San Francisco Bay Area Wetlands Restoration Program
Design Review Group

Letter of Review
November 6, 2003

California Department of Fish and Game Napa Plant Site Restoration
Napa County, California

IMPORTANT NOTICE: Please note that project review by the Design Review Group (DRG) does not constitute DRG endorsement of a project nor does it constitute a step in the regulatory and/or permitting process. Project proponents are free to pose questions to the DRG at their discretion and the DRG responds only to those questions deemed within its scope and realm of expertise. The Design Review Team does not intend to reach consensus in all of its feedback and dissenting opinions are included as expressed. All feedback is suggestive and non-obligatory; project proponents are not required to incorporate any or all of the feedback into their project design.

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1. Project Team:

a. Project Proponent(s): California Department of Fish and Game (represented by Carl Wilcox)

b. Project Presenter to Design Review Group: Carl Wilcox (California Department of Fish and Game)

2. Design Review Group Participants:

a. Dates Review Team met to discuss the project: The Design Review Group, including the Napa Plant Site Design Review Team, featured the first presentation of the project on September 15, 2003. Following the presentation, the Team discussed the project and inquired about further information.

b. Review Team: Peter Baye - Biology and restoration design (Independent biologist), Rachel Kamman - Engineering and wetland hydrology/hydraulics (Kamman Hydrology and Engineering), Phillip Lebednik - Engineering and wetlands function (LFR Levine-Fricke, Inc.), and Karl Malamud-Roam - Tidal marsh design (Contra Costa Mosquito Vector and Control District)

All four Design Review Team members were in attendance at the September 15, 2003 meeting.

c. Non-Review Team Meeting Attendees: (09/15/03) Bob Batha (San Francisco Bay Conservation and Development Commission), Andree Breaux (San Francisco Bay Regional Water Quality Control Board), Elise Brewster (Brewster Design Arts), John Brosnan

(Wetlands Restoration Program), Don Danmeier (Philip Williams Associates), Laura Hanson (Independent biologist), Amy Hutzel (California State Coastal Conservancy), Shelby Lathrop (Shaw Environmental), Michelle Levenson (San Francisco Bay Conservation and Development Commission), Mike Monroe (U.S. Environmental Protection Agency), Steven Osborn (City of San Jose), Barbara Ransom (Cargill), Diana Sokolove (CH2M Hill), Louisa Squires (Santa Clara Valley Water District), Eric Tattersall (California Department of Fish and Game), Jennifer Vick (National Park Service), Carl Wilcox (California Department of Fish and Game), and Larry Wyckoff (California Department of Fish and Game)

3. Review Process:

a. Assistance requested by project sponsor: Carl Wilcox, on behalf of the project's planning team, presented an overview of the proposed restoration project. Carl reviewed the Desired Feedback requested, as submitted in the completed Project Summary form and posed during the project presentation. The Desired Feedback consisted of those issues on which the Department of Fish and Game sought Design Review Team input. These were:

i. The goals and objectives of the project; the types of information the should be collected to inform the planning process.

ii. Appropriate topographic information needed.

iii. The appropriate level of hydrodynamic and sediment modeling to be undertaken to evaluate restoration potential and constraints and to develop appropriate designs.

iv. Desirability to predict future habitat conditions and rates of habitat development.

v. Design features that should be considered in the development of the restoration plan.

vi. How restoration of the site should be integrated with other restoration projects in the area.

vii. Use of dredge material in restoration; and constraints to restoration of the site.

b. Materials reviewed:

- Completed Design Review Group Project Summary Form
- Napa Plant Guiding Principles and Goals (May 26, 2003)
- Project location maps and site aerial photograph
- Project presentation to DRG, September 15, 2003

- Additional Information Requested by the Design Review Team: Design Review Team members did not ask to review additional materials following the September 15

presentation. The project is very conceptual in nature and those materials available for review have been presented to the group.

4. Design Review Group Findings and Comments:

The Design Review Team shared numerous comments and all feedback is captured in this section. The Team does not intend to reach consensus in all of its feedback and dissenting opinions are included as appropriate.

The following represents the professional opinions of the Design Review Team members. These opinions are provided for the benefit of the project proponent in direct response to those questions posed by the proponent. The project proponent is in no way obliged to incorporate any or all of the feedback herein into his project design.

a. Consistency with Habitat Goals:

Preliminary design plans have yet to be developed for the Napa Plant Site restoration and it is accordingly infeasible to assess any design's consistency with the *Baylands Ecosystem Habitat Goals Report*. The following information is a summary of the unique features and restoration opportunities that could be made use of when preliminary design plans are created. The following information also seeks to convey specific recommendations and potential unique restoration benefits of wetlands creation for the proposed project site.

The proposed project is located within the North Bay Subregion, in the Segment D - Napa River Area as defined in the *Baylands Ecosystem Habitat Goals Report*. Historically, Segment D was largely tidal salt marsh and tidal brackish marsh dominated by the hydrology of the lower Napa River. Very little bordering tidal flat existed in the area, except along the Napa River. Several of the tidal marshes flanking the eastern side of the Napa River reached into small valleys and swales and were bordered with moist grasslands through the upland transition zone. Today, Segment D's landscape is largely undeveloped, yet is dominated by salt ponds and agriculture. Existing tidal marsh to the south of Highway 37 - although somewhat distant from the proposed project site - supports the largest population of salt marsh harvest mouse in the North Bay. Tidal marsh habitat adjacent to the proposed project site, specifically at Fagan Slough, supports significant populations of California clapper rail and black rail. Within this region and along the bayland edge exist many localities of rare or extirpated species of high marsh plant species.

This Segment offers several unique restoration opportunities, including extensive potential to restore large patches of tidal marsh adjacent to the riverine system. The proposed project is ideally located to take advantage of such opportunities. The project site also offers the potential to restore tidal marsh among major, intact remnant historic tidal channels. The inactive salt ponds may be improved for waterfowl, especially diving ducks. Along the bayland edge, particularly along the eastern side of the Napa River, opportunities exist to restore natural transitions between restored tidal marsh and the adjacent uplands. Opportunities also exist along the banks of the Napa River to improve seasonal wetlands.

