



5.1 INTRODUCTION

What is Monitoring?

According to the National Oceanic and Atmospheric Administration (1979), monitoring is defined as the:

“...continued systematic time-series observation of predetermined pollutants or pertinent components of the ecosystem over a period of time sufficient to determine 1) the existing levels, 2) trends, and 3) natural variations of measured components.”

The MBNEP CCMP and companion documents address all three of the items stated in NOAA’s monitoring definition above. Volume II of the CCMP includes the Characterization that summarizes existing levels and trends, whereas the MBNEP Environmental Monitoring Plan (EMP) will describe measuring future trends and “natural variations of measured components.”

Overview

The National Estuary Program (NEP), established in 1987 under Section 320 of the Clean Water Act, was created to address long term planning and management in nationally significant estuaries that are impacted by human activities. A CCMP is developed by each designated NEP, outlining the strategy for action by the community. The Clean Water Act also requires the effectiveness of implemented actions to be tracked by programmatic and environmental monitoring.

Efforts to monitor the Morro Bay estuary and watershed are essential components to the success of the implementation strategy of the MBNEP as well as tracking the health of the ecosystem. These two different aspects of monitoring used in the EMP are *programmatic and environmental monitoring*. Monitoring provides the community as well as resource and land managers a mechanism to assess the performance of actions taken and to reevaluate the effectiveness of existing strategies. Feedback of interpreted monitoring data creates more informed management decisions that may lead to revisions or new management strategies. Data collected to answer new management needs can then be reduced and analyzed, so that predictive models can be developed and management options are created and implemented. Programmatic monitoring is detailed further in Chapter 6 of this document and in Volume II: The Environmental Monitoring Plan.

To better understand how programmatic and environmental monitoring fit together while assessing the performance of the CCMP as well as the health of the ecosystem, please reference Figure 5.1 (which is modified from the Galveston Bay NEP). Programmatic monitoring is the initial driver, as the action plan, such as a urban stormwater runoff plan, must have targets and goals to recognize success. Once targets are established and the plan is implemented, then the community responds according, following critical measures to lessen pollutant loads in storm water runoff. From the community’s action, changes are reported in pollutant discharge to the estuary. To understand the changes made by the stormwater runoff plan, assessments must be made by recording environmental change in the field. Long-term environmental monitors then can record not only changes in ambient conditions, such as water quality, but the effects of those conditions to the function of the entire ecosystem.

Both programmatic and environmental monitoring data will be available to the public, MBNEP participants, and others through the internet. Annual assessments on the health of the estuary and progress on implementing the CCMP will be available and distributed from the MBNEP office.



Chapter 5



5.2 GUIDING PRINCIPALS

Primarily, the objective of the EMP is to assess implementation of the MBNEP CCMP. To achieve this goal, the EMP will provide strategy on how to provide critical long-term data to assess changing ambient trends in the estuary. The various principals which have guided the framework of this strategy are listed below.

1. Measure the status of actions

This principal is the basis for the EMP. An Implementation Tracking System (ITS), indicating *action summary, percentage complete, and identified roadblocks to implementation*, will be the consolidation of all action monitoring data, and will be available to the public through the MBNEP website, as well as at the central office location. Further information of the ITS system can be found in Chapter 12: Information Tracking System, of Volume II: The Environmental Monitoring Plan.

2. Characterize trends

All data resulting from programmatic tracking as well as direct environmental sampling efforts will be tested for meaningful correlations to better refine management strategy and decisions. Further information on past trends can be found in Volume II of the MBNEP CCMP: The Characterization.

3. Integrate ongoing efforts

To avoid duplication, reduce overlap and minimize costs, existing efforts are the basis of the EMP. Where essential monitoring gaps have been identified, efforts have been made to work with existing agencies and/or organizations to provide need information. Detailed information regarding ongoing monitoring efforts can be referenced in Chapter 3: Current Monitoring in Morro Bay, of Volume II: The Environmental Monitoring Plan.

4. Utilize bioindicators

Monitoring of all variables in an ecosystem to assess change and overall health is not feasible. Therefore it is valuable to utilize indicators to evaluate specific resource quality to reduce costs and assessment time. The EMP will make use of various bioindicators, depending on habitat, possible stressor, and timeframe in question. Further information on bioindicators that will be utilized can be found in Chapter 10: Habitat Health of Volume II: The Environmental Monitoring Plan.

5. Utilize stakeholder-based Technical Advisory Committee (TAC)

Success of the EMP is based upon integrated efforts throughout the Morro Bay estuary and watershed. Without constant feedback of monitoring status, exchange of data, and refinements in the monitoring strategy, success will not be measure. To carry out these functions, it is necessary a stakeholder-based TAC be convened on a quarterly basis. For more information on roles and timelines of this TAC, please refer to page 5-22 of this chapter.

6. Utilize CCAMP data management strategy

Management of such a wealth of information requires a centralized data management strategy. Such a database exists, CCAMP (of the CCRWQCB), which will house data and metadata for all programs. This database and selected analytic tools will be available on the Internet as well as linked to the MBNEP website. Individual programs can input data directly into the CCAMP software to facilitate quarterly data reviews and annual reports. The analyses from this database will provide feedback to the MBNEP to evaluate action effectiveness and long-term trends. Further information of CCAMP can be found in Chapter 12: Information Tracking System, of Volume II: The Environmental Monitoring Plan.



