Dredging and Waterway Modification

	Goals	Revised 2007
	Problem Statement	Revised 2007
	Existing Management Structure	Revised 2007
	Achievements	New 2007
	Regulatory Improvements	New 2007
	Challenges	New 2007
Objective DW-1	**Determine behavior and fate of sediments in the Estuary**	1993 CCMP
Action DW-1.1	Conduct sediment transport studies and research	Revised 2007
Action DW-1.2	Sediment studies in marshes & mudflats	Revised 2007
Action DW-1.3	Continue to adopt and improve sediment management policies	Revised 2007
Objective DW-2	**Determine bioavailability of contaminants released by dredging**	1993 CCMP
Action DW-2.1	Sediment effects on aquatic species	Revised 2007
Action DW-2.2	Sediment quality objectives	Revised 2007
Action DW-2.3	Assess amount of material suitable for reuse	New 2007
Action DW-2.4	Address sediment quality and contaminant issues on a regional scale	New 2007
Objective DW-3	**Develop a comprehensive regional dredging strategy**	1993 CCMP
Action DW-3.1	Dredged needs assessment	Revised 2007
Action DW-3.2	Dredged material reuse and disposal	Revised 2007
Action DW-3.3	Regulatory land use procedures	Revised 2007
Action DW-3.4	Aquatic & terrestrial resources affected by dredging	Revised 2007
Action DW-3.5	Dredged material reference sites	Revised 2007
Action DW-3.6	Remove derelict structures revised to include sunken vessels and piles	Revised 2007
Action DW-3.7	Continue to implement regulatory & management of dredging & disposal	Revised 2007
Action DW-3.8	Develop a system to standardize dredging permit conditions	New 2007
Action DW-3.9	In-place knockdowns as an alternative to dredging	New 2007
Objective DW-4	**Encourage use of dredged material for restoration projects**	1993 CCMP
Action DW-4.1	Identify dredged material disposal options: Who, What updated	Revised 2007
Action DW-4.2	Conduct modeling of saltwater intrusion impacts of dredging	Revised 2007
Action DW-4.3	Update guidance for dredged materials testing	Revised 2007

Objective DW-5	**Identify threats & benefits from future waterway modifications**	1993 CCMP
Action DW-5.1	Identify areas vulnerable to climate change and sea level rise	Revised 2007
Action DW-5.2	Implement waterway modification policies protecting shoreline areas	Revised 2007
Action DW-5.3	Acquisition of diked baylands as buffer areas must adapt to sea level rise	Revised 2007
Action DW-5.4	Conduct studies on impacts of proposed new waterway modifications	New 2007
Action DW-5.5	Identify impacts of waterway modification & evaluate mitigation options	New 2007
Action DW-5.6	Minimize vectors for non-native invasive species due to waterway modification	New 2007
Action DW-5.7	Study saltwater intrusion impacts caused by dredging projects	New 2007
Action DW-5.8	Encourage information sharing and usage within LTMS community	New 2007
Objective DW-6	**Develop LTMS for the Delta**	New 2007
Action DW-6.1	Continue to develop and implement Delta LTMS	New 2007

Dredging and Waterway Modification Goals:

- Eliminate unnecessary dredging activities.
- Maximize the beneficial reuse of dredged material.
- Conduct dredging activities in an environmentally sound fashion.
- Continue to develop and implement a comprehensive Sediment Management Strategy for dredging and waterway modification.
- Manage modification of waterways to avoid or offset the adverse impacts of dredging, flood control, channelization, and shoreline development and protection projects.

Problem Statement

Sediment management in San Francisco Bay has improved from the Gold Rush days of hydraulic mining and the more recent "Mudlock" period (when fishing boats and citizens concerned about degradation of Bay fisheries blocked the Alcatraz disposal site in the 1980s) with the creation and implementation of the multi-agency Long Term Management Strategy (LTMS) program. Increasingly, the process of governing how dredging and other waterway modification activities occur in the Estuary is more closely scrutinized and also more collaborative. However, given the major human-induced alterations to the physical character and biological resources of the Estuary that have already occurred and the myriad existing and future pressures on the system, a comprehensive approach to sediment management in the Estuary is increasingly important.

Sediment dynamics and processes in the Estuary have been drastically altered by human activities. Modification first began with hydraulic gold mining in the 1800s, which brought huge quantities of sediment into the Estuary, resulting in blocked waterways and increased storm flooding. From the late 1800s to the mid-1900s, most of the Estuary's historical tidal marshes were diked or filled to be used for agriculture, duck clubs, salt ponds, and urban development. These activities have reduced the tidally influenced area by sixty percent and caused most of the remaining slough channels to silt up. In recent decades, further changes to both the natural sediment regime and to the hydrologic patterns that transport sediment have occurred as a result of channelization, shoreline riprapping, and the construction of large-scale dams and flood control projects throughout the Estuary and its tributaries. Dredging and sand mining projects have also potentially contributed to changes in sediment movement and deposition.

Each year, an estimated 4,000 commercial ocean-going vessels[2] move through the Estuary carrying more than seventy-five million tons of cargo[3] worth approximately $20 to $25 billion.[4] These vessels depend on deepwater ports and shipping channels in the Bay and Delta, which must be dredged annually to maintain their navigability. The total volume of

[2] The Marine Exchange of the San Francisco Bay Region (http://www.sfmx.org).
[3] U.S. Army Corps of Engineers' Navigation Data Center -Waterborne Commerce Statistics Center Web site (http://www.iwr.usace.army.mil/ndc/wcsc/wcsc.htm). Volumes are based upon data from 2005.
[4] The Metropolitan Transportation Commission's *Regional Goods Movement Study for the San Francisco Bay Area: Final Summary Report*, December 2004 (http://www.mtc.ca.gov/planning/rgm/).

material dredged annually from channels, ports, and marinas in the Estuary has decreased from approximately eight million cubic yards (mcy) in 1993 to just over four million cubic yards as of 2006 (including the San Francisco Main Ship Channel outside the Golden Gate). Of the 19 mcy of one-time new work dredging that was anticipated in the 1993 CCMP, most projects have either been completed or put on hold. The Oakland Harbor Navigation Improvement Project (aka the 50 Foot Deepening Project) is currently in progress, and the Baldwin Ship Channel is still under consideration. Few anticipated projects remain that involve large volumes of new dredging work. However, there is an increasing demand for new work dredging and deepening in smaller marinas around the Bay Area as these facilities strive to accommodate deeper-draft boats.

Historically, dredged material from navigation channels has been disposed of at the various in-Bay disposal sites and was expected to disperse with currents and tidal action. In the 1980s, mounding at the region's primary disposal site, SF-11, near Alcatraz Island (see Figure 1), and increasing concerns regarding the impacts of dredging and dredged material disposal on the Bay's aquatic organisms, water quality, and other ecological resources, highlighted the need for improved management of and alternative disposal options for dredged material.