The *Goals Report* contains the following recommendations specific to Segment D:

- Restore large areas of tidal marsh along both sides of the Napa River. This will entail restoring about half of the inactive salt ponds and Cullinan Ranch to tidal marsh.
- Manage the remaining acreage of inactive salt ponds on both sides of the Napa River as salt pond or shallow open water habitat to support waterfowl.
- Manage diked wetlands and seasonal wetlands in the adjacent uplands to improve seasonal ponding.
- Where possible, enhance riparian vegetation and marsh/upland transitions and provide upland buffers.

The *Goals Report* generally recommends, referring to the region as a whole, to manage crystallizer ponds as salt panne and open water habitat and to enhance and protect seasonal pond habitat in the Green Island area.

The *Goals Report* states implementing these recommendations would improve habitat conditions for tidal marsh-dependent species, such as the salt marsh harvest mouse and the California clapper rail, throughout the segment. It also would provide habitats for species associated with seasonal wetlands. Large-scale restoration would widen and deepen many of the tidal channels, and this would benefit fishes and diving ducks, as well as water circulation. Improving salt pond habitat also would provide valuable deepwater foraging and resting habitat for diving ducks. Restoring riparian vegetation would benefit many amphibians, birds and small mammals. Enhancing marsh/upland transitions would improve conditions for several rare plants.

The unique opportunity to expand marsh around Fagan Slough's prehistoric tidal marsh would imply conversion of ponds 9 and 10 to fully tidal marsh. These restoration design concepts are basically similar to preliminary, administrative draft USFWS maps and text for the tidal marsh ecosystem recovery plan. Given the apparent likelihood of incorporating these recommendations into the Napa Plant Site restoration, the proposed project has a great deal of potential to be consistent with the recommendations of the *Baylands Ecosystem Habitat Goals Report*.

b. Issues Addressed by the Review Team, Discussion and Findings:

The Design Review Team providing feedback on all questions posed. That feedback is provided in aggregate, following General Comments, below, provided by the members of the Design Review Team.

General Comments:

Peter Baye provided the following pond-specific recommendations:

Ponds 9 and 10. These ponds are severed portions of the once-continuous Fagan Slough marsh, one of the only prehistoric tidal marsh remnants with no history of persistent diking. Restoration of these ponds as a tidal marsh/slough system would eventually allow for

habitat expansion of numerous species of concern and rare/endangered species that occur in Fagan Slough ecological reserve, including:

California black rail (*Rallus jamaicensis coturniculus*)
soft bird's-beak (*Cordylanthus mollis* ssp. *mollis*)
delta tule pea (*Lathyrus jepsonii* ssp. *jepsonii*)
Sacramento splittail (*Pogonichthys macrolepidotus*)
Delta smelt (*Hypomesus transpacificus*)

There may be some limited habitat benefits for the salt marsh harvest mouse and California clapper rail, but these are likely to be substantially lower than in the lower Napa River restoration sites, where there is somewhat less freshwater influence.

Because of subsidence, initial tidal reflooding is likely to result in increased wave erosion of the railroad levee on the southern (downwind of NW winds) side of the ponds, and delayed marsh restoration. Construction of a broad, gently sloping (1:10 or flatter) marsh platform would dissipate wave energy and provide a ready substrate for initial marsh plant colonization. Low-growing high marsh vegetation on locally compacted substrates of this marsh platform could provide suitable habitat for soft bird's-beak. A possible convenient nearby source of fill may be the accumulated wash pond sediments (residual from decades of brine-washing mud from crystallizer beds off of harvested raw salt) on the other side of the RR tracks. Note that conversion of 9 and 10 to tidal marsh would eventually reduce potential for bird strikes at the adjacent Napa Airport runways relative to shallow open water or pan habitat. There would, however, be a temporary increase in waterbird use of the tidally restored ponds 9-10 during mudflat/lagoon transition phases.

Sediment supply to 9 and 10 may be constricted by the Napa River channel narrowing at this position, but extensive mudflats south of the crystallizers may provide an ample supply. Sediment transport patterns and concentrations should be investigated here. The dredging history of the barge canal should provide a valuable empirical reference site for estimating sedimentation potential. The northern outboard levee of ponds 9-10 should be graded down to high marsh elevations, but the levee foundation should remain in place to ensure stability of the adjacent Fagan Slough marsh. Regraded levees should be managed (selective spot-application of approved herbicide, presumably glyphosate) and monitored to suppress invasions by wetland weeds (*Lepidium latifolium*, annual mustards, fennel, etc.) for about 3 years, when native high marsh vegetation should be well-established.

Wash ponds. Wash pond 2 is unfilled, and impounds significant rainwater and/or levee overtopping. Wash pond 1 is partially filled. If excavated as a borrow source for buttressing the RR levee along ponds 9 and 10, the wash ponds would be pre-adapted for management as brackish choked tidal lagoons with considerable freshwater influence, indicating high feasibility for growth of *Potamogeton/Ruppia* submerged aquatic vegetation beds. These could be managed with minimal maintenance, as south White Slough was for many years. Because the railroad severs connection with the Fagan/9-10 complex, there is less additive benefit here for tidal marsh restoration. Flood constraints are minimized by adjacency to artificial uplands of the plant site.

Crystallizers and pickle ponds. The outer crystallizers (1-3, 7-8) and B-3 would be well-suited to tidal marsh restoration with direct drainage to the Napa River, to provide the continuous marsh band recommended by the Goals Project. Internal levee configurations and shapes should be modified to provide a complex boundary between open tidal and essentially nontidal salt pan (overtopped by storm high tides only) on the interior side. The grid pattern of crystallizer internal levees should be eliminated by grading. Channel patterns approximating sinuousity and complexity of historic tidal creeks should be constructed (excavated) in the compacted crystallizer beds that are restored to tidal marsh.