A 10-year Integrated Regional Plan

The MBNEP CCMP calls for implementation of its Action Plans within five years. In order to evaluate actions based on a five-year time period, the Environmental Monitoring Plan (EMP) is envisioned as a ten-year effort at minimum. Where geographic information on priority problems is sparse, pre-implementation data will be continually gathered to establish baseline, (up to three years into the Implementation period, depending on sample size). Tracking will continue during the active implementation period (tentatively five years to assess apparent trends) and then continue for succeeding years to gather statistically significantly sample size and assess lasting effects of implemented CCMP actions. In order to reduce overlap and fill in monitoring gaps, the EMP will assist in coordinating various organizations and agencies to not only evaluate the Comprehensive Conservation Management Plan (CCMP) overall, but give a fuller ecological picture of the Morro Bay watershed and its estuary.

As the Morro Bay watershed is a part of the Central Coast Ambient Monitoring Program (CCAMP), it is the intention of the EMP to integrate data into a larger, regional monitoring framework. This region ranges from Santa Cruz south to Ventura, and the Salinas basin to the east. With consistent protocols and parameters measured region wide, Morro Bay can contribute an intensive data source for other watersheds to draw upon as they build their comprehensive monitoring programs. Data comparisons available in a region-wide program are invaluable to assessing the overall health of the Morro Bay watershed in a biogeographical context.

5.3 MONITORING GOALS AND OBJECTIVES

The MBNEP Environmental Monitoring Plan is based upon the following goal and eight objectives that are consistent with overall program goals. The objectives listed are in reference to evaluation and research needs of the CCMP. These public concerns, targets and method of measurement are described in Volume II: The Environmental Monitoring Plan, Project Management Chapters 5-13. Further information on targets can be found in the CCRWQCB Basin Plan and in CCRWQCB's Technical TMDL's for Morro Bay watershed.

GOAL: **Track the implementation of CCMP actions and monitor the health of the Morro Bay ecosystem.**

In addition to identifying priority problems, the Management Conference began formulating objectives for the program. The topics each objective was identified under, i.e. geomorphological, human use, etc., are used as the basis of organization for Project Management Chapters 5-13 of Volume II: Environmental Monitoring Plan. An additional topic was added in 1999, Data Tracking and Management, which is outlined in Chapter 13 of this document. The objectives are categorized as follows:

Geomorphological:

- ✓ **Slow sedimentation by implementing management measures that address erosion and sediment transport.**
 - Sustain no net loss of existing wetlands (baseline 2001 Wetland Delineation).
Related CCMP Action Plan: All HAB, CC-1, All SED
 - Reduction of average annual suspended loads sediment by 15% by 2010 in stream and estuary waters, as to comply with water quality standards (waters should not contain suspended material in concentrations that cause nuisance or adversely effect beneficial uses, as stated in the CCRWQCB Basin Plan) and will comply with Sediment TMDL's set forth by the CCRWQCB in 2001.
Related CCMP Action Plan: CC-3, All SED
 - Waters should not contain settleable material in concentrations that result in deposition that causes nuisance or adversely affects beneficial uses, as depicted by bay bathymetry and wetland



- acreage assessments (as stated in the CCRWQCB Basin Plan) and will comply with Sediment TMDL's set forth by the CCRWQCB in 2001.
- Related CCMP Action Plan: CC-3, All SED
 - One hundred percent of publicly owned creeks will be fenced (conducive to wildlife access) and revegetated by year 2010.
Related CCMP Action Plan: CC-3, BACT-1, SED-4, 5, EDU-1
 - No net increase in mudflat geographic acreage, relative to past 10 years baseline (as stated in the CCRWQCB Basin Plan) and will comply with Sediment TMDL's set forth by the CCRWQCB in 2001.
Related CCMP Action Plan: CC-3, All SED

Human Use:

- ✓ **Ensure that bay water remains of sufficient quality to support a viable commercial shellfish industry, and safe recreational uses.**
 - Levels of bacteria will comply with Department of Health Services, CCRWQCB, and County Environmental Health standards for beneficial uses including shellfish harvesting and water contact recreation at all times. These measurable standards are listed in detail in Volume II: The Environmental Monitoring Plan.
Related CCMP Action Plan: ALL BACT, CC-3
 - For those waters with drinking water as a beneficial use, bacterial and other pollutant levels must comply with drinking water standards (as stated in the CCRWQCB Basin Plan).
Related CCMP Action Plan: ALL BACT, CC-3
 - Ensure that bay water remains of sufficient quality to support a viable commercial shellfish industry, and safe recreational uses
Related CCMP Action Plan: ALL BACT, CC-3
 - No closures of shellfish beds except for first flush rain event by year 2010.
Related CCMP Action Plan:
- ✓ **Protect social, economic, and environmental benefits provided by the bay and watershed through comprehensive resource management planning.**
 - Improve public access points to increase environmental and educational benefits.
Related CCMP Action Plan: All EDU, HAB-1, 3
 - Assess impacts and geographic area of environmentally sensitive habitats in the estuary that provide nursery rearing for commercial fish.
Related CCMP Action Plan: CC-5, All FLOW, HAB-, EDU 3
 - Freshwater flow sufficient at all times to maintain water quality by flushing and diluting pollutants.
Related CCMP Action Plan: All FLOW
 - For those waters with drinking water as a beneficial use, bacterial and other pollutant levels must comply with drinking water standards (as stated in the CCRWQCB Basin Plan).
Related CCMP Action Plan: All BACT, CC-3
 - Ensure that bay water remains of sufficient quality to support a viable commercial shellfish industry, and safe recreational uses
Related CCMP Action Plan: All BACT, CC-3
 - No closures of shellfish beds except for first flush rain event by year 2010.
Related CCMP Action Plan: All BACT, CC-3
- ✓ **Promote public awareness and involvement in estuarine management issues through education outreach and use of volunteers.**
 - Promote public awareness and involvement in human health management issues through education outreach and use of volunteers
Related CCMP Action Plan: CC-6, All EDU, All BACT
 - Continue estuarine management education to K-12, general public and stakeholder groups.
Related CCMP Action Plan: All EDU
 - Maintain accurate data displays to public at local museums and events to promote involvement in estuarine management issues and recruit volunteers.
Related CCMP Action Plan: All EDU



