaminants from unplanned levee breaches would be reduced to less than significant. Mitigation measures proposed for Sediments Impact-1 (Sediments Mitigation Measures 1A, 1B, and 1C) are also proposed for Sediments Impacts-3 under this alternative.

> *SEDIMENTS IMPACT-1:* The mobility and bioavailability of inorganic contaminants may increase within project ponds.

Hydrologic changes anticipated under Pond Management Alternative 1 may affect the mobility and bioavailability of contaminants through several mechanisms including oxidation, acidification, freshening, and wetting/drying cycles that increase production of methylmercury**.** Increases in levels of contaminants measured in pond water may be an indication of the effect of one or more of these mechanisms, which are discussed further below and were also discussed above in the summary of the types of project impacts anticipated.

Introduction of fresher bay water into the more saline ponds may release inorganic contaminants. Under Pond Management Alternative 1, initial release of all the ponds in March/April would mean that the pond systems would be released when incoming water salinities would be at their lowest (i.e., freshest). This freshening may increase dissolution of salts from sediments and cause more concentrated release of sediment-associated contaminants in comparison with Alternative 2, under which many of the pond systems with elevated concentrations of mercury and/or selenium are planned for initial release in July. However, the larger volume of water that may be present in the ponds in March/April may mitigate for the greater mass of contaminants potentially dissolving from salts. This impact would be short-term in duration, occurring only during the initial discharge period.

Oxidation Impacts. Average water depths and anticipated variation in water depths were modeled by Shaaf & Wheeler based on rainfall and tide data from 1994-1995 (see Section 4 of the ISP; Appendix A). Hydrologic changes expected under Pond Management Alternative 1 are presented in Table 2-1. As discussed above, changes in water levels in project ponds are relevant to the impacts to water quality and biota of contaminants in sediments.

Of the ponds that are known to have elevated levels of selenium and/or mercury higher than RWQCB screening criteria for wetland cover materials (Alviso Ponds A1, A2W, B1, A3W, A5, A9, A10, A15, A17, and A16), only Ponds A9, A10, A16, and A17 will be managed with water levels substantially shallower than existing conditions. The proposed hydrologic regimes for these ponds could result in periodic exposure of sediment to air. Of these, Ponds A1, A7, A8, A9 and A16 also support breeding and/or foraging populations of shorebirds, including some listed species, and are therefore considered to be sensitive habitat. Only two ponds (A9 and A16) currently have exposed "islands" that are used for nesting by shorebirds.

Variability in water levels, such as for batch ponds, will have an effect on the frequency and duration of sediment exposure as well. In batch ponds, large volumes of water are transferred from pond to pond during relatively short periods of time and water elevations can vary significantly over a number of weeks or months. In Ponds A9, A10, A16, and A17, reduced variability in water levels under this alternative may counteract the effects of the lower average water levels proposed for these ponds, and therefore the anticipated frequency and duration of sediment exposure within these ponds may be similar to or less than existing conditions. Predicted hydrologic conditions are based on tide and rain data from 1994-1995, and actual water levels will depend on future tide heights and weather patterns. Lower water levels than anticipated can result from weak tide cycles and/or prolonged dry weather.

Acidification Impacts. In ponds where average water levels will be more than 6 inches higher than existing conditions, exposure to acid levee soils could affect water pH in localized areas of the ponds. Although some North Bay levee soils have been found to be acidic, at this time, there is no indication that South Bay levee soils are the same. However, if some areas were found to have low pH levels, localized areas of acidic pond water could increase the mobility of sediment-associated contaminants. Lowered pH can also adversely affect wildlife through loss of invertebrate colonies that serve as food sources for birds. Foraging birds could experience direct toxicity if acid conditions are present. However, the impact of lowered pH is likely to be short–term. This is because saturating currently exposed levee sideslopes can restore reducing conditions that are known to decrease acidity; and saline bay waters contain carbonates that can buffer acid conditions towards more neutral conditions. Experience in the North Bay salt ponds shows that acid conditions resulting from pond drying was buffered back to neutral conditions after bay waters were introduced into ponds through levee breaches (Personal communication Mike Rugg).

Freshening Impacts. Introduction of fresher bay water into the more saline ponds may release inorganic contaminants. Of the ponds with elevated concentrations of inorganic contaminants (mercury and/or selenium), there are several ponds of medium salinity levels that will become substantially fresher under Alternative 1. These are Alviso Ponds A5, A8, A9, A10, A15, A17, and A16.

Significance: Potentially significant.

> *SEDIMENTS MITIGATION MEASURE-1A*: Conduct pre-project sampling of sediments from specific ponds, in accordance with the project Additional Sediment Sampling Analysis Plan (SAP).

The RWQCB, upon review of the Report of Waste Discharge (ROWD) for the ISP, recommended additional sediment sampling to further characterize the nature and extent of mercury and selenium contamination in ISP pond sediments. As a result, an Additional Sediment Sampling and Analysis Plan (SAP) was prepared (see Appendix J). The SAP describes the proposed sample locations, sample collection procedures, and chemical and physical analyses to be performed. The SAP proposes sampling 2 depths at each of 50 sampling locations distributed within 16 ponds, including ponds in the all three pond complexes. Sediment samples will be analyzed for metals, methylmercury, total organic carbon, salinity, and pH.