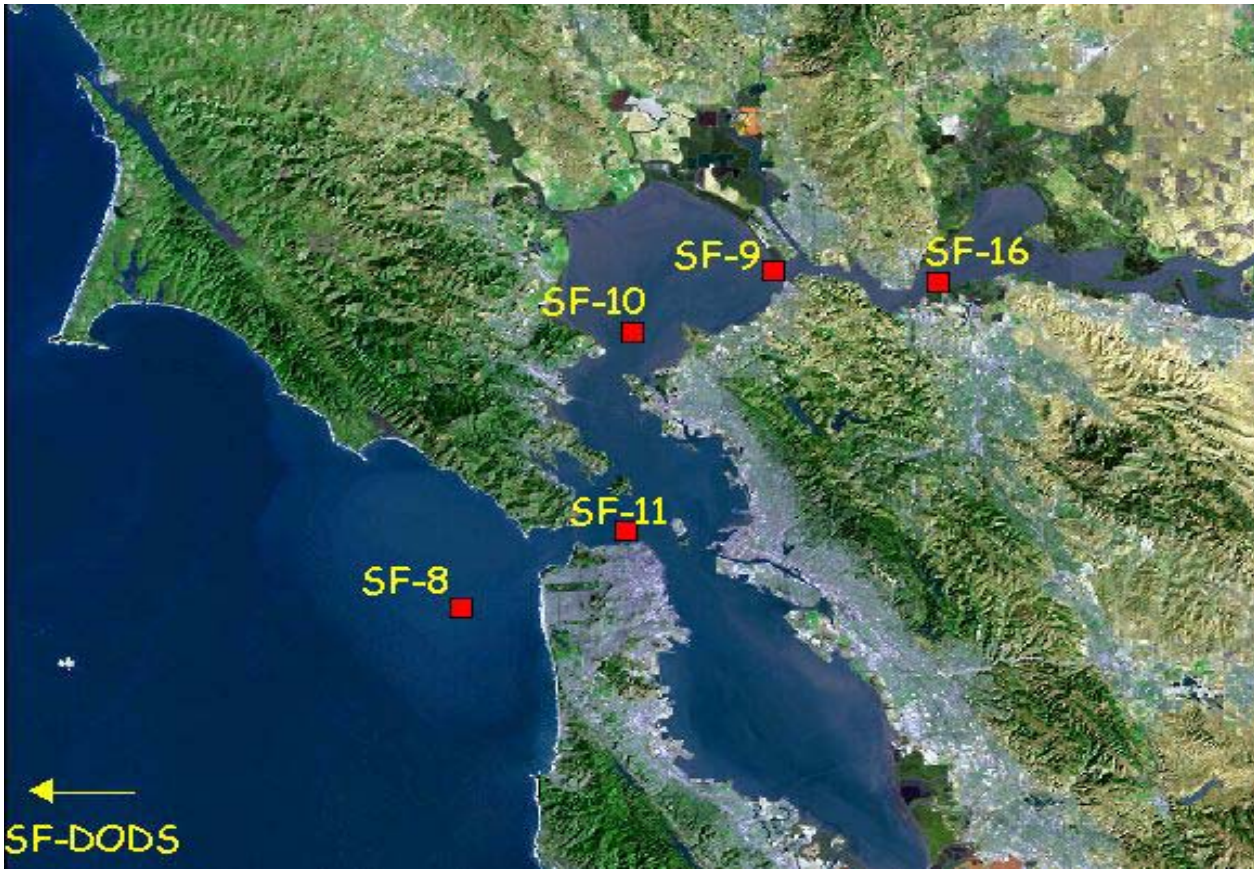

Figure 1. Designated dredged material disposal sites for the San Francisco Bay region.

Consequently, in the 1990s, the Bay regulatory agencies, resource agencies, and numerous stakeholders involved in Bay dredging and disposal developed the *Long Term Management Strategy (LTMS) for the Placement of Dredged Material in the San Francisco Bay Region* to

better manage dredging and dredged material disposal in the Bay. The LTMS process involved more than thirty different participants, including government agencies, environmental organizations, development interests, ports, and fishing organizations. The LTMS was led by an Executive Committee of the U.S. Army Corps of Engineers' South Pacific Division Commander, the U.S. Environmental Protection Agency's Regional Administrator, the Chairs of the San Francisco Bay Regional Water Quality Control Board and the San Francisco Bay Conservation and Development Commission, and a State Coordinator. This group was regularly advised on pertinent issues by the LTMS Policy Review Committee.

The LTMS established a new management approach with the goal of reducing in-Bay disposal by encouraging beneficial reuse of dredged materials whenever and wherever possible. In addition, the LTMS has worked with the U.S. Environmental Protection Agency to establish the federally authorized San Francisco Deep Ocean Disposal Site (SF-DODS) as another alternative to in-Bay disposal. Since 1993, the LTMS has coordinated with agencies and private entities alike to use approximately eight million cubic yards of dredged material in beneficial reuse projects, such as the Hamilton Wetlands Restoration Project, the Oakland Middle Harbor Enhancement Project, the Sonoma Baylands Restoration Project, the Montezuma Wetlands Restoration Project, and the Ocean Beach Demonstration Beach Nourishment Project, as well as a variety of levee rehabilitation projects.

The LTMS has also worked to increase its understanding of the impacts of dredging and disposal on Bay biota and habitat by implementing more effective testing protocols for dredged material, by funding ongoing technical studies, and by collaborating with the resources agencies in order to better regulate the timing and methods of dredging activities to protect Bay biota.

In 1998, LTMS agencies jointly prepared an environmental impact report/environmental impact statement to evaluate potential management strategies. In 1999, the LTMS was adopted in the federal Record of Decision (ROD) signed by the U.S. Army Corps of Engineers and the U.S. Environmental Protection Agency, and was subsequently included in the San Francisco Bay Regional Water Quality Control Board's Water Quality Control Plan (Basin Plan) amendments and the San Francisco Bay Conservation and Development Commission's San Francisco Bay Plan (Bay Plan). In 2001, agencies released the LTMS Management Plan, which presents an approach for the steady reduction of in-Bay disposal of dredged material from 2.8 mcy to approximately 1.25 mcy by 2012 (see Figure 2). A programmatic review of the LTMS occurs every three years, with each six-year review involving the consideration of policy amendments, if necessary, in order to ensure that the program is working effectively and that LTMS goals are being implemented. In addition, the LTMS Management Plan serves as a living document that is periodically updated to reflect emerging concerns and to guide the collective decision-making of LTMS agencies.