Because of mosquito concerns with brackish pans that become partially vegetated, it may be necessary to consider unnaturally hypersaline pans that provide similar high tide roost benefits (or greater benefits) to shorebirds. Brackish pans would be more natural at this site, but may be problematic for mosquito management. Hypersaline pans minimize vegetation (a mosquito breeding factor) and may produce brines concentrated enough to be lethal to most nuisance mosquito larvae. Large salt pans may also attract opportunistic nesting by threatened western snowy plovers (*Charadrius alexandrinus nivosus*).

A hypersaline pan complex including crystallizers 4-6, pickle ponds B1, B2 and Unit 3 should be consolidated by removing internal levees, and grading some irregular topography (depressions, hypersaline islands, depth gradients). Some "waste" or legacy salt from former industry may be useful to stockpile and use to maintain hypersaline conditions. Thick salt crusts and residual bittern liquor, however, would be disadvantageous for shorebird management. The pans should be managed to provide playa-like flats during the summer, and fall migration. It may not be feasible to maintain emergent flats in winter because of constraints of discharging hypersaline brines; emergent salt pond flats were maintained historically by pumping transfers of brines among concentrator ponds within complexes, and these will no longer be available. Water level management in salt pans, in the absence of a full solar salt operation, and in the absence of discharge or significant storage of brines, may be difficult in winter and spring.

Outboard levees. Outboard levees contain three components: armored intertidal and subtidal outer slopes, roads on levee tops, and inboard slopes. Removing decades of riprap from intertidal levee slopes and toes in a high wave-energy eastern shore would risk rapid erosion of levees, pond bottoms, and restored tidal marsh. Full removal of riprap would also be very costly. The habitat nuisance of riprap could be mitigated by removing supratidal levee portions (above high tide elevation). This would eliminate potential den sites for terrestrial predators such as raccoons, skunks, rats, and red fox. Retaining intertidal riprap with interstitial pockets of sediment, limiting growth of tall, emergent marsh plants, may provide refugia for Mason's lilaeopsis (*Lilaeopsis masonii*), which does inhabit mud veneers and pockets in riprap, and naturally grows on wave-pruned marsh turfs at exposed marsh scarps. Sources of this species are locally common on the Napa River and its sloughs.

Levee roads converted to pedestrian trails are likely to be attractive for terrestrial predator travel routes. Perimeter levee trails are incompatible with most habitat benefits of tidal marsh, particularly fringing marsh with limited distance from levees. Therefore, levee road should be graded down to high marsh elevation (as for the north levee of ponds 9-10). This would minimize human and terrestrial predator disturbance to the restored fringing marsh,

and allow natural wave-deposition of high marsh debris-berms (wrack-lines with significant high tide refugia for resident marsh wildlife) on high marsh. The interior slope of the perimeter levee should be graded to a gentle slope (1:10) and vegetated to minimize internal erosion potential during initial tidal restoration phases, and to provide a foundation for a prograding marsh band on the interior side. Public trails compatible with wildlife would consist of shrub-buffered, elevated trails on berms along the landside of the site, with spur trails to elevated viewing platforms. Fencing may not be necessary, since marsh topography discourages entry of nearly all visitors other than fishermen or naturalists, and marsh fencing seldom impedes vandals.

Artificial uplands (fill at Green Island plant site). Compacted fill is not necessarily an impediment to all types of native vegetation. Stony, shallow soils with low nutrient content may limit abundance of invasive non-native annual grasses, and favor small, stress-tolerant, native herbs that compete poorly with annual grasses. Given the prevalence of compacted, impermeable clay fill, constructing artificial seasonal wetlands that mimic vernal pools may provide significant new habitat for the Napa vernal pool flora that is in severe decline because of irreversible vineyard conversion. This flora includes the federally endangered Contra Costa goldfields (*Lasthenia conjugens*), which occurs on vernal pools near Soscol Creek. An inadvertent precedent for this suggestion exists: following construction of poorly-drained building pads in compacted subsoil at a business park adjacent to the Napa River, native grassland herbs and vernal pool plants briefly invaded and became prevalent. Adjacent uplands with intact soils supported mostly dense non-native grasses. The upland site could become a valuable mix of native grassland, scrub, and seasonal wetlands, based on lower Napa River reference sites with remnant native vegetation.

Heavy weed control (grading or herbicide, or both) prior to native vegetation establishment in Green Island uplands is highly recommended. For terrestrial grasslands near baylands, dominance by native creeping wildrye (*Leymus triticoides, L. x multiflorus*) would most closely approximate natural conditions, and would provide greatest resistance to weed invasions. Native bunchgrasses and scrub may be appropriate to diversify the site, but will be more subject to weed invasions. CDFG Huichica Unit is a suitable source of propagation stock of native herbs of alluvial lowland grasslands and bay edges. Heavy initial seeding with native species propagated from local sources is highly recommended to establish an initial competitive footing against annual grasses. Extensive transplanting and irrigation is not recommended. Fertilizer addition is strongly discouraged because it would confer competitive advantage to annual grasses. Transplants of perennial herbs, grasses, and woody species should be made in wet, cool, winter months.

Peter Baye pointed out poor salt marsh harvest mouse habitat could function as great cordylanthus habitat. Karl Malamud-Roam noted that abandoned parking lots (with excessive soil compaction) produce some of the best cordylanthus habitat.

Peter noted the potential for debris mounds along the south edge of the project site (at the Napa River's edge) due to the long wind fetch there. The edge is heavily rip-rapped; Peter noted sediment accretion in rip-rap cracks can provide good habitat for Mason's lilaeopsis.

Rachel Kamman suggested taking maximum advantage of the freshwater opportunities available at the site.

Rachel suggested that, for public access, to use peninsular access - such as the railroad bed - opposed to circular levee trails.