Water Quality

- ✓ **Ensure that bay water remains of sufficient quality to support a viable commercial shellfish industry, safe recreational uses, healthy eelgrass beds, habitats for listed species, cold water aquatic habitat, and thriving fish and shellfish populations.**
 - Sustain no net loss of existing wetlands (baseline 2001 Wetland Delineation).
Related CCMP Action Plan: CC-1, All HAB, All SED
 - Freshwater flow sufficient at all times for dilution of pollutants and flushing to maintain water quality.
Related CCMP Action Plan: All FLOW
 - Levels of bacteria will comply with Department of Health Services, CCRWQCB, and County Environmental Health standards for beneficial uses including shellfish harvesting and water contact recreation at all times. These measurable standards are listed in detail in Volume II: The Environmental Monitoring Plan.
Related CCMP Action Plan: CC-3, All BACT
 - For those waters with drinking water as a beneficial use, bacterial levels must comply with drinking water standards (as stated in the CCRWQCB Basin Plan).
Related CCMP Action Plan: CC-3, All BACT
 - Ensure that bay water remains of sufficient quality to support a viable commercial shellfish industry, and safe recreational uses
Related CCMP Action Plan: CC-3, All BACT
 - Decrease average annual nutrient inputs (loading) by 25% from urban and agricultural runoff by the year 2010. Levels of nutrients shall not cause nuisance aquatic growth or adversely affect beneficial uses (as listed in CCRWQCB Basin Plan Standards).
Related CCMP Action Plan: All NUTR, CC-3
 - Levels of nutrients shall not be present in creek and bay waters at levels which cause toxic effects to aquatic organisms and plants. These measurable standards are listed in detail in Volume II: The Environmental Monitoring Plan.
Related CCMP Action Plan: All NUTR, CC-3
 - Water column dissolved oxygen concentrations shall remain above 5.0 mg/l at all times. Median values shall be maintained above 85 percent saturation. In cold freshwater habitats, dissolved oxygen concentrations shall not be reduced below 7.0 mg/l at any time (as listed in CCRWQCB Basin Plan Standards).
Related CCMP Action Plan: CC-5,6
 - Decrease levels of heavy metals (such as copper) and toxics (such as organophosphorous pesticides) to be in compliance with EPA Toxic rules in creeks and bay waters to natural background levels (which will be established by the year 2002), and shall not cause impacts to beneficial uses, such as cold water aquatic organisms, endangered species, drinking water or recreational use (as stated in CCRWQCB Basin Plan Standards)
Related CCMP Action Plan: All HMT, CC-3
 - Decrease metals and toxics in sediments to satisfy NOAA chronic/acute standards (i.e. the geometric mean copper levels in marine sediment shall not be over 25,000 ppb) for marine and freshwater sediment, and shall not cause impacts to beneficial uses, such as cold water aquatic organisms, endangered species, drinking water or recreational use (as stated in CCRWQCB Basin Plan Standards).
Related CCMP Action Plan: All SED, All HMT
 - To reduce urban NPS loads to comply with Storm Water Phase II rulings (see EPA Storm Water Phase II Final Rule document).
Related CCMP Action Plan: CC-3,4
 - To reduce agricultural NPS loads to satisfy applicable water quality standards within five years (see CCRWQCB Basin Plan).
Related CCMP Action Plan: EDU-3,4, CC-3, SED-4-7, BACT-1, NUTR-3
 - Reduce urban NPS loading by 20% from new and existing development by establishing residential load reduction programs within the next 10 years.
Related CCMP Action Plan: All NPS actions
 - Support regional efforts to improve advance land use and development planning measures consistent with CZARA and Storm Water II Final Ruling.
Related CCMP Action Plan: CC-7



- Support regional actions to obtain compensation for environmental injuries are directed to the Morro Bay ecosystem.
Related CCMP Action Plan:
- Eliminate the release of harmful materials (paints, solvents, etc.) from marinas and docksides within 10 years.
Related CCMP Action Plan: CC-3, BACT-2,4,5, HMT 2-4, EDU-2
- Decrease illegal dumping and discharges (solid waste, toxics and hazardous waste) within 10 years.
Related CCMP Action Plan: BACT-3

Living Resources:

