4.0 EVALUATION OF PROJECT ALTERNATIVES

4.1. COMPARISON OF DUTCH SLOUGH RESTORATION PROJECT ALTERNATIVES

This chapter describes alternatives to the Dutch Slough Restoration Project. This Project is expected to provide many ecological, scientific, and recreational benefits. There are, however, both long-term and short-term environmental consequences of implementing this Project. This section presents a comparison of the alternatives to allow the reader and the decision-makers to understand the balance between the impacts and benefits of the Project's alternatives.

The main difference among the alternatives is in the design of the restored wetland and terrestrial landscape, and their associated aquatic habitats (channels, open water). The three alternatives represent different mixes of habitats, with different amounts of grading and imported fill to create these habitats.

The alternatives are:

- **Alternative 1:** Low marsh and open water emphasis with minimal grading (Minimum Fill Alternative)
- **Alternative 2**: Mix of mid marsh, low marsh, and open water with moderate fill (Moderate Fill Alternative)
- **Alternative 3:** Mid marsh and low marsh emphasis with imported fill (Maximum Fill Alternative)
- **Alternative 4:** No Project Alternative: leaving the site in current uses.

In Alternatives 2 and 3, Marsh Creek may be diverted into the project site at one of three locations to restore a natural delta at the mouth of the creek. In addition, a number of possible management options are considered for the open water areas under Alternatives 1, 2 and 3. All three restoration alternatives are consistent with providing high quality public access and restoration opportunities and provide for protection of existing infrastructure.

There are numerous natural resources that are fundamental to the basic goals of the tidal freshwater wetland restoration and were used as benchmarks for broad comparison of the alternative's benefits. Similarly, there are certain categories of environmental risks or predictable impacts that are generally given outstanding policy weight in wetland ecosystem planning and regulation in the Bay-Delta ecosystem. Without eclipsing other potentially significant project benefits or impacts, these key wetland planning factors are highlighted for purposes of guiding the comparison of alternatives. These key factors were instrumental in early planning and review of the project design, prior to the formulation of alternatives, and they are broadly summarized here:

- Special-status native estuarine fish and their essential habitats (benefit);
- Risk of spread and/or dominance of non-native submerged aquatic vegetation (potential impact);
- Nonnative predator fish species (potential impact);

- Production of methylmercury in the aquatic/wetland food chain (potential impact);
- Contaminant effects to water quality (potential impact);
- Feasibility (logistical, technical, geographic) of tidal wetland restoration (risk)
- Rapidity of tidal wetland restoration (ecological succession) processes (risk);
- Stability/resilience of tidal wetland habitats during accelerating sea level rise (risk);
- Native riparian woodland vegetation (benefit);
- Native marsh vegetation, including special-status plant species and their communities (benefit);
- Native wetland wildlife species diversity and abundance, including special-status wildlife species and their habitats (benefit);
- Native terrestrial wildlife species diversity and abundance in declining terrestrial habitats of the Bay-Delta ecosystem, including special-status wildlife species (benefit);
- Integration of wetland and terrestrial landscape structure, approaching historic, natural conditions as much as feasible within modern constraints (benefit);

Many of these key planning factors may be either antagonistic or mutually supportive in different wetland restoration designs. For example, maximizing wetland restoration area may magnify impacts to terrestrial or nontidal wetland habitats and species. Maximizing restored intertidal marsh in subsided delta lands may induce risks of exposing contaminants in fill material to the aquatic environment (depending on fill sources and sediment quality), or require increased “cannibalization” of restoration sites for borrow pits that become deepwater habitats. Marsh restoration itself may in some circumstances induce increases in perturbations or losses of existing wetland and terrestrial habitats, or, depending on the location of Marsh Creek channel, increases in the availability or production of methylmercury in the aquatic environment. Each of these examples of interactions among planning factors is relevant to the comparison of alternatives.

Alternative 3 generates the greatest extent of tidal freshwater marsh habitat, fully occupying the Gilbert and Burroughs parcel with the maximum area of tidal marsh and constructed marsh sloughs. For this reason, it is a useful standard of comparison for all alternatives that share the same basic wetland restoration objectives. Alternative 3 yields the greatest area of mid-marsh (middle intertidal marsh zone), which would fully occupy the Gilbert parcel. The design of Alternative 3 also would minimize increases in tidal prism that risks short-term tidal damping (reduction in tidal range) that may trigger the need for dredging tidal sloughs to ensure adequate tidal conveyance to the restoration site. The extent of slough dredging potentially needed would be minimized by Alternative 3, and so would its costs and impacts to existing tidal marsh and channel habitats. Alternative 3 also would minimize the risk of potential spread and dominance of SAV by minimizing the area of constructed open water subtidal areas (restricted to the Emerson Parcel). The greatest extent of potential native estuarine fish habitat (“blind”, dead-end tidal sloughs bordering marsh banks) would be available soonest with Alternative 3 if the time required to complete its construction were the same as that of other alternatives. Alternative 3 would virtually eliminate most of the project impacts associated with potential wind-wave erosion of interior levee slopes or marshes adjacent to large open water areas of the Gilbert and Burroughs parcel in Alternative 2 (and especially in Alternative 1).