Phil Lebednik suggested exploring the potential for salt marsh harvest mouse habitat at the site. He added that if rapid return on restoration is sought, restoring Ponds 9 and 10 would be a good place to start.

Phil Lebednik, referring to the airport's concerns about bird strikes, suggested minimizing extensive bird habitat in Ponds 9 and 10 and emphasizing open water to the south.

Phil Lebednik suggested using the retained levees for public access.

Desired Feedback:

The Desired Feedback consisted of those issues on which the Department of Fish and Game sought Design Review Team comments and recommendations. These topics were:

i. The goals and objectives of the project; the types of information the should be collected to inform the planning process.

Peter Baye shared extensive comments on regional habitat balance and needs. Peter stated habitat goals for the east Napa salt facility should consider regional patterns of existing habitat availability in the San Pablo baylands, and the current prospects for habitat restoration within them. The majority of the Napa Marsh (salt pond restoration, west shore) appears to be designated as either shallow lagoon habitat (brackish to saline impoundments with choked tidal circulation or non-tidal flooding management) or tidal marsh. Skaggs Island is likely to be restored as tidal marsh, while the Haire parcel (Skaggs Island NE of Rainbow Slough) may become a shallow, perennial impoundment. Cullinan Ranch is likely to be restored tidally, but may result in a persistent tidal lagoon for many years because of deep subsidence. Mare Island may sustain some non-tidal seasonal wetlands for shorebirds on its extensive dredge disposal sites, proposed for reactivation. The remainder of the east lower Napa River baylands is largely in transition to tidal marsh. Only ponds 1, 1A, and west end duck club are likely to be managed to provide extensive high tide flats (emergent, shallow submerged) for shorebirds, and west end is likely to gradually transform to tidal marsh.

Peter noted the forecast prevalence of impoundments and tidal marsh/mudflat succession in restored diked bayland habitats suggests relative regional scarcity of high tide shorebird roost habitat, traditionally provided by disced hayfields with winter pools, and shallow edges of salt

ponds. This scarcity indicates *a suitable role for some shallow hypersaline flats (seasonal salt pond) to provide reliable high tide shorebird roosts, as a counterpart to the vast tidal flats of northern San Pablo Bay*. Currently, extensive flats are only temporarily available at Pond 3, which will undergo succession to tidal marsh. Prior to its hypersaline condition (before the 2002 breach), Pond 3 was one of the centers for canvasback abundance in the north bay (Takekawa and Marn 2000, Accurso 1992), along with other salt ponds previously in industrial operation. Takekawa and Marn recommended that loss of Napa ponds 3-5 (as canvasback habitat) be compensated by providing suitable alternative habitats and increasing large brackish shallow water areas. Canvasback historically preferred a diet rich in carbohydrate-rich aquatic plants, such as sago pondweed (*Potamogeton pectinatus*) and to a lesser extent, wigeongrass (*Ruppia maritima*) in shallow ponds, sloughs, or lagoons around 0.5-2 m deep. Shallow fresh-brackish impoundments (choked tidal lagoons or managed ponds), similar to the more saline south White Slough, Vallejo, would be an appropriate option for canvasback habitat in the upper Napa ponds, either west or east side, where freshwater influence is greatest.

Peter Baye felt that although crystallizer ponds have been restored to tidal marsh, it might not be the most efficient thing to do in this case given the site topography, elevations and compacted soil. Peter noted the area does not have a great deal of shallow panne habitat and these sites are already panne surfaces; he noted this could be viable potamogeton habitat. He felt this project presents a good opportunity for these habitats and they could be easily achieved, stating it would not be a natural place for them but yet a convenient place. Peter emphasized the potential for native grasslands, vernal pools and seasonal wetlands on the site.

Peter suggested amassing the following information for the planning process:

- Perimeter levee elevations
- Interior levee elevations (esp. crystallizers)
- Wash pond elevations
- Wash pond sediment quality and volume
- Seasonal variation in sediment concentrations in Napa River opposite ponds B-3 and 9
- Examination of crystallizer substrate compaction (cores, bulk density)
- Estimation of residual salt load
- Dredging records (depths, volumes) of barge canal

Rachel stated photogrammetry would likely provide sufficiently accurate survey data if verified with ground surveys both within the ponds and on internal levees. She also recommended ground verification in vegetated zones on site and at reference sites, because accurate ground surface elevations are critical in designing (and accurately modeling) restoration sites that are at, or close to, anticipated marsh plain elevations. She suggested tidal and vegetation monitoring at reference site(s) to establish target

elevations for transitional vegetation zones. Rachel suggested the use of a series of photographs as a low cost method determine subtle grades within each of the crystallizer ponds. She then asked about planned coring methodology for the outboard marsh and adjacent reference sites, and suggested coring/piezometers to evaluate potential groundwater influences on wetland function.

Phil Lebednik suggested adopting a landscape approach to conceptual design of the restoration to develop appropriate habitat mixes into the project goals, with an emphasis on back engineering (i.e., because several restoration projects nearby have been conducted at various times in the past, project proponents can probably learn some valuable lessons about restoration success under local conditions and also these projects would provide the most relevant information regarding the Napa Site's restoration trajectory); he added that the project might take the opportunity to incorporate habitat types that may be underrepresented in the region.

ii. Appropriate topographic information needed.

Rachel Kamman commented earlier regarding the use of photogrammetry to map site topography and the need for ground controls and vegetation surveys.

Rachel suggested that interior levees should be degraded to eliminate cell-like drainage patterns and create subtle variations in topography. The placement of these materials should be designed based on the existing grades within cells, desired channel plan form and drainage patterns. As such interior levees need to be delineated to a level of detail sufficient to estimate earthmoving costs.