- ✓ **Ensure integrity of the broad diversity of natural habitats and associated native wildlife species in the bay and watershed**
 - Sustain no net loss of existing wetlands comparisons being results from 2001 Wetland Delineation..
Related CCMP Action Plan: CC-1, All HAB, All SED
 - Assess the status and trends of the quality and quantity of selected habitats (open channel, mudflat, salt marsh (low and high), freshwater marsh, riparian, coastal dune scrub, maritime chaparral, grassland, and oak woodland) to assist in evaluating the CCMP.
Related CCMP Action Plan: All HAB
 - Maintain freshwater flow during low flow seasons sufficient to support nursery habitat for steelhead trout
Related CCMP Action Plan: CC-5, All STL, All FLOW, HAB-1
 - Maintain freshwater flow during high flow seasons sufficient to support steelhead migration
Related CCMP Action Plan: CC-5, All STL, All FLOW, HAB-1
 - Increase and/or enhance habitats for species of special concern in the watershed and estuary by 15% of year 2001 acreages.
Related CCMP Action Plan: All HAB, ALL STL
 - Increase a minimum of 20% of eelgrass acreage from year 2000 levels to support of brant and other species.
Related CCMP Action Plan: HAB-8
 - Assess the intensity of selected human activities that impact the resources of Morro Bay and establish activity carrying capacity to advise habitat management decisions.
Related CCMP Action Plan: CC-6, All HAB
 - Increase populations of Federally/State listed and special concern species (such as eelgrass, redlegged frogs, steelhead trout, overall wintering bird migrants and Morro Manzanita) in the watershed and estuary from year 2000 inventory estimates.
Related CCMP Action Plan: EDU-8, HAB-1,2,4,9
 - Maintain benthic community indices at established baseline levels, based upon National Monitoring Program Final Report 2001 mean indices.
Related CCMP Action Plan: All HAB, All STL
 - Decreased coverage of prominent exotic species (velvet grass, hoary cress, Giant reed, Cape ivy) by 15% in sensitive areas (such as riparian corridor, coastal dune scrub, and Morro Estuary Natural Preserve) by year 2010.
Related CCMP Action Plan: HAB-9
- ✓ **Reestablish healthy steelhead trout habitat in Chorro and Los Osos Creeks**
 - Restore 50 % of stream geomorphological processes in Chorro and Los Osos Creeks to provide the minimum physical, chemical, and biological habitat requirements (for south-central coast ESU) steelhead as described by CDFG and NMFS (spawning, rearing and migration).
Related CCMP Action Plan: CC-3,5, All STL
 - Remove all fish barriers to stream habitat for spawning and rearing by 2010.
Related CCMP Action Plan: STL-2, CC-5
 - Increased population of steelhead fish in Los Osos and Chorro Creeks by the year 2010.
Related CCMP Action Plan: All STL, CC-5
 - Successful attainment of the goals of the Steelhead Recovery Plan (anticipated 2001) as listed by NMFS and CDFG in Morro Bay watershed.
Related CCMP Action Plan: All STL



5.4 CURRENT MONITORING IN MORRO BAY

Existing monitoring efforts in the Morro Bay estuary and watershed are the foundation of the MBNEP Environmental Monitoring Plan (EMP). The wide array of natural communities interacting with a relatively small amount of anthropomorphic impacts, creates a noiseless framework to test hypothesis and detect change from the Comprehensive Conservation Management Plan. Coordinating with the many stakeholders monitoring in the study area, a comprehensive long-term monitoring plan can be established.

Stakeholder Monitoring Base

Stakeholders involved in the EMP include many local organizations and agencies. In many cases, the stakeholders will work closely together, sharing program resources and collaborating to develop strategies to ensure the most appropriate approach to use to collect data. For example, CCAMP will be sampling the confluences of Chorro and Los Osos Creek and the estuary as part of their program. In addition, Friends of the Estuary will be monitoring those locations monthly as well, collaborating on labor, lab timing and coordination for mutual benefit. Stakeholder involvement is outlined in Volume II: The Environmental Monitoring Plan, listing primary and secondary implementers crucial to the evaluation of the CCMP. Asterisks indicate parameters that will not initially be measured, yet will be phased in when funding becomes available.

The MBNEP staff, to insure consistency in evaluating monitoring questions will track the data collected by these groups. The data will be tracked via Internet through CCAMP and SLO Logic data streams for the entire county. The MBNEP will electronically house all MBNEP/Friends of the Estuary (FOE) information gathered to evaluate specific actions as well trend data. The data collected will be utilized to develop quarterly monitoring summaries and annual reports to assist in biennial review. Below is a highlighted list of major existing monitoring agencies and organizations active in the Morro Bay estuary and watershed.

Current Information Gaps

Tables 5-1 and 5-2 illustrates that a more intensive focus has existed primarily on conventional water quality and various physical and chemical monitoring of Morro Bay and it's watershed, versus biological and ecological parameters. Table 5-3 below summarizes the weaknesses existing in physical and chemical information on Morro Bay. The greatest weaknesses are as follows:

- Long-term and geographical organic pollutant monitoring
- Temporal variability within settleable and suspended metals
- Wide-spread benthic organism monitoring information
- Bioaccumulation of metals and other toxics on a geographic and temporal scale
- Toxicity and chemical effects on biological organisms
- Overall lack of temporal monitoring among ongoing efforts

Table 5-4 below summarizes the weaknesses existing in biological and ecological information on Morro Bay. The greatest weaknesses are as follows:

- Little overall information on toxicity/chemical effects and bioaccumulation and its effect on a wide range of indicators.
- General wildlife information is sparse, especially concerning long-term trends, quality assurance and level of detail.
- Ecological data on benthos and plankton is primarily short duration studies, with little temporal and companion data to create hypothesis.
- Little high quality geographic coverage and temporal variability of wetlands.
- No consistent format of any geographic coverage assessments.