SEDIMENTS MITIGATION MEASURE-1B: Conduct post-implementation monitoring in areas with elevated concentrations of inorganics to determine whether conditions are occurring that would increase contaminant mobility (e.g., methylation, acidification, or oxidation of sediments, or visual observation of increased drying or wetting/drying cycles).

Post-implementation monitoring would focus on ponds where available data indicate the presence in sediments of concentrations of inorganics that exceed standards and where proposed hydrologic regimes could result in exposure of contaminated sediments. To date, these ponds include Alviso Ponds A9, A10, A16, and A17. If results of the SAP indicate additional ponds with elevated inorganics and hydrologic regimes of concern, these ponds would be monitored as well.

SEDIMENTS MITIGATION MEASURE-1C: If post-implementation monitoring during the Continuous Circulation Period (Sediments Mitigation Measure-1B) indicates the presence of conditions that would increase contaminant mobility, implement water management measures to mitigate these conditions.

The following measures would be implemented in the order presented:

1. Assess the risk posed by the increase relative to ambient conditions in the South Bay.
2. Adjust water management to raise water levels and minimize wetting/drying cycles.
3. Monitor pH levels. If levels below pH 6 are identified, restore saturated conditions to acid sediments/levee soils to promote the buffering of pH towards neutral conditions.
4. Add water management structures. Minor adjustments to water levels can be made in some ponds by decreasing or increasing pumping in ponds where pumps will be present, or adding or removing weir boards in ponds where weirs are present. Modification of water control structures/pumps in one pond will affect the hydrology of other ponds in that system, so effects of specific water level changes on all ponds in the system must be evaluated before implementing this measure.

SEDIMENTS MITIGATION MEASURE 1D: If post-implementation monitoring (Sediments Mitigation Measure 1B) during the Initial Release Period identifies elevated levels of inorganic impacts in discharge waters, potentially attributable to freshening effects, this impact may be mitigated in future releases by implementing additional water control measures designed to reduce freshening effects.

Freshening may be slowed during the Initial Release Period by introducing bay water in summer when salinities in incoming water are higher. By reducing the salinity difference between introduced bay water and existing pond water, the rate of freshening may be slowed such that dissolution of contaminants may be reduced. Although reductions in flow through the ponds could also reduce freshening effects, such reductions would result in higher salinities in discharge waters. Therefore, a better solution to freshening impacts may be to increase the volume of water prior to discharge, which would dilute the contaminants that dissolve and become re-suspended as a result of freshening and to reduce the concentrations of these contaminants in discharge water.

Post-mitigation Significance: Less than significant

> *SEDIMENTS IMPACT-3*: Changes in pond water levels may alter exposure of wildlife to contaminants in sediments.

Under Alternative 2, the dry-down cycles that would occur in ponds that would be managed as seasonal ponds could create additional foraging opportunities for birds, where currently access is limited by deeper water levels. Additional foraging access could increase exposure of foraging birds to contaminants in sediments. While diving and dabbling waterfowl may be exposed to some contaminants in sediments covered with ponded water; in general, more forms of wildlife could be exposed to contaminants as pond levels decrease. Increased access to sediments, combined with potential increased mobility and bioavailability of contaminants, could impact foraging birds.

Significance: Potentially significant

> *SEDIMENTS MITIGATION MEASURE-1A*: Conduct pre-project sampling of sediments from specific ponds, in accordance with the project Additional Sediment Sampling Analysis Plan (SAP).

See Appendix J and discussion under Sediments Impact-1.

> *SEDIMENTS MITIGATION MEASURE-1B*: Conduct post-implementation monitoring in areas with elevated concentrations of inorganics to determine whether conditions are occurring that would increase contaminant mobility (e.g., methylation, acidification, or oxidation of sediments, or visual observation of increased drying or wetting/drying cycles).

See discussion under Sediments Impact-1.

> *SEDIMENTS MITIGATION MEASURE 1C*: If post-implementation monitoring indicates the presence of conditions that would increase contaminant mobility, implement water management measures to mitigate these conditions.

See discussion under Sediments Impact-1.

Post-mitigation Significance: Less than significant

> *SEDIMENTS IMPACT-3A:* Changes in hydrology may increase wildlife exposures to contaminants.

Increasing the number of connections to receiving waters, or changing the nature of the connections (for example creation of uncontrolled openings such as gaps in the levee or installation of culverts with no water control structures) can create more opportunities for fish to enter the ponds. Introduction of fish into ponds where they are not currently present could increase the potential for biotic exposure to sediment-associated contaminants. To the extent that predators consume these fish, bioaccumulation could increase, especially for mercury and selenium.

Significance: Potentially significant.

> *SEDIMENTS MITIGATION MEASURE-1A*: Conduct pre-project sampling of sediments from specific ponds, in accordance with the project Additional Sediment Sampling Analysis Plan (SAP).