As for the tidal channel networks, Rachel suggested establishing subtle topographic variations and construction of third and fourth order channels as part of wetland design. The mid-order and smaller channels can be left to form on their own. In high marsh areas, smaller connector channels may be required to provide adequate circulation and prevent fungal growth. Levee, "channel cut" soil can be used to create subtle topographic variations that will delineate and drive lower order channel networks. Karl Malamud-Roam questioned whether the elevations were opportunities or constraints and stated that question could be answered with criteria setting and consistency with the stated goals.

Karl also suggested using photogrammetry using three existing sites (the airport, Green Island, and the railroad bridge) and three new benchmark sites.

Karl suggested comparing the levee elevations relative to tidal datums and suggested leaving the majority of the levees at their current heights. He

noted there are several natural phasing options from north to south, with various phases possible.

Rachel agreed that phasing looked feasible (phase I: Breach to Unit 3 and crystallizers 7,8 &9; Phase to add Crystallizers 1 - 6 B1 and B2) but would require over sizing of Phase 1 channels to accommodate a period of reduced tidal prism. B3 could be restored and monitored as a pilot project with a separate breach to the bay (per historical channel alignments, or connected to the upstream end of the unit 3 drainage network and available freshwater sources as high marsh ponds/panne).

iii. The appropriate level of hydrodynamic and sediment modeling to be undertaken to evaluate restoration potential, constraints and develop appropriate designs.

Rachel advocated use of a one-dimensional model as an accurate and cost effecting design tool to size and plan placement of tidal channels. One-dimensional models can accurately predict interior tidal ranges and inundation frequencies. Both these parameters can be altered using channel plan form and dimension to create a variety of habitats. Rachel also noted the channel construction would likely constitute one of the largest project costs. Thus, maximizing habitat value and minimizing project costs will likely require an iterative approach to channel and wetland design. Sediment supply rates predicted using a one (or two) dimensional model can used in combination with a long term marsh accretion model (Per Krone, 1985?) to predict spatially variable marsh accretion rates.

Two-dimensional models can provide more detailed information regarding tidal circulation and sedimentation patterns. However, circulation/sedimentation is driven largely by elevation and bathymetry in an extremely flat and shallowly inter-tidal salt pond sites. As such the design encompasses creation of drainage areas and circulation patterns, and little additional information is gained by using a two-dimensional model. Karl Malamud-Roam suggested using the modeling data and efforts that went into the Napa Flood Control and Napa-Sonoma Marsh projects, as opposed to new, independent hydrodynamic modeling. Karl posed the question - how well can likely boundary conditions be characterized?

iv. Desirability to predict future habitat conditions and rates of habitat development.

Peter Baye felt the backs of Ponds 9 and 10 could serve as brackish back marsh panne habitat and noted a choice would not have to be made between salt ponds and tidal marsh with such a gradual transition. He considered this approach as maximizing use of what's there in the present and taking advantage of potential channel constraints.

Peter felt there are no predictive ecological models that can be applied meaningfully to tidal marsh succession, either here or elsewhere. Predictive models in ecology are available for some terrestrial ecosystems (e.g. forestry models), but are seldom if ever used for site-specific purposes because of excessive inherent unpredictability, reliance on unverified simplifying assumptions needed to run the models, and lack of basic data. They are used mainly to provide heuristic, theoretical comparisons or tests of hypotheses, rather than provide substantive, time-specific, site-specific predictions of future ecological conditions. Their purposes and uses are sometimes misunderstood or misapplied. The "geomorphic evolution" models used in San Francisco Bay tidal marsh restoration projects are essentially physical sedimentation models with added vegetation-elevation thresholds. They generally assume a static and linear relationship between tidal elevation and marsh vegetation type in sheltered, mature marsh conditions (uncritical adoption of early, limited data by Hinde, Atwater decades ago). These relationships based on observations of established marsh vegetation in sheltered settings have not been verified for secondary or primary succession associated with tidal restoration. Forecasts of marsh establishment at Crissy Field (Presidio) and Sonoma Baylands based on physical modeling methods, for example, have been inaccurate. Ecological and physical modeling should not be confused, and habitat models that "piggyback" on purely physical sedimentation models should be viewed with skepticism. Physical modeling may be useful to estimate relative rates of development of alternative habitat types.

Rachel Kamman stated that given the current knowledge of successful habitat restoration in the area, and the large local sediment supply, there was likely little concern that timely sedimentation would produce desirable habitats. If there is interest in determining marsh accretion rates, coring and dating of nearby marsh sediments will provide the most accurate prediction of expected sedimentation rates.

Marsh evolution models are available. These models provide a depiction of a possible sequence of depositional events, but are limited in their ability to accurately predict long-term sedimentation and marsh evolution rates and patterns. Marsh evolution represents an integrated mixture of threshold dependant geomorphic and biological processes. These highly variable physical and biological processes are a product of both extreme and intermediate episodic events, and long-term (average) conditions. As a result, uncertainty in numerical models of these processes is high, and provides little additional information beyond empirical/field evidence.

v. <u>Design features which should be considered in the development of the restoration plan.</u>

Peter suggested considering the following design features:

- Marsh platform along S end of ponds 9, 10
- Excavation of accumulated wash pond sediments for (a).
- Regraded high marsh on perimeter levee
- Regrading/redistribution of interior levee fills (crystallizers, pickle ponds)
- Low berm as hydraulic barrier between salt pan and restored fringing tidal marsh in crystallizers (scavenged fill from interior levees).
- Compaction and excavation of seasonal wetlands/vernal pools in upland fill, upland native grassland and scrub revegetation (& establishment of *Lasthenia conjugens*)
- Restricted (choked) tidal lagoon in wash ponds
- Water (brine) level management options for isolated salt pans in former crystallizers

Rachel suggested the design include delineation of drainage areas and zones supporting varied hydrologic conditions and associated target habitats. The determination of these conditions should be based on project habitat goals, with design criteria established based on reference site conditions. Supra-tidal features will require appropriate site elevations, freshwater sources and/or groundwater inputs. In these and high marsh areas, smaller connector channels may be required to provide adequate circulation and prevent fungal growth. She suggested maximizing use of broad, transitional and upland vegetation zones to provide high tide refuge and wide buffer zones.