Table 5-1 Summary Of Existing Physical/Chemical Monitoring Morro Bay.

	Hydrology /Freshwater Inflow	Circulation	Pollutant Sources	Conventional Water Quality	Pollutant : Metals	Pollutants: Organics	Sediment Quality	Sediment Transport	Dredged Material	Land Use
MBVMP	■		■	■	□		□			
RWQCB	■		□							
NMP	■		■	■	■					
CCAMP			□	■	■					
Cal Poly							□	□		□
UCCE				□			□			□
NRCS	□	□					■	■		□
RCD	□						■	■		□
CDPR										
CDHS										
CDFG										
CMC				□						
NMFS		□								
Sea Grant										
Cty Eng.	□								□	
Cty Ag										■
Cty Hlth			□							
CSLO					□					□
Morro Bay										□
ACOE							■		■	
USFWS	□									□
Duke	□	□		□			□	□		
Audubon										
Tenera				□	□					
MorroGroup	■	□	□				□	□		□
Jones/Stoke										
Cleath/Assoc.	□									

■ Extensive Data ■ Substantial Data □ Moderate Data □ Minor Data



Table 5-2 Summary Of Existing Biological/Ecological Monitoring on Morro Bay.

	Wetlands	Plankton	Benthos	Oyster	Fish (other)	Herps	Birds	Mammals	Bioaccumulation	Toxicity/Chemical Effects
MBVMP	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>				<input type="checkbox"/>			
RWQCB	<input type="checkbox"/>			<input checked="" type="checkbox"/>					<input type="checkbox"/>	<input type="checkbox"/>
NMP			<input checked="" type="checkbox"/>				<input type="checkbox"/>			
CCAMP									<input type="checkbox"/>	
Cal Poly		<input checked="" type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>		
UCCE										
NRCS	<input type="checkbox"/>									
RCD	<input type="checkbox"/>									
CDPR	<input type="checkbox"/>					<input type="checkbox"/>	<input type="checkbox"/>			
CDHS		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>					<input type="checkbox"/>	<input type="checkbox"/>
CDFG	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
CMC										
NMFS					<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>		
Sea Grant								<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Cty Eng.										
Cty Ag										
Cty Hlth		<input type="checkbox"/>								
CSLO										
Morro Bay										
ACOE										
USFWS	<input type="checkbox"/>					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Duke										
Audubon						<input type="checkbox"/>	<input checked="" type="checkbox"/>			
Tenera						<input type="checkbox"/>				
MorroGroup	<input type="checkbox"/>					<input type="checkbox"/>				
JonesStokes	<input checked="" type="checkbox"/>									
Cleath/Asso										

Extensive Data
 Substantial Data
 Moderate Data
 Minor Data



Table 5-3 Summary Of Physical And Chemical Information On Morro Bay.

<input checked="" type="checkbox"/> Extensive Data <input checked="" type="checkbox"/> Substantial Data <input type="checkbox"/> Moderate Data <input type="checkbox"/> Minor Data	Geographic Coverage	Temporal Variability	Duration	Level of Detail	Quality Assurance
Hydrology/Freshwater Inflow	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Circulation	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pollutant Sources	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Conventional Water Quality	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Pollutant: Metals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pollutants: Organics	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sediment Quality	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Sediment Transport	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Dredged Material	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Land Use	<input checked="" type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input checked="" type="checkbox"/>



Table 5-4 Summary Of Biological And Ecological Information On Morro Bay.

<input checked="" type="checkbox"/> Extensive Data <input checked="" type="checkbox"/> Substantial Data <input type="checkbox"/> Moderate Data <input type="checkbox"/> Minor Data	Geographic Coverage	Temporal Variability	Duration	Level of Detail	Quality Assurance
Wetlands	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Plankton	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Benthos	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Oyster	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Recreational Fish	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fish (Other)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Herps	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Birds	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mammals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bioaccumulation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Toxicity/Chemical Effects	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



5.5 SUMMARY OF MONITORING ACTIVITIES

Currently, ongoing monitoring in the watershed and bay provides the starting point for developing a comprehensive environmental protection program. To achieve its goals the EMP must coordinate a large range of variables including diverse stakeholders, numerous parameters and multiple objectives incorporated into the CCMP. Where essential monitoring gaps have been identified, efforts have been made to work with existing agencies and/or organizations to provide need information. This chapter summarizes how the monitoring effort will be coordinated according to specificity of trend characterization, project-specific success and research needs. Therefore, the three coordinating components are as follows:

- 1) **TREND Monitoring**
- 2) **PROJECT-SPECIFIC Monitoring**
- 3) **RESEARCH Monitoring**

These three components discussed in this chapter, constitute the strategy that the MBNEP will use to help determine whether the stated CCMP actions and their objectives are being met. Further details of monitoring activities are discussed in Volume II: The Environmental Monitoring Plan, Project Management Chapters 5-13.

TREND monitoring are those activities that will assess trends and track overall watershed and estuarine health and include all environmental monitoring efforts occurring in the watershed and bay. *RESEARCH* includes activities developed to provide additional information needed to guide long-term planning, implementation, and monitoring. *PROJECT-SPECIFIC* monitoring are those activities required to determine whether individual action plans are successful at reaching the goals of the MBNEP. Specific monitoring activities may overlap more than one category and answer more than one question.