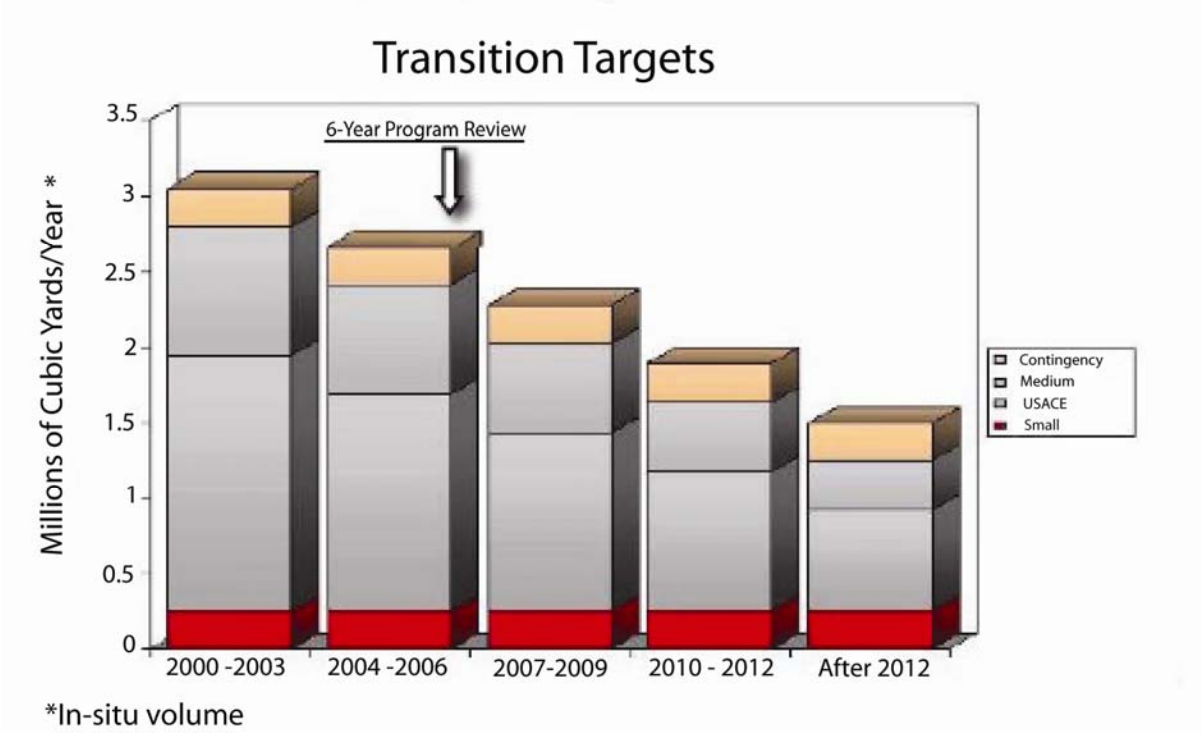

Figure 2: LTMS in-Bay disposal volume targets during the twelve-year Transition Period. Every three years, the annual disposal volume limit automatically decreases by 387,500 cy.

As of 2007, the LTMS continues to focus on increasing beneficial reuse of dredged materials. Despite the success of recent beneficial reuse projects in the Bay Area, there is a growing need to find ways to substantially increase the number of beneficial reuse opportunities, especially over the next five years as the LTMS endeavors to complete its goal of reducing in-Bay disposal to one million cubic yards per year. One of the biggest constraints to maximizing beneficial reuse is the need for adequate and reliable funding at the state and federal levels.

Another emerging issue is the potential for a sediment debt in the Estuary. Due to a variety of factors, such as increasing water diversions upstream of the Delta and morphologic and hydrologic alterations to the major tributaries and rivers that transport sediment into San Francisco Bay, the Estuary may be receiving decreasing volumes of sediment. Decreasing sediment inputs could impede wetland formation and increase erosion of existing habitats. Erosion of California's beaches (Ocean Beach in San Francisco, for example) is an ongoing issue, and the sources and sinks of Bay sands are poorly understood. Adequate sediment input into the Estuary will be increasingly important as the rate of sea level rise continues to accelerate, and storms become more intense. An adaptive, collaborative sediment management approach, such as the LTMS, that considers all aspects of Bay sediment dynamics is critical to addressing the impacts of global climate change and other human-induced changes in Bay sediment dynamics. The use of suitable dredged sediments in wetlands restoration projects and other appropriate strategies should be used to respond to a potential sediment deficit. LTMS agencies will continue to study sediment dynamics in the Estuary to better address these types of emerging issues.

Existing Management Structure

The U.S. Army Corps of Engineers (the Corps) is granted primary regulatory authority for protection of navigable waters in the United States. Three sections of federal legislation grant the Corps regulatory authority for proposed dredging and disposal activities. Under Section 404 of the Clean Water Act, the Corps regulates discharge of dredged material into inland and near-coastal waters of the United States. Under Section 10 of the Rivers and Harbors Act, the Corps regulates any dredging and disposal activities occurring in navigable waters. Section 103 of the Marine Protection Research and Sanctuaries Act (MPRSA) authorizes the Corps to regulate transport of dredged material for the purpose of disposal into ocean waters. The Corps evaluates proposals for dredging and disposal activities based on impacts to navigation, fish and wildlife, conservation, water quality, water supply, safety, aesthetics, and general public interest. The National Environmental Policy Act (NEPA) of 1969 and the California Environmental Quality Act (CEQA) of 1970 require environmental assessment of each permit application and the preparation of an environmental impact statement if the assessment indicates significant environmental impacts.

The Clean Water Act and the MPRSA also assign the U.S. Environmental Protection Agency (U.S. EPA) a major role in the management of dredged material. Section 102 of the MPRSA grants U.S. EPA authority to designate ocean disposal sites and cooperate with the Corps in the development of criteria for evaluation of environmental impacts of proposed disposal activities. Section 404 of the Clean Water Act requires U.S. EPA to perform similar functions in the regulation of dredging activities in estuaries and other inland waters. U.S. EPA, in cooperation with the Corps, has developed guidelines for the evaluation of the environmental impacts of dredged material discharges and has the responsibility of reviewing permit applications and providing comments to the Corps.

The State Water Resources Control Board and its nine Regional Water Quality Control Boards regulate water quality in California. Activities affecting water quality are evaluated by the State and Regional Boards. As part of the environmental review specified by the Clean Water Act, Section 401 requires state water quality agencies to verify that a dredged material discharge will not violate water quality standards.

The state McAteer-Petris Act (1965) created the San Francisco Bay Conservation and Development Commission and gave it permitting authority for dredging and filling activities in San Francisco Bay. The Commission reviews proposed activities to ensure compliance with the Bay Plan.

The California State Lands Commission administers public trust lands in coastal waters (within a three-mile state territorial limit) and other tidal and submerged areas. Written authorization from the State Lands Commission must be obtained prior to dredging or depositing dredged material on lands under its jurisdiction.

Various government agencies, including the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, the U.S. Coast Guard, the California Department of Fish and Game, and the California Coastal Commission, are involved in the review of dredging applications and provide comments to the permitting agencies. Under Section 7 of the federal Endangered Species Act, federal agencies such as the Corps are required to consult with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service on activities that

may adversely affect federally listed species and their habitat before issuing dredging permits. Similarly, Sections 2091 and 2081 of the California Endangered Species Act require state agencies to consult with the California Department of Fish and Game before permitting activities that may have adverse impacts on state listed species and their habitats. Local government agencies have jurisdiction over some types of dredged material disposal and beneficial reuse activities.

A 1996 amendment to the Magnuson-Stevens Act now requires the National Marine Fisheries Service and regional fishery management councils to minimize, to the extent practicable, adverse effects to Essential Fish Habitat (EFH) caused by fishing or dredging activities. The Act requires federal agencies such as the Corps to consult with the National Marine Fisheries Service about actions that could affect Essential Fish Habitat.

The LTMS Management Committee continues to manage implementation of the LTMS and maintains strong public involvement through the participation of interested parties and stakeholders at regularly held meetings and through several workgroups composed of LTMS stakeholders.

As part of the LTMS effort, the Dredged Material Management Office (DMMO) was created in 1995. It is a joint program of the San Francisco Bay Conservation and Development Commission, the San Francisco Bay Regional Water Quality Control Board, the California State Lands Commission, the U.S. Army Corps of Engineers, and the U.S. Environmental Protection Agency. Also participating are the California Department of Fish and Game, the National Marine Fisheries Service, and the U.S. Fish and Wildlife Service. The purpose of the Dredged Material Management Office is to make the dredging permitting process more efficient and less cumbersome for applicants and agencies alike. This is accomplished by: 1) joint review of project-specific sampling and analysis plans and review of the results of the sediment quality sampling, 2) joint review of suitability determinations for material proposed for disposal in San Francisco Bay (see Figure 2), and 3) allowing applicants to fill out one application form, which the agencies then jointly review at biweekly meetings before issuing their respective authorizations. The Dredged Material Management Office is also intended to increase efficiency and coordination between the member agencies and to foster a comprehensive and consolidated approach to handling dredged material management issues.

