

South Bay Salt Pond Restoration Project Adaptive Management Plan Outline October 1, 2004

I. Introduction

- **Need for Adaptive Management**

- The South Bay Salt Pond Restoration Project (Project) will occur in phases over the coming decades. Because there are many scientific and social uncertainties with respect to achieving Project Objectives, project managers must design a process to learn from each phase. Based on that learning, future phases can be modified and improved. The Adaptive Management Plan, which includes monitoring and experimentation to address critical questions, is the process by which information on key uncertainties will be generated, analyzed, disseminated and incorporated into project decision-making. The result will ultimately be a better informed and continually improving restoration project.
- The Project's Adaptive Management Plan will be an integral element of the Project's Record of Decision (ROD). A ROD based solely on the initial Restoration Plan will not be sufficient.
- According to the National Research Council, the elements of an effective Adaptive Management Plan include:
 - Clear restoration goals and targets,
 - Sound baseline/reference conditions,
 - An effective process for learning from restoration and management actions, and
 - An explicit process for refining and improving future restoration actions.The Project's Adaptive Management Plan will incorporate each of these elements.

- **Scientific Analysis of Project Objectives**

- The Project Objectives were developed through the Project's Stakeholder Forum and revised by the Project Management Team. The Project Objectives are:
 1. Create, restore, or enhance habitats of sufficient size, function, and appropriate structure to:
 - Promote restoration of native special-status plants and animals that depend on South San Francisco Bay habitat for all or part of their life cycles.
 - Maintain current migratory bird species that utilize existing salt ponds and associated structures such as levees.
 - Support increased abundance and diversity of native species in various South San Francisco Bay aquatic and terrestrial ecosystem components, including plants, invertebrates, fish, mammals, birds, reptiles and amphibians.
 2. Maintain or improve existing levels of flood protection in the South Bay area.

3. Provide public access and recreational opportunities compatible with wildlife and habitat goals.
 4. Protect or improve existing levels of water and sediment quality in the South Bay, and take into account ecological risks caused by restoration.
 5. 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.
 6. Protect the services provided by existing infrastructure (e.g., power lines, railroads).
- As in many ecosystem restoration projects, some of the objectives may be in conflict with others and changes may be required. These Objectives must be viewed in light of the available scientific knowledge, in order to determine to what extent each Objective is achievable.
 - The Science Team conducted science syntheses, i.e. focused literature reviews, of 9 important scientific issues directly relevant to the Project Objectives. The Key Science issues are:
 1. Maintaining and improving functioning of the South Bay ecosystem.
 2. Incorporating knowledge of the sediment budget and sediment dynamics in restoration design.
 3. Restoring tidal salt marsh and associated habitats over the next 50 years at pond and pond-complex levels.
 4. Assisting the recovery of special status and other indicator species using the restoration of ecosystem function and tidal salt marsh and associated habitats.
 5. Managing salt ponds to protect migratory bird diversity and abundance.
 6. Predicting impacts of hydrological modifications from salt pond management and ecosystem restoration actions.
 7. Predicting pollutant effects on the biological functioning of the South Bay.
 8. Limiting the impact of invasive species and other nuisance species.
 9. Minimizing the negative ecosystem effects of human-related activities and infrastructure.
 - Based on the science syntheses, the Science Team will develop science-based evaluations of the Project Objectives, which will be documented in the Science Plan. These science-based evaluations will inform managers of conflicts and uncertainties, but resolving competition or conflict among objectives may ultimately be resolved based on societal values.
- **Adaptive Management Plan Specific Approach (a description of the specific approach to Adaptive Management for the Project)**
 - Identifies performance standards and measures for achieving Project Objectives based on the best existing baseline/reference conditions.
 - Identifies monitoring activities to track restoration progress and targeted research (applied studies) to test hypotheses related to Adaptive Management decisions.
 - Includes applied studies that can be initiated in the Planning Phase.