Trend Monitoring Workplan

The following discussion summarizes TREND monitoring to list measurable parameters, frequency of sampling and location of sites. The TREND Monitoring workplan is summarized in two parts, the watershed and the estuarine sampling schemes. The analytes and parameters listed below in Tables 5.5 (watershed components) and Table 5.6 (estuarine components) comprise the basis for the Morro Bay Environmental Monitoring Plan. These parameters will be consistently monitored through the duration of the CCMP's implementation period, and until their respective monitoring questions have been answered. Relative data information needs are listed in Tables 5.5 and 5.6, and are organized by corresponding EMP topic, and monitoring question number, such as Sediment Reduction, SR-7. Further detail of these monitoring questions, parameters and data quality objectives, please see Volume II: The Environmental Monitoring Plan.

The TREND Monitoring workplan will be coordinated primarily by the Friends of the Estuary's (FOE) Volunteer Monitoring Program (MBVMP) with assistance by the Morro Bay National Estuary Program (MBNEP) and the Central Coast Regional Water Quality Control Board (CCRWQCB). Funding for the program coordination will come from Friends of the Estuary's State Water Resource Control Board 319(h) grant through June 2003. Research to identify extramural funding to support the TREND Monitoring workplan will begin in July 2001.



Table 5.5 Morro Bay Watershed Monitoring Parameters/Variables

Watershed Component	Parameter/ Variables	Implementer *Primary/ Secondary	Frequency	Location	Data Info Need	Related Action Plan
Conventional Water Quality	Nutrient Series, Chloride, Total Suspended Sediment, Coliform Series, Turbidity, Dissolved Oxygen, pH, Salinity, Conductivity, Temperature, Chlorophyll a	*CCAMP Funding/ FOE collection	Monthly	2 sites: SYB/TWB Figure 5.3	SR-5 PH-2-5	CC-3 CC-4 All SED All BACT All NUTR FLOW-1,4 All HMT
Volunteer Water Quality	Nutrient Series, Total Suspended Sediment, Coliform Series, Turbidity, Dissolved Oxygen, pH, Salinity, Conductivity, Temperature, Chlorophyll a, Flow	*FOE	Monthly	15 sites: Tributary/ Confluence Figure 5.3 Flow sites, Figure 7.4, EMP	SR-5 PH-2-5 RF-2-5	CC-3 CC-4 CC-6 All SED All BACT All NUTR All FLOW All HMT
Sediment Chemistry	Title 22 Hazardous waste metals, Organochlorine Pesticides and PCBs, Organophosphorous Pesticides, Carbamate and Urea Pesticides (HPLC), Particle size, Polynuclear Aromatic Hydrocarbons	*CCAMP	Annually	2 sites: SYB/TWB Figure 5.3		CC-3 CC-6 All HMT EDU-4
Bioaccumulation (bivalves)	Trace Organics full scan +PAH Full Scan Metals	*CCAMP	Annually	2 sites: SYB/TWB Figure 5.3		CC-3 CC-6 All HMT
Bioaccumulation (fish)	Trace Organics full scan +PAH Full Scan Metals	*CCAMP	TBD	2 sites: SYB/TWB Figure 5.3		CC-3 CC-6 All HMT All STL
Freshwater Bioassessment	Benthic Macroinvertebrates, Harpacticoids, Plankton	*FOE, *CCAMP	Annually	10 sites Figure 5.3	SR-7	CC-6
Fish Surveys	Community Diversity/Density	*FOE/NEP	TBD	4 sites as coordinate d by CDFG		CC-5 CC-6 All HAB All STL
Bird Surveys	Community Diversity/Density	*FOE	Quarterly	10 sites Figure 5.3		CC-6 All HAB SED-6
Geomorphological Suite	Stream Cross-Sectional and Longitudinal Profiles, Habitat Typing, Photodocumentation	*FOE/RCD	Annually	21 sites on Chorro and Los Osos tributaries	SR-3,4- 6	CC-6 All HAB
Habitat Delineation	Acreage of habitats (listed in Chapter 8/9) Satellite imagery Groundtruthing	NEP/FOE	TBD	All major habitat types	RF-6	All HAB