The LTMS is designed to develop technically feasible, economically prudent, and environmentally acceptable long-term solutions over the next fifty years. Ocean, in-Bay, and upland disposal sites will be evaluated, as will the potential for using clean dredged materials to create wetlands or restore levees.

Capitalizing on the valuable work of the LTMS, many of the dredging activities recommended in the 1993 CCMP's Dredging and Waterway Modification program were drawn from the LTMS workplan. In addition, activities to specifically address waterway modification were developed, such as shoreline protection and the acquisition of buffer areas. This program is intended to comprehensively address both dredging and waterway modification actions.

Achievements, 1993–2007

LTMS Goals

- Maintain in an economically sound manner those channels necessary for navigation in the San Francisco Bay and Estuary and eliminate unnecessary dredging.

- Conduct dredged material disposal in the most environmentally sound manner.

- Maximize the use of dredged material as a beneficial resource.

- Establish a cooperative permitting framework for dredging disposal and applications.

Since the initiation of the LTMS program, substantial progress has been made in implementing the LTMS and in meeting the program's overall goals. Allowable in-Bay disposal volumes have been reduced by more than fifty percent compared with pre-LTMS volumes, and actual in-Bay disposal in recent years has been about one-third of historical levels. In 1994, the San Francisco Deep Ocean Disposal Site (SF-DODS) was designated as an alternative to in-Bay disposal. The site is in waters nearly 10,000 feet deep and fifty-five miles off the coast of San Francisco, deeper and farther offshore than any other designated ocean disposal site in the country. To date, more than ten mcy of material have been successfully diverted to the site, and extensive annual monitoring indicates that there have been no significant adverse impacts at the site. Dredged sand has also been successfully diverted to the SF-8 disposal site for beach replenishment, immediately outside the Golden Gate in the city and county of San Francisco. In addition, since the inception of the LTMS program, new upland and wetland reuse projects have been approved, implemented, and/or expanded. As of March 2007, over nine mcy of material have been delivered to these beneficial reuse sites, which include:

- Hamilton Wetlands Restoration Project, Marin County—a 2,400-acre seasonal tidal wetland restoration project

- Sonoma Baylands Salt Marsh Restoration Project, Sonoma County—a 322-acre tidal wetland restoration project

- Montezuma Wetlands Project, Solano County—a 2,398-acre wetland and mixed habitat restoration project

- Winter Island Levee Rehabilitation Project, Contra Costa County—a levee rehabilitation project to protect approximately 450 acres of managed wetlands

- Sherman Island, Sacramento County—a levee rehabilitation project

- Oakland Middle Harbor Enhancement Project, Alameda County—an eelgrass sub-tidal habitat restoration project

- Ocean Beach Demonstration Beach Nourishment Project, San Francisco County—a beach restoration project designed to prevent coastal erosion

LTMS-Funded Scientific Studies
The LTMS continues to fund and implement scientific studies on dredging and disposal issues, including data gaps related to environmental work windows, mercury methylation potential and management, disposal plume tracking and modeling, effects of dredging plumes on herring eggs, and juvenile salmon distribution in the Estuary.

Regulatory Improvements
The interagency Dredged Material Management Office (DMMO) has successfully created more efficient regulatory procedures that have facilitated the processing of hundreds of dredging and disposal projects while still ensuring that LTMS targets are met and that federal and state permit requirements are implemented. The Dredged Material Management Office also posts electronic permit applications and guidance documents online, is developing a database for tracking project-specific data, and produces annual reports to evaluate program performance.

The LTMS has developed tools to help dredgers and contractors fulfill their permit requirements while also meeting LTMS disposal targets. The Integrated Alternatives Analysis (IAA) reduces paperwork and encourages planning for beneficial reuse of dredged material by evaluating a permittee's overall dredging program. The Small Dredger Programmatic Alternatives Analysis (SDPAA) reduces paperwork and costs for small dredging operations, and expedites the processing of permits without reducing environmental protection.

The LTMS program specifies Environmental Work Windows, which are those areas and times when dredging and disposal will have less potential impact on sensitive Bay fish and wildlife. Dredgers able to work within the work windows need not consult separately with the resource agencies. Prior to 2001, only about fifty percent of dredging work was being performed during work windows. But by 2003, eighty percent of dredging work was performed within the work windows, and the percentage has increased in the last few years, demonstrating the program's success. In 2005, the LTMS completed additional programmatic consultation with the U.S. Fish and Wildlife Service in order to clarify work windows. From 2006 to the present, additional programmatic consultation with the National Marine Fisheries Service has been in progress to clarify work windows further and to include the green sturgeon as a new federally listed species.

The U.S. Environmental Protection Agency and the U.S. Army Corps of Engineers issued the Inland Testing Manual for Dredged Material (ITM) in 1998 to provide comprehensive guidance to evaluate the potential for contaminant-related impacts associated with dredged material disposal into open water. Since 1998, the Dredged Material Management Office agencies have issued a number of public notices (PN99-3, PN01-01, etc.) to provide additional regional guidance.

Challenges, 2007–2017
Despite the significant progress that the LTMS has made in its coordinated and collaborative approach to sediment management since 1993, the next decade will bring emerging and ongoing challenges that will need to be addressed on a regional scale in order to continue to reduce in-Bay disposal, maximize beneficial reuse, and meet the LTMS targets.

One of the biggest constraints to maximizing beneficial reuse is the need for adequate and reliable funding at the state and federal levels. Decreasing dredging budgets and federal policies that favor open-water disposal are continuing problems. Improved state and federal policies and funding for beneficial reuse are needed. Achieving cost parity between the expense of beneficially reusing material versus disposing of it in-Bay would allow more dredgers (especially small dredgers) to participate in beneficial reuse projects.

Another challenge is the lack of disposal options for contaminated dredged materials. Rehandling sites are needed for the small but persistent volumes of dredged material that have elevated contaminant levels and cannot be used in the available reuse projects, nor disposed of at the open water disposal sites.

Lastly, understanding and managing human impacts to sediment sources, movement, and sinks in the Estuary is increasingly important in the face of global climate change and resultant sea level rise. As sea level continues to rise more rapidly as a result of global climate change, increased flooding and erosion and additional alterations to waterways and sediment processes are likely to occur. This is a particular concern when it comes to the Estuary's remaining wetlands and wetland restoration projects, both of which need adequate sediment supplies to adapt to sea level rise. Delta islands are especially vulnerable to catastrophic flooding because of land subsidence and the increased risk of levee failure.

Dredging and Waterway Modification Actions

Objective DW-1

Determine the behavior and fate of sediments in the Estuary and adopt policies to manage their modifications.

ACTION DW-1.1 (Revised 2007)

Conduct studies, research, modeling, and analysis of sediment processes and trends to more thoroughly understand sediment transport in San Francisco Bay, particularly in light of sea level rise and changing sediment inputs from the Delta and major tributaries.