For the tidal channel networks, Rachel suggested establishing subtle topographic variations and construction of third and fourth order channels as part of wetland design. The mid-order and smaller channels can be left to form on their own. Levee, "channel cut" soil can be used to create subtle topographic variations that will delineate and drive lower order channel networks. Rachel also suggested channel design criteria include balancing on-site cut and fill.

Rachel noted levee breaches would be an important aspect of the restoration design. She recommended using in the historical channel location on the leeside of an eastern river shoreline cut. This historic alignment would shelter the inlet from flood-stage river sediments, and would be beneficial in keeping the breach open and maintaining sub tidal habitat, particularly flood-stage refuge for fish.

vi. <u>How restoration of the site should be integrated with other restoration projects in the area.</u>

Phil Lebednik suggested adopting a landscape approach to conceptual design of the restoration to develop appropriate habitat mixes into the project goals, with an emphasis on back engineering (i.e., because several restoration projects nearby have been conducted at various times in the past, project

proponents can probably learn some valuable lessons about restoration success under local conditions and also these projects would provide the most relevant information regarding the Napa Site's restoration trajectory; he added that the project might take the opportunity to incorporate habitat types that may be underrepresented in the region. [Note: this is a copy of the text from above, but it seems very pertinent here, as well.]

vii. Use of dredge material in restoration; and constraints to restoration of the site.

Peter Baye suggested the only habitat construction demand for fill is the marsh platform along the south shore of ponds 9-10. The fill requirement for this may be met by wash pond sediment or excavation as an on-site borrow source. Offsite needs for dredged material are probably very limited, and may not exist if these on-site sources are ample. Coordination with dredging projects may constrain the schedule of restoration work if dredging project schedules control restoration schedules, and are subject to independent delays. The volumes of "supply-side" dredged material habitat designs may exceed those genuinely needed for ecological restoration. The *Goals Project* recommended judicious use, not capricious use, of dredged material for marsh restoration.

Peter noted potential constraints to the restoration include:

- Public demand for recreation and perimeter levee trails
- Sediment quality of wash pond sediments
- Sediment supply and rate to ponds 9, 10
- Compaction and impermeability of crystallizer substrates near modern sea level
- Limitations of water level management in crystallizers (lack of discharge, internal reallocation space)

Rachel also felt there was enough elevation on the site that there would be no need to import more dredged material. If dredged material fill needed to be accepted, she suggested the fill be placed on the upland transition boundaries.

Phil Lebednik asked about the availability of data on the concentration of metals in the sediments at the site. Mercury in particular is of concern in the Bay in general, and there could be other metals of concern, depending on site or region-specific levels. Wetland conditions are thought to increase the potential for methylation of mercury, and methyl mercury is considered to be the most bioavailable form in the environment. Therefore, wetland restoration could increase the methylation of mercury at a site. At the present time, not much is known about the specific conditions in Bay wetlands that might influence the rate of methylation of mercury, but there are a number of ongoing and anticipated future studies that should be

consulted by the proponents as the conceptual design for the site moves forward. The California Bay Delta Authority is supporting mercury studies in the North Bay and Delta, SFEI is conducting a mercury study, and the Regional Board may be coordinating a mercury study in the near future. Note that methylation rates may or may not be directly related to concentration of total mercury in sediment; therefore, until more information is available, sediment containing relatively low levels of total mercury may also be of concern. The greatest concern regarding fish would be associated with those habitats that might tend to increase mercury methylation and have a direct connection to the River. Regarding bird bioaccumulation, any habitats that encouraged bird foraging and increased methyl mercury production would be of concern. Consideration of these issues should be incorporated into the process for developing the conceptual restoration plan.

c. Issues Not Addressed by the Review Team and Rationale:

The Design Review Team provided feedback on all questions posed in the completed Project Summary form and during the project presentation.

d. Phasing and Coordination:

e. Other issues:

5. Disclaimers:

a. The recommendations of the Restoration Program are not binding on any permitting agency and they will not restrict any agency's authority.

b. The Wetlands Restoration Program's Design Review Group makes every effort to provide guidance; we cannot guarantee issuance of permits by any regulatory agency.

c. The Wetlands Restoration Program's Design Review Group is intended to provide comments and feedback on plans and designs. This assistance will necessarily be limited, and should not be expected to substitute for professionally prepared site evaluations, hydrological studies, final designs, and construction plans.

d. The Restoration Program and the participating agencies will not be liable for the failure of any project.

e. Project review by the Design Review Group does not constitute an endorsement of the project by the Design Review Group or by the Wetlands Restoration Program.

6. References

Accurso, L.M. 1992. Distribution and abundance of wintering waterfowl on San Francisco Bay 1988-1990. Unpubl. Master's Thesis. Humboldt State University, Arcata, CA. 252 pp.

Takekawa, J.Y. and C.M. Marn. 2002. Canvasback. pp. 268-272 in: Baylands Ecosystem Species and Communities Profiles: life histories and environmental requirements of key plants, fish and wildlife. P.R. Olofson, ed. San Francisco Bay Regional Water Quality Control Board, Oakland, CA. 2000.

ATTACHMENT A

Project Description

i. Project objectives:

The stated mission of the Napa Plant Site restoration is shared with that of the South Bay Salt Ponds restoration: to prepare a scientifically sound and publicly supportable restoration and public access plan that can begin to be implemented within five years. The overarching goal of the Restoration Plan is the restoration and enhancement of wetlands and transitional habitats on the Napa River while providing wildlife-oriented public access and recreation.