- Identifies specific Adaptive Management questions and related monitoring/experiments to be conducted in Phase 1.
- Includes process for identifying applied studies for later phases.
- Defines a process for including exogenous forces (climate change, population growth) and relevant social factors (changes in socioeconomic conditions, community values and public expectations).
- Defines a process for synthesizing data from Adaptive Management studies and incorporating that information into decision-making to improve current phases and design future phases.

II. Adaptive Management Process – Design and Implementation of Adaptive Management Monitoring and Targeted Research (see diagram)

- **Describe background for Adaptive Management**
 - Clearly define the problem (San Francisco Bay habitat loss and related effects) and state the project goals
 - Summarize baseline/reference data that supports the performance criteria
 - Define performance standards (restoration targets) and measures (metrics)
 - Give the scientific basis for the performance standards and measures
- **Describe activities associated with monitoring to track restoration progress**
 - Give performance standards and measures for monitoring.
 - Describe monitoring methods, timelines, and responsible parties.
 - Describe how monitoring information will be checked for quality/peer reviewed
 - Explain how information will be fed into the Science Structure for interpretation and reporting to decision makers.
 - Describe monitoring that should occur in planning, Phase 1 and future phases.
- **Describe activities associated with targeted research**
 - Articulate the Conceptual Models and written descriptions showing the cause and effect linkages between restoration actions and the desired outcomes.
 - Identify key uncertainties in the Conceptual Models that are to be tested by Adaptive Management.
 - Develop hypotheses that will be tested by Adaptive Management experiments, including a clear understanding of how they will help narrow key uncertainties.
- **Describe process to develop and implement Adaptive Management monitoring and targeted experiments**
 - Describe how the Science Structure functions to develop, implement, interpret and disseminate Adaptive Management information.
 - Design monitoring to track progress toward performance standards and experiments that will answer each hypothesis.
 - Implement the Adaptive Management monitoring and experiments.
 - Quality Control review and analyze data from Adaptive Management monitoring and experiments.

- Describe process for Peer Review of results.
- Assess progress toward performance standards from monitoring information. Was the performance measure a feasible metric that gave an accurate measurement of the standard? Do results show change along a predicted ecological trajectory toward Project Objectives? If not, are there factors constraining or impacting the system? Or, is the system functioning well and should performance standards be changed? How should future monitoring be designed? What actions for current and future restoration phases should managers consider implementing based on this information?
- Assess Adaptive Management experiment. Did the experiment answer the question posed? Was the Conceptual Model confirmed, or does it need to be revised? Did we identify the correct link in the Conceptual Model but ask the wrong question (wrong hypothesis)? Did we design the right Adaptive Management experiment to answer the question?
- Describe process for evaluating and including exogenous and social factors into Adaptive Management applied studies and/or interpretation.

III. Incorporating New Information into Management Decisions

- **Define process for incorporating new understanding into management actions**
 - Describe how Adaptive Management information is generated, assessed and then moved forward to decision-makers.
 - Describe types of actions decision-makers may take based on the Adaptive Management information. For example:
 - Use new understanding to inform where to restore, when to restore, or how much to restore.
 - Revise plans for Phase 2 and future phases based on new information. This may include another iteration of alternative development.
 - Re-define the problem (e.g., enlarge geographic area), restate goals (e.g., previous goals may not be achievable), or evaluation criteria (e.g., we may be using wrong metrics in measuring progress toward goals).
- **Define process for decision makers and scientists to re-evaluate Project Objectives, Conceptual Models, and Adaptive Management monitoring and experiment design**
 - Describe how Adaptive Management information will be considered by decision-makers, including institutional framework among management agencies and regulatory agencies.
 - Describe stakeholder and public participation processes.
- **Define Logistical Requirements of Adaptive Management Studies**
 - Specify the funding, responsibilities and institutional arrangements to carry out the Adaptive Management Plan,
 - Identify Quality Control and Peer Review processes and structure.
 - Specify timeline for all activities.