Who: LTMS agencies, U.S. Geological Survey, California Coastal Conservancy, National Oceanic and Atmospheric Agency, California Ocean Protection Council, San Francisco Estuary Institute, academic researchers, and project proponents

What: To better understand the behavior and fate of sediments in the Estuary, the following activities were conducted as part of the LTMS workplan, or are proposed or ongoing by others:

- Identify and summarize quantitative models available for application in the Estuary and the current status and variety of existing numerical modeling. As necessary, conduct tracer studies to define the short- and long-term transport of suspended particles from estuarine disposal sites. (LTMS Phase II, Task 3, Work Element F) (Completed)

- Calculate an annual sediment budget for the period 1956 to 1990 and project next fifty years. Calculate the distribution of in-Bay deposits and loss to the ocean by difference between input and net accumulation. Obtain annual maintenance dredging volumes to

relate annual sediment supply to maintenance requirements. (LTMS Phase II, Task 3, Work Element F) (Ongoing)

- Conduct field and laboratory studies to characterize suspended and dt1>°sited sediment. Complete detailed hydrographic surveys of navigation and disposal areas for verification of sediment transport models. (LTMS Phase II, Task 3, Work Element F) (Completed)

- Measure sediment afflux and influx through the Golden Gate over time, including major import or export events, to determine suspended sediment losses. (LTMS Phase II, Task 3, Work Element F) (To be performed)

- Develop three-dimensional sediment transport models that could be incorporated into existing two-dimensional models. (LTMS Phase II, Task 3, Work Element F) (Ongoing)

- Map Estuary bathymetry and sediment types, such as the Ocean Protection Council's California State Waters Mapping Project and the U.S. Geological Survey's San Francisco Bay Project.

- Measure inputs from tributaries and exchange with the coastal ocean over time.

- Study sediment processes, particularly between tidal flats and wetlands.

- Encourage higher resolution geographic information systems (GIS) and other geospatial data collection efforts throughout the Bay to establish accurate baseline data for bathymetry, sediment composition, etc.

Further field studies and modeling efforts should be conducted to develop a more comprehensive knowledge base of sediment transport and deposition across the whole Estuary.

When: Ongoing

Cost: $$ (Multiple projects and studies)

Uncertainty: Highly uncertain—high-resolution mapping costs are probably higher and more variable than other research costs.

ACTION DW-1.2 (1993 CCMP)
Conduct studies on sediment changes aimed to define accumulation and erosion processes on beaches and in marsh and mudflat areas.

Who: U.S. Geological Survey (lead), LTMS agencies, National Marine Fisheries Service, California Coastal Conservancy, academic researchers, and project proponents

What: Study estuarine sediment dynamics with particular focus on processes acting in near-shore areas. Identify trends in accumulation and erosion of sediment and what management practices may be responsible for those trends. Also, pursue further research to determine potential impacts of large-scale sediment removal activities, both sand and muds, on

sediment processes in San Francisco Bay. Integrate these efforts with the LTMS and other sediment research efforts.

When: Ongoing

Cost: $$ (Projects and studies)

Uncertainty: Cost likely in the low millions range but is fairly uncertain and dependent on geographic range and data richness of all the studies

ACTION DW-1.3 (Revised 2007)
Continue to adopt and improve policies to manage modification of estuarine sediment production, movement, and deposition.

Who: Lead and responsible agencies under California Environmental Quality Act (CEQA) and National Environmental Policy Act (NEPA), i.e., U.S. Army Corps of Engineers, San Francisco Bay Regional Water Quality Control Board, San Francisco Bay Conservation and Development Commission, and the California State Lands Commission

What: Require applicants for waterway modification and sediment removal projects to avoid or minimize, where appropriate, project impacts on sediment production, movement, and deposition through development of erosion and sediment control plans and state and federal permits.

- Condition project approvals to avoid adverse impacts to estuarine sediment dynamics.

When: Ongoing

Cost: No direct costs

Objective DW-2
Determine the bioavailability of contaminants released by disposal of dredged material through methods such as bulk chemistry assays, toxicity bioassays, and bioaccumulation tests.

ACTION DW-2.1 (Revised 2007)
Conduct laboratory and field bioaccumulation investigations and studies on suspended sediment effects on sensitive life stages throughout the food chain.

Who: LTMS agencies, resource agencies, academic researchers, and project proponents

What: To better understand the effects of suspended sediment and bioaccumulation on aquatic species, the following activities were developed as part of the LTMS workplan:

- Prepare a detailed bioaccumulation study plan and conduct field investigations to produce a baseline bioaccumulation survey with conclusions about the levels of aquatic species contamination related to deposited and suspended sediment conditions. (LTMS Phase II, Task 3, Work Element G) (Completed)

- Conduct tests with pelagic eggs of fish species representative of those that spawn in San Francisco Bay. Eggs/embryos/larvae of other species representative of species that spawn in the Estuary might also be considered. (Ongoing)

- Document the distribution of suspended sediment in time and space from individual and multiple disposal activities in relation to long-term background concentrations of suspended sediments in the Central Bay. Hydraulically dredged sediment from hopper dredges and mechanically dredged sediment from barges will be monitored. All the data will be evaluated from a mass balance approach to assess the distribution of disposal-related suspended sediments and the role of disposal operations in the suspended sediment in the Central Bay. (LTMS Phase II, Task 3, Work Element G) (Ongoing)

- Develop a risk assessment model to determine the impacts of dredging and disposal activities on Essential Fish Habitat and species listed under the federal Endangered Species Act.

The LTMS is continuing to develop a list of studies to address similar topics for future research.

When: Ongoing

Cost: $ (Projects, studies)

Uncertainty: Fairly certain based on small number of studies needed

ACTION DW-2.2 (Revised 2007)
Develop and set sediment quality objectives.

Who: State Water Resources Control Board and LTMS agencies

What: Coordinate with the State Water Resources Control Board's required efforts to establish sediment quality objectives for enclosed bays and estuaries that define when test results are considered to be significant in predicting an adverse environmental effect.

When: In progress

Cost: $ (Staff time)

Uncertainty: Fairly uncertain due to unknown number of additional staff hours required

ACTION DW-2.3 (New 2007)
Use information on ambient concentrations of contaminants in San Francisco Bay sediments to help assess the amount of material suitable for beneficial reuse.

Who: LTMS agencies

What: Use the Dredged Material Management Office (DMMO) data on sediment results and coordinate with the Regional Monitoring Program for Water Quality and the San Francisco Bay Regional Water Quality Control Board's Toxic Hot Spot Cleanup Plan (Cleanup Plan) to effectively assess regional sediment quality and sediment concentrations for contaminants of concern throughout San Francisco Bay.

When: Ongoing

Cost: $ (Staff time)

Uncertainty: Fairly uncertain due to unknown number of additional staff hours needed

Performance Measures:
1) Percentage of the Bay that has been sampled and quantified for contaminant concentrations

2) Percentage increase in material used for beneficial reuse

ACTION DW-2.4 (New 2007)
Address sediment quality and contaminant issues on a regional scale.

Who: LTMS agencies and Central Valley Regional Water Quality Control Board

What: Use existing sediment quality data to assess the location of toxic hot spots throughout the Estuary and develop a plan to address them. Coordinate with the San Francisco Bay Regional Water Quality Control Board's and the Central Valley Regional Water Quality Control Board's Regional Toxic Hot Spot Cleanup Plans (Cleanup Plans) (created under the Bay Protection and Toxic Cleanup Program).

When: Ongoing

Cost: $ (Staff time, plan development)

Uncertainty: Fairly uncertain due to unknown number of hours needed

Performance Measures:
1) Number of hot spots that have been identified in the Estuary

2) Volume of contaminated sediments removed from these spots

Objective DW-3

Develop a comprehensive regional strategy to better manage dredging and waterway modification and ancillary activities.