The potential benefits of integrating a relocated, self-constructing Marsh Creek deltaic marsh would be the same in Alternative 3 as Alternative 2, which shares the same Emerson parcel design. Alternative 3 would provide somewhat less interspersion of terrestrial and tidal wetland "edge" habitats than Alternative 2, because the island-like low constructed/retained mounds (restored as riparian woodland, floodplain grassland) in the Burroughs parcel would be graded down to low tidal marsh. In contrast, Alternative 2 includes these semi-terrestrial habitat "islands" in the Gilbert parcel, in proximity to constructed new tidal sloughs. Both Alternatives 3 and 2 otherwise maximize the trade-off between restored tidal wetlands and terrestrial habitats in favor of wetlands. Neither would retain large, substantial blocks of terrestrial habitat to support wildlife that may move between terrestrial and wetland habitats. Terrestrial habitats (grassland, oak woodland, and riparian woodland) are reduced to a narrow fringe at the southern end of the project site. Current or planned residential development of most adjacent and neighboring parcels has largely eliminated terrestrial habitat that could interact significantly with restored tidal wetlands.

The apparent advantage of Alternative 3 over Alternative 2 in terms of basic wetland restoration objectives may be offset, or outweighed, by significant feasibility, cost, and impact considerations. Alternative 3 has the appearance of providing more tidal marsh area than Alternative 2, but without reference to realistic project schedule factors. Even assuming that funds were available immediately for full construction of Alternative 3, the availability of sufficient fill volumes of sufficient quality to complete construction is highly uncertain. Tidal restoration could not proceed until internal site construction of any alternative is completed. If Alternative 3 construction required multiple imported fill sources, with delivery staggered over many years (depending on independent projects generating fill, such as navigational dredging), there could be prolonged delays in the actual initiation of tidal restoration. Delay itself may induce further risks of cost and logistic complications for project completion. This risk is not speculative: the only large-scale brackish tidal marsh restoration project in the Bay-Delta (Montezuma Wetlands) is still not filled to the point at which actual tidal breaching may proceed, after nearly a decade of incremental construction. Large-scale wetland restoration that relies on large volumes of imported dredged or fill sediment risks dependency on the schedule of fill-generating projects outside its control. Alternative 2, with more modest (but still substantial) demands for imported fill, reduces the area of immediate tidal marsh after construction compared with Alternative 3, but it is more likely to be completed sooner, and with lower risk of project delay due to cost or fill availability constraints. The practical benefits of Alternative 2, therefore, may be realized sooner and with greater reliability than the more ambitious Alternative 3.

Differences in potential project schedules among alternatives may also influence the final outcome of tidal restoration success. As indicated in the assessment of hydrology and geomorphology, it is likely that sea-level rise will accelerate during the next century, including the next decade in which the project's tidal marsh restoration would initiate. Tidal marshes in subsiding coasts, such as the Gulf of Mexico, are subject to marsh "drowning" (conversion to open water) when thresholds of submergence tolerance by marsh vegetation are exceeded. Alternative 3 proposes extensive areas of "low marsh" establishment close to the lowest elevation threshold of the dominant pioneer marsh vegetation (tules); nearly the entire Burroughs parcel is proposed as low marsh in Alternative 3. This indicates a significant risk of a foundering marsh restoration (rapid conversion of young low marsh to open water) if tidal restoration is delayed (due to fill availability or cost constraints) and sea level rise accelerates significantly in the same time period.

Alternative 3 also maximizes the potential for methylmercury production in tidal marsh (Water Quality, Section 3.2). Because the relationship between tidal freshwater marsh with unimpeded, full tidal drainage, and methylmercury production and trophic availability are not adequately understood, it is difficult to use this factor to discriminate among alternatives. Still, the placement of fill and full marsh construction is effectively an irreversible commitment of resources in Alternative 3. If methylmercury production in tidal marsh exceeded that in open shallow water, and was determined to be detrimental to the Dutch Slough's aquatic resources, it would be extremely difficult or infeasible to correct.

Alternative 2 includes the most balanced gradient between terrestrial ecotone (transition) habitats, high marsh, mid marsh, and low marsh zones. This alternative provides the greatest integration of habitats that are ecologically linked by seasonal or tidal movements of fish and wildlife, or variable habitat requirements for their different life-history stages. It places potential flood refuge habitat, nesting habitats, and foraging habitats in greater proximity (and potential interaction) than Alternative 3. Alternative 1 exhibits comparable degree of habitat integration, but at a smaller scale of wetland habitat.