The Guiding Principles for the restoration are: the Restoration Plan is based on the best available science, and independent scientific review; the Restoration Plan is developed through an inclusive and open process; the Restoration Plan is a flexible plan that is based on the concept of adaptive management; the Restoration Plan is implemented in a timely manner to demonstrate early, visible success; the Restoration Plan emphasizes naturally sustaining systems and integrates habitat development actions at the landscape scale; and, development of the Restoration Plan will consider costs of implementation and monitoring so that planned activities can be effectively executed with available funding.

The Long-Term Restoration Objectives are to: create or enhance habitats of sufficient size and appropriate structure to promote restoration of native special status species that depend on San Francisco Bay habitat for all or part of their life cycles; create or enhance habitats of sufficient size and appropriate structure to for migratory bird species; create habitats, where feasible, of sufficient size, structure, function and diversity to support increased abundance and diversity of native species, including plants, invertebrates, fish, mammals, birds, reptiles and amphibians; provide public access and recreational opportunities compatible with wildlife and habitat goals; maintain or improve existing levels of water quality in the Napa River, and minimize adverse effects caused by habitat restoration activities; develop a restoration plan which maximizes wildlife values while addressing airport safety considerations; maintain or improve existing levels of flood protection; implement design and management measures to maintain or improve current levels of vector management, control predation on special status species, and manage the spread of non-native invasive species; and, protect existing infrastructure.

ii. Project location and map:

The Napa Plant Site project is located along the east side of the Napa River in Napa County, just southwest of the Napa County Airport and west of the city of American Canyon, and at the end of Green Island Road. See attached map, Figure 1, below.

INSERT HARD COPY OF FIGURE 1, Regional and Project Location (pdf file)

iii. Type and acreage of habitats to be created or restored:

There are just over 1,000 acres of former crystallizer and concentrator ponds on the site. The ultimate composition of restored ponds in terms of type and quantity in the end habitat mix has yet to be determined.

iv. Past use and current condition of the site:

The Napa Plant Site was acquired by the State of California as part of the larger Cargill Salt Ponds purchase, which closed on March 6, 2003. The plant site consists of 1,400 acres of former salt evaporation ponds and crystallizers and Green Island along the east side of the Napa River at the end of Green Island Road.

Overall, the site encompasses approximately 1,400 acres of mostly evaporator ponds and crystallizer ponds. Cargill is currently removing the remaining salts from the ponds and the process may take up to 8-10 years, although progress is proceeding well at this time. Through the salt harvesting process, Cargill will maintain a base layer of 6"-12" of salt in the ponds. Some ponds will likely become available for restoration within 3 years. The project site's ponds were all used for the production of sea salt and there are no bittern ponds within the site's 1,400 acres. Remediation of residual soil salinities is not expected to be necessary. Since the mid-1990s, or roughly the end of active salt production, the sites have undergone an annual ponding and drying cycle.

The B ponds - B1, B2, and B3 - are located along the east side of the site and served as concentrator ponds; elevations range from 3 feet NGVD and down. The northern ponds - 9 and 10 - served as the concentrator ponds and are now at elevations of about 1-0 feet NGVD and 2-1 feet NBVD, respectively. A portion of Pond 1 contains excess dredge material on the site. The plant site itself is about 20 acres in size and is elevated above the tides. The remaining nine ponds served as crystallizers.

Cargill has prepared the Napa Work Plan, approved by the Department of Fish and Game, which describes the salt removal process.

v. Description of any special features or issues:

a) Public access

Public access is very likely to be a component in the restoration planning and design of the proposed project.

b) Flood control

Flood control is not an significant issue under consideration in this project.

c) Subsidence

Subsidence is not a critical concern at the proposed project site.

d) Mitigation

Mitigation is not a component of the proposed project.

e) Other adjacent/nearby projects

The project site is nearly surrounded by other wetland restoration projects and preserves, including Fagan Slough, which has several hundred acres of tidal marsh adjacent to a full transition zone. The Napa Flood Control project is adjacent to the contiguous Ponds 9 and 10 and the Port of Oakland project site is located to the south. The Napa Marsh restoration project is located across the river - on its west banks - and all of its ponds are former salt production facilities, as well. Some of its ponds are already open to tidal influence; the EIR/EIS for this project is in its final stage and near completion. The Napa Marsh ponds are planned to be approximately 50% tidal marsh and 50% managed tidal ponds. Wildlife use of the Napa Plant site's ponds has been limited since the cessation of salt production, with bird use quite minimal. Given the quantity of existing wildlife habitat around the proposed project site, the Napa County Airport has already expressed concerns about potential increases in bird strikes that could be associated with the restoration of the former plant site.

f) Opportunity for transitional habitats

The project offers the potential for the creation of large bands of transitional and upland habitats above tidal marsh elevations.

ATTACHMENT B

Completed Project Summary Form

1. **Project Name: Napa Plant Site Wetland Restoration Project**

2. **Project Proponent –** California Department of Fish and Game

3. **Project Objectives –** See attached Goals and Objectives for Napa Plants Site.

4. **Status of Project Planning –** The Project site was acquired by the Department of Fish and Game in March of 2003. The site is currently in the process of being desalinated by Cargill Salt. Concentrating the existing salt on the site into existing crystalizers and harvesting the salt for commercial use are accomplishing this.

   The Department is initiating the planning process by bringing preliminary concepts to the DRG to obtain input on how planning should proceed from a technical perspective. It is the Departments objective to have a plan for the site completed by the end of 2005.

5. **Project Description –** The Napa Plant site is located on the east side of the Napa River in the City of American Canyon. The site consists of 1,400 acres of salt concentrator ponds and crystalizers and some adjacent uplands. As described in the Goals and Objective the Department anticipates restoring a portion of the site to tidal marsh, while retaining some amount of the area as managed wetlands.