ACTION DW-3.1 (Revised 2007)
Develop a dredge project needs assessment and, as necessary, a prioritization plan, including structural and nonstructural methods to minimize volume requirements.

Who: LTMS agencies and project proponents

What:

- Compile long-term dredging volume estimates for all federal projects, public and private ports, marinas, and harbors. Prioritize the disposal needs of each individual dredging project. ($25,000) (Completed)

- Identify alternative dredging practices, general design considerations, and potential new technologies (e.g., shallow draft transports) for new projects and recommend modifications for existing projects to reduce dredged material volumes. Require implementation of the dredging design modifications for all applicable projects through the Clean Water Act Section 404 permitting process. (LTMS Phase II, Task 3, Work Element C) ($22,000) (Completed for several U.S. Army Corps of Engineers' projects)

- Address issues related to maintaining authorized project depths while minimizing the need for dredging, resulting when isolated shoaling can cause ship draft restrictions soon after dredging is completed.

When: Ongoing

Cost: $ (Project, staff time)

Uncertainty: Highly uncertain since each project will vary in scale and amount of staff time needed

ACTION DW-3.2 (Revised 2007)
Identify dredged material reuse and non-aquatic disposal opportunities and constraints and develop funding mechanisms to enable reuse and non-aquatic disposal opportunities to occur.

Who: LTMS agencies and U.S. Congress

What: The following tasks were developed as part of the LTMS workplan:

- Complete a comprehensive inventory of geographic sites that are suitable for reuse and/or disposal alternatives. Include preliminary cost estimates for the range of sites, review existing state or federal bonds available for restoration projects, and identify monetary benefits and intrinsic value to the public of created habitats. Working with local agencies, constraints on potential reuse sites, such as laws, regulations, agency policies, engineering impediments, and environmental considerations, including contaminants, wetland impacts, endangered species, etc., will be evaluated. (LTMS Phase II, Task 2, Work Element B) ($5,200,000) (Completed)

- Document procedures necessary to evaluate acceptable material type, consistency, and contaminant levels for reuse projects; coordinate with regulatory and resource agencies to share information and achieve agreement(s). Estimate amount of material not acceptable for aquatic and unmanaged or unconstrained non-aquatic disposal. Identify potential benefits and impacts resulting from disposal on terrestrial, wetland, and aquatic

ecosystems. Plan and conduct field/laboratory experiments/demonstrations as needed to determine effectiveness and feasibility of dredged material reuse techniques. (LTMS Phase II, Task 3, Work Element D) ($790,000) (Completed)

- Develop site-specific conceptual reuse/non-aquatic disposal plans. Provide preliminary engineering, with cost estimates, for site improvements, unloading facilities, transportation improvements, site preparation, and maintenance. Develop "value-added" guidelines to determine intrinsic value to the public of restored or created wetlands. Develop "capitalization" programs for dredge material reuse projects, such as federal or state bonds to pay for reuse projects. (LTMS Phase II, Task 3, Work Element E) ($500,000) (Completed)

- The U.S. Congress should continue to authorize and appropriate funding for the U.S. Army Corps of Engineers to implement upland disposal and reuse sites within the Estuary. In addition, incentives should be developed for private disposal and wetland restoration opportunities. (Ongoing)

The LTMS will continue to increase capacity for and practicability of beneficial reuse and will work to identify opportunities and overcome constraints in order to maximize the potential for beneficial reuse of dredged materials.

When: Ongoing

Cost: $ (Program and policy implementation)

Uncertainty: Highly uncertain since dependent on Congressional participation, and the scale and number of potential beneficial reuse projects is variable

ACTION DW-3.3 (Revised 2007)
Develop land use procedures to promote reuse of dredged material, wetlands restoration and/or creation, and other beneficial uses.

Who: LTMS agencies, local land use agencies, and regulatory agencies

What: Evaluate state, regional, and local land use agencies' long-term plans with respect to promoting the beneficial reuse of dredged material for projects such as wetlands restoration/creation. Make recommendations to local land use agencies for procedures to promote the beneficial reuse of dredged material while avoiding or mitigating for impacts to existing natural resources. Follow up with active effort to obtain adoption of recommended procedures by local agencies.

When: Ongoing

Cost: $$ (Policy action, staff time)

Uncertainty: Highly uncertain due to unknown number of hours and unknown number of land use agencies to participate

ACTION DW-3.4 (Revised 2007)
Identify the aquatic and terrestrial resources that are affected by dredging and disposal and are to be protected in the Bay and Delta. (See Aquatic Resources Action AR-4.10.)

Who: LTMS agencies

What: Establish and document existing resources and beneficial uses to be protected. Document health and distribution of resources to be protected. Conduct a two-day intensive workshop on the impacts to resources and beneficial uses caused by dredging. Document effects of dredged material disposal on resources of concern. (LTMS Phase II, Task 2, Work Element A) ($50,000) (Completed)

The LTMS will continue to support scientific studies on the potential impacts of dredging and disposal on aquatic and terrestrial resources. In addition, the LTMS agencies will coordinate with regional efforts such as the Subtidal Habitat Goals Project.

When: Ongoing

Cost: $$ (Policy action, staff time)

Uncertainty: Fairly uncertain due to unknown number of studies required

ACTION DW-3.5 (Revised 2007)
Identify appropriate dredged material reference sites for use in development of sediment testing protocols.

Who: LTMS agencies

What: The LTMS and the U.S. Environmental Protection Agency have developed databases to store sediment quality data for the Alcatraz Disposal Site (SF-11) and the San Francisco Deep Ocean Disposal Site (SF-DODS). The LTMS will continue to increase its data-gathering potential in order to further refine sediment testing protocols.

When: Ongoing

Cost: $ (Staff time)

Uncertainty: Fairly uncertain since unknown whether extraordinary costs and staff time will be needed to increase data-gathering efforts

ACTION DW-3.6 (Revised 2007)
Evaluate retention and removal needs for derelict structures in the Bay and Delta, especially abandoned and sunken vessels and dilapidated pile-supported structures.

Who: U.S. Army Corps of Engineers and San Francisco Bay Conservation and Development Commission

What: Various derelict structures along the shoreline are affecting sediment transport and local navigation. A comprehensive inventory should be completed to assess the feasibility of removing these structures on a case-by-case basis.

When: Ongoing

Cost: $ (Policy action, project implementation/mitigation)

Uncertainty: Fairly certain

ACTION DW-3.7 (1993 CCMP)
Continue to implement and, as needed, develop new regulatory and management policies for Estuary sediment removal and placement projects and only allow projects that are consistent with the state's existing policies in the San Francisco Bay Plan and in the San Francisco Bay and Central Valley Basin Plans.

Who: Estuary regulatory, planning, and resource agencies and dredging project sponsors

What: Local, state, and federal agencies should modify their policies regarding dredging activities as needed to ensure that they are consistent with the policies of the San Francisco Bay Conservation and Development Commission's San Francisco Bay Plan and the respective Basin Plans of the San Francisco Bay and Central Valley Regional Water Quality Control Boards. Ports and other dredging sponsors should plan and conduct dredging activities consistent with the state's dredging policies.

When: Ongoing

Cost: No direct cost

ACTION DW-3.8 (New 2007)
Standardize and consolidate the procedural aspects of dredging permit conditions, where possible, among the relevant agencies.