Alternative 1 is distinguished by its retention of a large block of terrestrial habitat adjacent to restored tidal marsh, mostly at the southwest corner of the Emerson Parcel. This would be a long-term advantage if sea level rise causes the adjacent tidal marshes to become submerged. This alternative has the least potential long-term significant adverse impact to terrestrial wildlife species. It also generates, however, the least tidal marsh (the primary habitat goal of the project), and generates the maximum amount of shallow to deep open water, which may become nuisance habitat (SAV beds with high concentrations of predatory fish that impact high-priority listed salmonids and native estuarine fish). Alternative 1 is likely to require the most remedial levee stabilization and repair because it retains the greatest open water area and fetch (wind-wave potential), which is likely to be significant in open water management strategies other than subsidence reversal. Alternative 1 has some advantage over Alternatives 2 and 3 in that it is likely to be constructed most quickly and be available for tidal restoration soonest after project approval. It also provides a degree of wetland and terrestrial habitat integration (interspersion of different marsh zones, gradients, and related terrestrial habitats) similar to Alternative 2, but over a smaller area.

All tidal restoration alternatives (1-3) stand in marked contrast with the long-term consequences and risks of Alternative 4, the "no project" alternative, viewed in context of the same weighted evaluation factors. Alternative 4 conservatively retains extensive existing productive agricultural (grazing) and terrestrial habitat features and functions (mixed lowland grassland and pasture habitats bordering riparian woodland and tree groves), and in an area of the Delta that is undergoing rapid urbanization and cumulative impacts (mostly direct losses, conversion) to these terrestrial habitats. This is important for conservation of a number of special-status terrestrial species, such as Swainson's hawk. Alternative 4 also preserves, for the foreseeable future, some internal, non-tidal freshwater marsh habitats that support breeding populations of special-status reptiles such as western pond turtle (and potential habitat for other sensitive/special-status wetland wildlife species as well). Alternative 4 avoids risks of significant expansion of non-native, noxious submerged aquatic vegetation, and adds no additional risk of increased methylmercury production.

These "foreseeable" environmental benefits of Alternative 4, however, may be tenuous in the long-term context of accelerated sea-level rise and the sustainability of terrestrial habitats that have already subsided below modern sea level. The risk of catastrophic levee failure, or the risk of escalating levee maintenance costs, may offset or cancel the near-term benefits of protecting terrestrial habitats and agriculture in the long term. Even if restored tidal tule marshes encounter challenges, such as marsh "drowning" thresholds (failing to adjust to accelerated sea level rise), in future decades, they will at least be initially close to a threshold for long-term sustainability, even under higher forecast rates of sea level rise. Terrestrial and non-tidal wetland habitats below sea-level will inevitably face increasing risks of catastrophic flooding, increasing costs of preventing or recovering from flooding, and decreasing resilience as flood events become more frequent. If Alternative 4 turns out to be unsustainable because of sea level rise, tidal restoration initiated later may be less feasible and more costly to initiate than at current sea level. Furthermore, Alternative 4 would result in lost opportunities for estuarine fish recovery and tule marsh and special-status wetland species habitat creation.

In comparing alternatives in view of impacts to existing habitats and biological resources, it is important to note that most direct impacts are due to elimination of existing habitats by nearly all aspects of the restoration process – construction of restoration features and the restoration (habitat conversion) itself. Construction of all three alternatives will result in loss of almost all existing vegetation, and therefore, habitats. Most major indirect (primarily post-construction) impacts, such as the disturbance of wetland wildlife habitats by recreational uses of the site (emanating from the community park or general public access) also do not substantially differ among tidal restoration alternatives.

Overall, Alternative 2 achieves the most advantageous and reliable long-term balance of environmental restoration benefits and risks, given realistic assumptions about project implementation, funding, and schedule, and full consideration of the long-term sustainability of publicly-owned conservation lands managed for habitat values in the Delta landscape.

4.2 ENVIRONMETALLY SUPERIOR ALTERNATIVE (Dutch Slough Restoration Project)

CEQA Guidelines (Section 15126.6(a) and (e)(2)) require that an EIR's analysis of alternatives identify the "environmentally superior alternative" among all of those considered. In addition, if the No Project Alternative is identified as environmentally superior, then the EIR also must identify the environmentally superior alternative among the other alternatives. As described above, because the Dutch Slough Restoration Project is an environmental restoration and public access project, its primary adverse impacts are related to hydrology, water quality and biological resources. A number of these impacts are short-term conditions that would result from construction. The No Project Alternative would eliminate these potential impacts, and, because it would have the fewest impacts overall, would nominally be the Environmentally Superior Alternative. However, this alternative would also forego the longer-term environmental benefits of the project on fisheries, and marsh and special-status wetland species habitat.

As required by CEQA, the Dutch Slough Restoration Project alternatives were analyzed to determine which would be the Environmentally Superior Alternative. Alternative 1 could have somewhat less environmental impacts to existing environmental resources than Alternatives 2 and 3, considered without reference to long-term environmental benefits. Therefore this EIR considers the Dutch Slough Restoration Project's CEQA Environmentally Superior Alternative to be Alternative 1. It should be noted, however, that even this alternative and mitigation, would result in some significant adverse impacts, as with Alternatives 2 and 3.