Table 5.6 Morro Bay Estuarine Monitoring Parameters/Variables

Estuarine/ Near Shore Component	Parameter/ Variables	Implementer Primary/ Secondary	Frequency	Location	Data Info Need	Related Action Plan
Volunteer Water Quality	Nutrient Series, Coliform Series, Turbidity, Dissolved Oxygen, pH, Salinity, Conductivity, Temperature, Chlorophyll a	FOE	Monthly	16 sites: Figure 5.4	PH 2-5	CC-3,4,6 All SED All BAC All NUT All FLW
Pathogen Indicators	Total Coliform, Fecal Coliform, Enterococcus, <i>E. coli</i>	FOE/DHS, Local Government	Monthly	10 sites: Figure 2.2	PH 2-5	CC-3,6 All BAC
Sediment Chemistry	Title 22 Hazardous waste metals, Organochlorine Pesticides and PCBs, Organophosphorous Pesticides, (HPLC), Particle size, Polynuclear Aromatic Hydrocarbons	CCAMP	TBD	At all water quality sites. 16 sites: Figure 5.4		CC-3,6 All HMT EDU-4
Bioaccumulation (bivalves)	Trace Organics full scan +PAH Full Scan Metals	RWQCB – TMDL/FOE	Initial Screening only	5 sites: 2 Delta, 1 Bay mouth, 2 Mudflat		CC-3,6 All HMT
Bioaccumulation (fish)	Trace Organics full scan +PAH Full Scan Metals	*CCAMP	TBD	5 sites: 2 Delta, 1 Bay mouth, 2 Mudflat		CC-3,6 All HMT All STL
Nutrient Biological Impact	Nutrient Series, Eelgrass Productivity, Eelgrass Epiphytic Index, Turbidity, Eelgrass density transects	NEP/Cal Poly	Three Year Monitoring Project	5 Transects based on J. Chestnut/Tetra Tech transects		CC-3 CC-6 All NUT HAB-8
Benthic Infauna (Partial RBP)	Eelgrass Community Diversity Benthic Macroinvertebrates, Plankton	NEP/Cal Poly	Three Year Monitoring Project	5 Transects based on J. Chestnut/Tetra Tech transects	SR-7	HAB-8 CC-6
Brant Surveys	Brant Migration / Resident Timeline, Brant Density, Brant Age Composition, Brant Habitat delineation	J. Roser, Audobon/ NEP	TBD	6 Observation points on bay perimeter. 2 Front bay, 1 delta, 2 back bay		CC-6 All HAB
Fish Trawls	Community Density/ Diversity	CDFG	Annually	4 sites as coordinated by CDFG		CC-6 All STL All HAB



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Estuarine/ Near Shore Component	Parameter/ Variables	Implementer Primary/ Secondary	Frequency	Location	Data Info Need	Related Action Plan
Shore Bird Survey	Community Density/ Diversity	Pt. Reyes Observatory/ Audobon	Annually	6 Observation points on bay perimeter. 2 Front bay, 1 delta, 2 back bay		CC-6 SED-6 All HAB
Eelgrass Survey	Community Density/ Distribution	NEP/ J. Chestnut & Cal Poly	Annually	5 Transects based on J. Chestnut/Tetra Tech transects		CC-6 HAB 8
Plankton Survey	Community Density/ Diversity Turbidity, Temperature	UCCE, DHS/ Coast Guard, FOE	Monthly	4 sites: Estero Bay, Harbor Mouth, N. T-Pier, Back Bay Channel		CC-6
Algal Cover Transects	Percent Cover	FOE	Four times a year, during algal growth season. One time in dormant season.	4 Transect Sites: Chorro Delta, Shark Inlet, Pasadena Point, and Grassy Isl.		CC-6
Estuarine Bioassessment	Plankton, Macroinvertebrates/ Harpactacoids	FOE/NEP	Annually for five years	5 sites: 2 Delta, 1 Bay mouth, 2 Mudflat		CC-6
Near Shore Metals/ Pathogen Indicators	Title 22 Hazardous waste metals, Coliform series	CCAMP	Annually	3 sites in Estero Bay		CC-3 CC-6 All BACT All HMT
Geomorphological Suite	Stream Cross-Sectional and Longitudinal Profiles, Habitat Typing, Photodocumentation, Bay Bathymetry, Artificial Depo Markers	*FOE/RCD	Annually	21 sites on Chorro and Los Osos tributaries	SR-3,5,6	CC-6 All HAB
Habitat Delineation	Acreage of habitats (listed in Chapter 8/9) Satellite imagery Groundtruthing	NEP/FOE	Every five years beginning in 2001.	All major habitat types	RF-6	All HAB



Time Frame

Time frames for implementing specific monitoring elements are presented in the Table 5.7 below. The parameters indicated are those that will be initiated, or funded through MBNEP CCMP Environmental Monitoring Plan. Initial monitoring activities will be focused upon gathering pre-implementation data to support evaluation following action plan implementation. Watershed data will be based upon the ten-year study of Morro Bay National Monitoring Program (NMP), and will transition from bimonthly sampling to monthly sampling due to the accrued large data set. Number of sites will be decreased to better focus on evaluating BMPs on a tributary basis instead of individual BMPs that have already been proven effective.

Table 5.7 MBNEP Monitoring TREND Timetable

Related CCMP Action	Monitoring Component (See Tables 4.1a/b)	MBNEP Monitoring TREND Timetable 2000-2001											
		Jul-00	Aug-00	Sep-00	Oct-00	Nov-00	Dec-00	Jan-01	Feb-01	Mar-01	Apr-01	May-01	Jun-01
All Priority Actions	Conv./Volunteer Water Quality												
SED -2,4,5	Sediment Chemistry												
CC-4 BACT-1,3,4	Bioaccumulation (bivalves)												
CC-6 HAB-1,9	Freshwater Bioassessment												
CC-6, HAB 1,9 STL - 2,3	Fish Surveys												
CC-6 HAB - 1,9	Bird Diversity			9/15 - 9/30			10/15 - 10/30			3/15-3/30			7/15
SED -5 STL - 3	Geomorphological Suite		Creek sites									Aerial	
CC -4,6 BACT -1,3,4	Pathogen Indicators												
NUTR - 1,2	Nutrient Biological Impact												
HAB - 1 STL - 3	Benthic Infauna												
CC-6 HAB - 1,9	Brant Surveys												
CC-6, HAB 1,9 STL - 2,3	Fish Trawls/Counts												
CC-6 HAB - 1,9	Shorebird Surveys												
CC -6 HAB -8	Eelgrass Surveys												
CC - 6 HAB -1	Plankton Surveys												
CC -6 HAB -1	Algae Cover Transects												
CC -6 HAB -1	Estuarine Bioassessment												