Who: LTMS agencies

What: Permit conditions in each of the regulatory agencies' permits often overlap (e.g., sampling efforts, monitoring, times of the year that they can work, reporting requirements, etc.) and can differ in their procedural aspects (e.g., dates to submit monitoring reports, post-dredge survey formats, etc.). Complete LTMS-funded study to assess and catalog required permit conditions for each of the regulatory agencies, identify overlapping and/or conflicting procedural aspects of these permit conditions, and develop coordinated permit conditions. Then, LTMS agencies should identify how they will use these consolidated permit conditions in the issuance of their respective permits.

When: In progress

Cost: $ (Project, staff time)

Uncertainty: Fairly certain since project is underway

Performance Measures:
1) Percentage of permits and percentage of total volume of removed material that have been authorized under this system

2) Number of guidance documents developed to facilitate implementing standardized conditions

ACTION DW-3.9 (New 2007)
Continue to identify and evaluate when and how in-place knockdowns should be used as an alternative to dredging.

Who: LTMS agencies

What: A knockdown is an activity involving the leveling or spreading of shoaled or mounded material in order to maintain a waterway rather than directly removing material from that waterway. Differentiate between in-place knockdowns and dredging activities, and develop better protocols for when knockdowns may be appropriate to use. Additionally, identify the potential impacts of in-place knockdowns on habitat and aquatic resources and compare to the potential impacts of regular dredging activities.

When: Ongoing

Cost: $ (Studies, policy action)

Uncertainty: Fairly certain due to known range of studies to be conducted to evaluate this issue

Performance Measures:
1) Number of studies conducted on the potential impacts of knockdowns (Output)

2) Number of projects that evaluated knockdown and dredging alternatives to determine the option with the least environmental impact

Objective DW-4

Encourage, support, and implement the beneficial reuse of dredged material for projects such as wetlands creation/restoration, levee rehabilitation, landfill cover, and upland building material where environmentally acceptable.

ACTION DW-4.1 (Revised 2007)
Continue to implement the LTMS goal to maximize the use of dredged material as a beneficial resource.

Who: LTMS agencies

What:

- List all available disposal options (see Aquatic Habitat Institute and Phillip Williams & Associates Ltd., 1990 "Status and Trends Report on Dredging and Waterway Modification") and document studies performed to date that are specific to each option and the Estuary disposal requirement. Identify disposal options feasible for the Estuary together with potential disposal capacity, and document unfeasible options. (LTMS Phase II, Task 1, Work Element A) ($25,000) (Completed)

- Prepare cost estimates to a preliminary level (plus or minus twenty-five percent) for the dredging/disposal combinations under consideration. Develop a cost-estimating model covering the mobilization, excavation, hauling, disposal, and monitoring costs for the main dredging/disposal techniques under consideration. Develop methods for capitalization of costs considering funding by ports versus other methods, such as federal or state bonds. (LTMS Phase II, Task 3, Work Element B) ($18,000) (Completed)

- Summarize disposal options identified from previous actions. Categorize specific disposal options into management options and develop evaluation criteria. Criteria should consider environmental, engineering/economic, and institutional/regulatory factors. (LTMS Phase II, Task 4, Work Elements A and B) ($20,000) (Completed)

- Select dredged material disposal options. Evaluate alternative dredged material disposal approaches based on engineering, economic, and environmental criteria. Select the most practicable dredged material disposal option or options and provide the necessary documentation needed to support this selection. Develop site-specific management plans for the selected options, including site environmental and capacity monitoring, permit requirements, mitigation plans, operation procedures, guidance for site use, and delineation of site management responsibilities. (LTMS Phase III, Tasks 1, 2, and 3) (Completed)

- Develop implementation component for dredged material disposal plan. The implementation plan should include administrative, procedural, management, and monitoring requirements; environmental documentation for the life of the plan; long-term water quality certification, site-specific and regional permits and authorization; formalized regional mitigation strategies; and implementation of site management requirements. (LTMS Phase IV) (Completed)

- Periodically re-evaluate the selected dredged material disposal plan based on changing regulatory, economic, environmental, and technological conditions. This review is to assure that decision-makers will maintain a viable implementation strategy that reflects changing conditions throughout the fifty-year implementation timeframe. (LTMS Phase V) (Completed)

- Continue to support new beneficial reuse options and identify potential beneficial reuse sites throughout the Bay Area (e.g., South Bay Salt Pond Project levees), including cost estimates and alternative disposal methods. Conduct periodic review as necessary.

- Continue to implement the LTMS transition to reduced in-Bay disposal and increased beneficial reuse in the Bay Area, and develop a tracking system to determine whether or not these goals are being met.

- Identify funding opportunities and constraints for potential beneficial reuse projects.

- Provide adequate funding for beneficial reuse at a regional and national level and amend policies that constrain beneficial reuse.

- Monitor wetlands where dredged material has been beneficially reused to assess project impacts and habitat functionality (e.g., sedimentation rates, success of native plant colonization, methylmercury creation, etc.). (See Wetlands Management Action WT-5.2.)

When: Ongoing

Cost: $$ (Program implementation, monitoring)

Uncertainty: Highly uncertain due to unknown cost of monitoring, unknown number of beneficial projects, and unknown funding sources and amounts

Performance Measures:
1) Volume of sediment used in beneficial reuse projects on an annual basis (Output)

2) Number of new active beneficial reuse sites annually (Output)

ACTION DW-4.2 (Revised 2007)
Maintain and improve local guidance and implementation for testing that is consistent with the federal* Inland Testing Manual *and the* Ecological Evaluation for Dredged Material Proposed for Ocean Disposal in the Marine Environment *(aka the "Ocean Testing Manual" or the "Green Book") and continue to refine testing procedures and protocols for beneficial reuse and upland environments.

Who: U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, San Francisco Bay Regional Water Quality Control Board, San Francisco Bay Conservation and Development Commission, and California State Lands Commission

What: The LTMS and Dredged Material Management Office (DMMO) agencies should continue to issue public notices and other documents when necessary to provide guidance and updates on testing protocols and procedures for both open-water disposal and beneficial reuse of dredged material.

When: Ongoing

Cost: No direct cost

ACTION DW-4.3 (Revised 2007)
Continue to implement sand replenishment projects like the U.S. Army Corps of Engineers' Ocean Beach Demonstration Beach Nourishment Project.

Who: U.S. Army Corps of Engineers and U.S. Environmental Protection Agency

What: The U.S. Army Corps of Engineers' Ocean Beach Demonstration Beach Nourishment Project has been achieving successful implementation since 2005. There is an increasing threat of coastal and estuarine erosion due to increasing storm events and sea level rise, and management actions should be taken to address this threat.

- Implement more beach and sediment nourishment projects around the Bay Area to prevent massive sediment loss from important habitat. Both short-term pilot projects and ongoing programmatic projects should be pursued depending on the severity of the erosion issue and the success of the initial management action.

- Investigate the relationship between sand extraction and the potential for impacts on beach erosion.

When: Ongoing

Cost: $ (Project development and implementation)

Uncertainty: Uncertain due to unknown number of potential projects and unknown volume of material to be placed

Performance Measures:
1) Number of site(s) that have been designated

2) Number of cubic yards of material that are reused at the site(s) annually

Objective DW-5

Identify threats to and benefits for Estuary resources from future modifications to waterways.

ACTION DW-5.1 (Revised 2007)

Determine areas subject to flooding and erosion and identify causes. In particular, identify those areas most vulnerable to the effects of global climate change and sea level rise, evaluate the potential impacts, and identify potential management measures for these areas.