6. **Special Features or Issues –** The site is somewhat subsided, with the most subsided areas at approximately -0.7 NGVD. Generally the site ranges between 0.0 and 2.0 NGVD. In the north, restoration of ponds 9 and 10 may be constrained by their proximity to the Napa Airport. Opportunities may exist to re-establish upland and stream transitions. The Napa County Flood Control Agency has expressed a desire to use the area for disposal of maintenance dredge material from the Napa River channel. Appended

7. **Available Information –** Available information is limited for this initial meeting. The site is in close proximity to the Napa Marsh Restoration project which has conducted extensive evaluation of the hydrodynamics and water quality of the Napa River in relation to large scale tidal wetland restoration. The DEIR/S for the project can be found at: http://www.napa-sonoma-marsh.org/documents.html. The site currently has very little biological use due to the current management regime. The site was an active salt plant until approximately 1990 at which time commercial salt harvest was suspended. The ponds on site are currently characterized by high salinities. They currently pond water in the winter and early spring as result of precipitation and subsequently are allowed to dry in the summer.

Desired Feedback – The Department seeks initial guidance on: the goals and objectives of the project; the types of information which should be collected to inform the planning process;

appropriate topographic information needed; the appropriate level of hydrodynamic and sediment modeling to be undertaken to evaluate restoration potential, constraints and develop appropriate designs; desirability to predict future habitat conditions and rates of habitat development; design features which should be considered in the development of the restoration plan; who restoration of the site should be integrated with other restoration projects in the area; use of dredge material in restoration ; and constraints to restoration of the site.

NAPA PLANT SITE RESTORATION PLAN

MISSION, GOAL, GUIDING PRINCIPLES, AND OBJECTIVES

DRAFT May 1, 2003

Mission: To prepare a scientifically sound and publicly supportable restoration and public access plan that can begin to be implemented within five years

The overarching goal of the Restoration Plan is the restoration and enhancement of wetlands and transitional habitats on the Napa River and in San Pablo Bay while providing wildlife-oriented public access and recreation.

Guiding Principles for the Restoration Plan

1. The Restoration Plan is based on the best available science, and independent scientific review is an integral part of its development and implementation.
2. The Restoration Plan is developed through an inclusive and open process that engages all stakeholders and interest groups.
3. Numerous federal, state and local agencies are partners in the Restoration Plan and their views are considered fully.
4. The Restoration Plan is a flexible plan that is based on the concept of adaptive management - recognizing that information gathering is part of implementation and that modifications will be made in the future based on that information.
5. The Restoration Plan is implemented in a timely manner to demonstrate early, visible success.
6. The Restoration Plan emphasizes naturally sustaining systems and integrates habitat development actions at the landscape scale to provide ecosystem-level benefits to the Napa River and San Pablo Bay.
7. Development of the Restoration Plan will consider costs of implementation and monitoring so that planned activities can be effectively executed with available funding.

Long-Term Restoration Project Objectives

1. Create or enhance habitats of sufficient size and appropriate structure to promote restoration of native special status species that depend on San Francisco Bay habitat for all or part of their life cycles.

2. Create or enhance habitats of sufficient size and appropriate structure to for migratory bird species.
3. Create habitats, where feasible, of sufficient size, structure, function and diversity to support increased abundance and diversity of native species, including plants, invertebrates, fish, mammals, birds, reptiles and amphibians.
4. Provide public access and recreational opportunities compatible with wildlife and habitat goals.
5. Maintain or improve existing levels of water quality in the Napa River, and minimize adverse effects caused by habitat restoration activities.
6. Develop a restoration plan that maximizes wildlife values while addressing airport safety considerations.
7. Maintain or improve existing levels of flood protection.
8. Implement design and management measures to maintain or improve current levels of vector management, control predation on special status species, and manage the spread of non-native invasive species.
9. Protect existing infrastructure.

San Francisco Bay Area Wetlands Restoration Program
Design Review Group

Conflict of Interest Statement

The San Francisco Bay Area Wetlands Restoration Program Design Review Group (the Group) attempts to have those reviewers who participate as members of the Group avoid any conflict of interest. Conflict of interest, as it relates to the Group, is distinguished into two categories: financial and personal/institutional. The two distinct types of conflict of interest warrant two distinct courses of action of the part of each Group member. All those members having a *financial* conflict of interest with a project will NOT be allowed to evaluate proposals for which they have a financial connection and/or provide guidance and comment on that project, without exception. However, those Group members having a *personal/institutional* conflict of interest are required only to disclose any relationship, yet are not disallowed from project review and comment.

Regardless of the type of conflict of interest, each Group member has the personal obligation to avoid a conflict as well as the personal obligation to disclose any such conflict, whether real or apparent, to the Group as a whole.

Financial Conflict of Interest. The Wetlands Restoration Program expects that Group members will not review proposals in whose development they have assisted or if they would receive a financial benefit from the funded project. A conflict of interest would be considered to exist whenever a member of the Group **or** a relative of a Group member (including, for instance, a spouse, sibling, parent or child) has a personal, material, or financial interest in a transaction or project under consideration by the Group.

Personal/Institutional Conflict of Interest. If a Group member has a personal or institutional connection with a project sponsor in any way, but there is no conflict of interest, the member will be allowed to participate in the project review provided that any connection is disclosed prior to project review. A personal connection with a project sponsor is considered worthy of disclosure if any of the following relationships were applicable during the **past four years**: collaboration on research, pilot, or implementation proposal or project; co-authorship; thesis or postdoctoral advisorship; and/or supervisor/employee relationship. An institutional connection – such as between employers and their employees – will be considered worthy of disclosure. For example, an employee of a state or federal agency is considered to have an institutional connection with a proposal submitted by that agency, even if the project sponsor is in a different division of the agency than the reviewing Group member. Similarly, a university faculty member is considered to have an institutional connection with a proposal submitted by that university, even if the applicant is in a different department of that university campus.

To avoid any problems with conflict of interest or appearance of bias, scientific and technical reviewers are expected to review proposals independently and without delegating the review task in whole or in part to any other person. Any efforts to delegate review will be considered a conflict of interest. If you are uncertain about a potential conflict of interest, please contact John Brosnan at (510) 622-5048.