See Appendix J and discussion under Sediments Impact-1.

> *SEDIMENTS MITIGATION MEASURE-1B*: Conduct post-implementation monitoring in areas with elevated concentrations of inorganics to determine whether conditions are occurring that would increase contaminant mobility (e.g., methylation, acidification, or oxidation of sediments, or visual observation of increased drying or wetting/drying cycles).

See discussion under Sediments Impact-1.

> *SEDIMENTS MITIGATION MEASURE 1C*: If post-implementation monitoring indicates the presence of conditions that would increase contaminant mobility, implement water management measures to mitigate these conditions.

See discussion under Sediments Impact-1.

Post-mitigation Significance: Less than significant

> *BENEFICIAL SEDIMENT IMPACT-1*: Higher average water levels in some ponds could decrease the mobility and bioavailability of contaminants and the potential for wildlife exposure to contaminants in those ponds.

No mitigation is required for beneficial impacts.

> *BENEFICIAL SEDIMENT IMPACT-2:* In the long term, freshening of hypersaline sediments will produce sediment and water conditions that can promote habitats more endemic to the South Bay ecosystem. This would be a beneficial impact.

No mitigation is required for beneficial impacts.

5.3.4 Pond Management Alternative 3: Phased Initial Discharge

The only difference between Pond Management Alternatives 2 and 3 is in the timing of initial discharge of pond waters. As described in Chapter 2, under Pond Management Alternative 2, water control structures would be installed in summer or fall and initial discharge of the existing pond contents would begin the following year in March/April when salinities within the ponds and receiving waters are the lowest. Under Alternative 3, on the other hand, the initial discharge from a limited number of ponds would occur in July/August, with discharge from other pond systems occurring in subsequent years. Ponds with a July/August initial release are noted in Table 2-1.

Impacts and mitigation measures under Pond Management Alternative 3 would be mostly the same as those under Pond Management Alternative 2 (see Section 5.3.3). After initial discharge, operational water levels and salinities would be the same as for Alternative 2 No additional increases in long-term sediment contaminant bioavailability or potential wildlife exposure are anticipated due to the timing of the initial discharge. The mobility and bioavailability of inorganic contaminants in sediments (addressed under Sediments Impact-1) may be reduced under the July/August initial discharge scenario (Alternative 3) due to reduction in the freshening effect and other changes, as described below.

> *SEDIMENTS IMPACT-1:* The mobility and bioavailability of inorganic contaminants may increase within project ponds.

Under Alternative 3, this impact will be reduced compared to similar impacts under Alternative 2. The phased timing of initial release proposed under Alternative 3 would allow releases to occur in such a way as to minimize impacts to water quality. For example, the initial release of several pond systems is planned for July, when incoming water salinities are higher. As described in Chapter 2, initial release of Alviso System A7, which contains Ponds A5 and A8 with elevated mercury and selenium, is anticipated to occur in July. Initial release from Baumberg Systems 2, 8A, and 11 is also planned for July under this alternative**.** Limited sampling data for Baumberg System 2 doesn't indicate elevated levels of inorganics. Sampling data do not presently exist for Baumberg Systems 8A and 11. The higher Bay water salinity would result in reduced freshening effects in these ponds during the initial discharge period only. Although this impact is reduced under Alternative 2, it is still potentially significant. Since freshening is only a concern where pond sediments contain elevated levels of inorganic chemicals, mitigation for this impact includes sampling for these chemicals and monitoring their mobility (Sediments Mitigation Measures 1A, 1B, and 1C, below). In addition, effects potentially attributable to freshening may be mitigated by implementing additional water control measures proposed in Sediments Mitigation Measure-1D.

Significance: Potentially significant.

> *SEDIMENTS MITIGATION MEASURE-1A:* Conduct pre-project sampling of sediments from specific ponds, in accordance with the project Additional Sediment Sampling Analysis Plan (SAP).

See Appendix J and discussion under Sediments Impact-1, Section 5.3.3.

> *SEDIMENTS MITIGATION MEASURE-1B:* Conduct post-implementation monitoring in areas with elevated concentrations of inorganics to determine whether conditions are occurring that would increase contaminant mobility (e.g., methylation, acidification, or oxidation of sediments, or visual observation of increased drying or wetting/drying cycles).

See discussion under Sediments Impact-1, Section 5.3.3.

> *SEDIMENTS MITIGATION MEASURE 1C:* If post-implementation monitoring indicates the presence of conditions that would increase contaminant mobility, implement water management measures to mitigate these conditions.

See discussion under Sediments Impact-1, Section 5.3.3.

> *SEDIMENTS MITIGATION MEASURE 1D*: If post-implementation monitoring (Sediments Mitigation Measure 1B) during the Initial Release Period identifies elevated levels of inorganic impacts in discharge waters, potentially attributable to freshening effects, this impact may be mitigated in future releases by implementing additional water control measures designed to reduce freshening effects.

See discussion under Sediments Impact-1, Section 5.3.3.

Post-mitigation Significance: Less than significant