Who: U.S. Geological Survey and local governments for local subsidence; U.S. Environmental Protection Agency for global changes

What:

- Submit a report that identifies areas subject to extreme wave events.

- Determine relative sea level change by: 1) quantifying local elevation changes along the shoreline; and 2) determining the most supportable estimate for change in global sea level.

- Identify buffer areas to accommodate coastal flooding.

- Identify management measures to minimize coastal erosion.

When: Ongoing

Cost: Unknown

ACTION DW-5.2 (Revised 2007)
Implement waterway modification policies that protect shoreline areas from detrimental flooding and erosion while maintaining natural resource values and while anticipating the potential effects of global climate change and sea level rise.

Who: U.S. Army Corps of Engineers, Federal Emergency Management Agency, California Department of Water Resources, San Francisco Bay Conservation and Development Commission, Delta regulatory agencies, and local governments

What: Adopt enforceable policies that require preservation, where possible, of upland areas to: 1) provide adequate floodplain buffers and/or transition habitat zones; or 2) allow space to build or enlarge protective levees or other flood control structures; or 3) allow adequate space for marsh transgression and migration as a result of sea level rise. These policies may be enacted through local zoning, the U.S. Army Corps of Engineers, the Federal Emergency Management Agency, and the California Department of Water Resources.

When: Ongoing

Cost: $$ (Staff time, policy action)

Uncertainty: Highly uncertain due to unknown extent of increased flooding and rate of sea level rise

ACTION DW-5.3 (1993 CCMP)
Establish a program to acquire diked historic baylands listed as buffer areas for coastal flooding and to adapt to sea level rise. (See Wetlands Management Action WT-4.1.)

Who: California State Legislature, California Coastal Conservancy, land trusts, California State Lands Commission, San Francisco Bay Joint Venture, and private foundations

What: Bond and mitigation funds should be provided to purchase diked baylands that can serve as buffer areas for rising sea level or that could be used to mitigate for erosion of tidal marsh.

When: Ongoing

Cost: $$$ (Land acquisition, program development, and implementation)

Uncertainty: Highly uncertain due to unknown amount of land acquisition

ACTION DW-5.4 (New 2007)
Conduct studies and research as necessary to address the potential impacts of new waterway modifications (e.g., wave, tidal, and subtidal power generation facilities; Aquatic Transfer Facility; wind power generation facilities; liquid natural gas extraction; etc.) on the Estuary and evaluate potential avoidance and mitigation measures.

Who: Project proponents and permitting agencies

What: Evaluate project proposals involving new waterway modifications as needed in order to address the potential impacts they may have on aquatic organisms, habitat, sediment dynamics, and water quality. Develop appropriate management measures to eliminate or mitigate for these impacts.

When: Ongoing

Cost: $$ (Project)

Uncertainty: Highly uncertain

Performance Measures:
1) Number of studies conducted for each proposed activity

2) Number of impact avoidance and mitigation measures that have been proposed or implemented

ACTION DW-5.5 (New 2007)
Evaluate potential cross-media impacts of dredging and waterway modification activities and evaluate mitigation options.

Who: LTMS agencies, other appropriate agencies, and project proponents

What: Consider potential cross-media impacts when evaluating projects and work with project proponents to assess mitigation options to offset impacts as appropriate.

When: Ongoing

Cost: $ (Policy action, staff time)

Uncertainty: Highly uncertain due to difficulty of quantifying and mitigating cross-media impacts

Performance Measures:
1) Percentage of projects that have identified and quantified cross-media impacts

2) Percentage of projects that have established and implemented mitigation measures to address cross-media impacts

ACTION DW-5.6 (New 2007)
Identify and minimize potential vectors for the spread of non-native invasive species due to dredging and waterway modification activities. (See Wetlands Management Action WT-4.2.)

Who: LTMS agencies, San Francisco Estuary Institute, academic researchers, and project proponents

What: Disturbance of sediments and habitat due to dredging and waterway modification activities may create a potential for the proliferation of non-native invasive species. The transportation, disposal, or beneficial reuse of dredged material may also contribute to the colonization of non-native invasive species. Applicants and project proponents should be required to evaluate these potential impacts, and management measures should be developed to address them when appropriate.

When: Ongoing

Cost: $ (Policy action, staff time)

Uncertainty: Fairly uncertain since number of staff hours required is unknown

Performance Measures:
1) Percentage of projects that have assessed the potential vectors for non-native invasive species spread or colonization

2) Percentage of projects incorporating documented management measures to prevent the establishment or spread of non-native invasive species.

ACTION DW-5.7 (1993 CCMP)
Conduct modeling and field studies to determine the saltwater intrusion impacts caused by dredging projects.

Who: U.S. Army Corps of Engineers and project proponents

What: Conduct modeling and field studies to determine saltwater intrusion impacts caused by dredging projects. Based on the results of the studies, manage dredging projects to minimize the impacts caused by saltwater intrusion. Require project expansions and future projects to mitigate for significant saltwater intrusion impacts as identified during the California Environmental Quality Act (CEQA)/National Environmental Policy Act (NEPA) process.

When: Ongoing

Cost: $ (Studies)

Uncertainty: Fairly certain due to small number of studies and minimal staff time needed

ACTION DW-5.8 (New 2007)
Encourage greater collaboration on scientific research projects and sharing of data and results within the LTMS community and use these findings to inform the decision-making process.

Who: LTMS agencies, academic researchers, San Francisco Estuary Institute, private researchers, and the California Coastal Conservancy

What: Conduct an annual Scientific Research Symposium to present the results of LTMS-funded and LTMS-related scientific studies. The symposium should contribute to the LTMS program review by:

- Evaluating progress toward identifying and implementing beneficial reuse sites.
- Using new data to improve management of dredged material.
- Identifying potential topics for further research, and funding constraints and opportunities for more technical studies.

When: Ongoing

Cost: $ (Staff time, project implementation)

Uncertainty: Fairly certain

Performance Measures:
1) Frequency of the symposium

2) Number of representatives from agencies, environmental research institutes/universities, and stakeholder groups who regularly attend the symposium

3) Percentage of emerging policy/regulatory issues for which data collection and analysis was conducted and completed

Objective DW-6 (New 2007)
Develop a strategy to better understand sediment management, dredging, and waterway modification in the Delta.

ACTION DW-6.1 (New 2007)
Continue to develop, fund, and implement the Delta Long Term Management Strategy (Delta LTMS) program.

Who: U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, Delta regulatory agencies, and stakeholders

What: The San Francisco Bay LTMS does not include the Sacramento-San Joaquin Delta. The Delta is an important source of sediment supply to the Bay, and efforts are underway to formulate a strategy for managing and restoring the Delta. Changes in Delta management

could have large impacts on Bay sediment supply. There has been great interest in implementing an LTMS for the Delta. Currently in its formative stages, a Delta LTMS will be critical to both working to understand potential changes in sediment supply to the Estuary and in developing sediment management policies and goals for the region.

When: In progress

Cost: $$$ (Program development and implementation)

Uncertainty: Highly uncertain due to unknown scale of program, number of agencies involved, etc.

Performance Measures:
1) Number of agencies and stakeholders participating in the Delta LTMS (Output)

2) Number of policy documents (environmental impact statements/environmental impact report, management plan, etc.) developed to support and guide the Delta LTMS program (Output)