Project-Specific Monitoring Workplan

The data for the PROJECT-SPECIFIC monitoring workplan will be collected by the project proponents and coordinated by the MBNEP. An environmental monitoring plan will accompany each action plan proposal when it is submitted to the MBNEP for funding and approval, and will be based upon either a pre/post or a upstream/downstream study design. The MBNEP staff will be responsible for prescribing monitoring details that will coincide with the consistent TREND monitoring workplan, if applicable. The monitoring results will then be used to determine action effectiveness and to provide a "feed back loop" to each implementer to help them effectively manage and maintain their actions.

Each monitoring plan will contain the following:

1. Define the action plan objectives and performance criteria.
2. List the questions that the monitoring plan will answer and how the evaluation techniques will be used to answer the questions.
3. Identify the qualitative methods (i.e., photo points, video taping, or recording visual observations during storm events) or quantitative methods (i.e. water quality sampling, or cross sections) to be used to determine project performance.
4. Identify sampling locations, frequency of sampling, and sampling procedures.
5. Provide a schedule for submitting data to the MBNEP in a data format suitable for incorporation into the CCAMP master database.
6. Identify how the project is consistent with California Nonpoint Source Pollution Control Program. (Please refer to Volume I: CCMP, Appendix E.)

Research Priorities For Morro Bay

"Research," as reported by the National Research Council, is "referred to [as] measurement and experimental programs undertaken to answer more open-ended questions." Research needs are important to understanding fully the background processes that occur in the Morro Bay estuary and watershed. Fulfilling these needs can also aid in development of techniques that may help answer monitoring and management questions. The research component of the EMP is entirely independent from the TREND or PROJECT SPECIFIC workplan components. Funding for these studies are dependent on outside sources and timing of implementation of these needs is uncertain and based on TAC prioritization, and program needs.

Research needs will be prioritized upon action implementation timelines and funding availability. The MBNEP Technical Advisory Committee (TAC) will determine whether these studies will be done by contractor or by the MBNEP when funding becomes available. Some studies will be funded and coordinated through other avenues than the MBNEP, however data from these studies will be an integral part of evaluating success of MBNEP goals.

The technical community developed the identified Research Needs for the MBNEP study areas listed below over the last nine years. In 1991, the Bay Foundation of Morro Bay prepared a list of research needs. The list included specific research needs for the estuary and watershed including, but not limited to, a tidal and bathymetric survey of the estuary, water quality assessments, and habitat inventories. In 1995, a research needs workshop was held to build on the existing list and to identify questions still remaining to effectively manage the watershed and to prioritize actions. Workshop participants identified five primary areas in which research is needed: sedimentation, fresh water inflow, biological resources, toxins, and land use. In the Volume II: The Characterization, the data gaps below are also referenced in the end of each relevant chapter, detailing additional background information.



In 1997, the MBNEP initiated a bathymetric survey and the development of a tidal circulation model, a streamflow and sediment loading study, a nutrient loading study, a bacteria loading study, and a bay habitat characterization. Research Needs listed below are organized by corresponding EMP topic and monitoring question number, such as Sediment Reduction, SR-7. For more information on these topics, please refer to Chapter 4 of Volume II: The Environmental Monitoring Plan. These needs include, but are not limited to:

Sediment Reduction (SR)

- SR-8** What are the sediment plume effects on Morro Bay and Estero Bay?
- SR-9** What is the effective minimum width for fenced riparian buffer to improve water quality improvement?
- SR-10** Is there a positive correlation between salt and freshwater flow mixing zone and spatial particle size deposition?
- SR-11** Is the lack of water clarity positively correlated with decreasing eelgrass productivity?

Public Health Issues (PH)

- PH-7** What other processes are effective at filtering bacteria from surface water? Wetlands? Flood plains, etc?
- PH-8** What is the effective minimum width for fenced riparian buffer to improve water quality improvement?
- PH-9** What is the best pathogen indicator for stormwater runoff?

Reduction of Freshwater Flow (RF)

- RF-7** How do changes in wastewater management affect distribution of freshwater wetland habitats?
- RF-8** What is the effective minimum width for fenced riparian buffer to improve water quality improvement?
- RF-9** Is there a positive correlation between salt and freshwater flow mixing zone and spatial particle size deposition?
- RF-10** What are the optimum instream flow allotments for the Chorro Valley Users Group?
- RF-11** What are the effects of Morro Bay Power Plant on bay circulation patterns?
- RF-12** What are the impacts of changes in freshwater inflow on oligohaline habitats?

Water and Sediment Quality (WSQ)

- WSQ-10** Are nutrients adversely affecting aquatic communities? Eelgrass?
- WSQ-11** What is the effective minimum width for fenced riparian buffer to improve water quality improvement?
- WSQ-12** What is the optimum amount of nutrients needed for row croppers of the Los Osos and Chorro Valleys?
- WSQ-13** What function does nutrient variances have on Eelgrass productivity in Morro Bay (Comparison of Instantaneous And Comprehensive Methodologies)?
- WSQ-14** What are the ecological effects of algal blooms (Freshwater And Estuarine)?
- WSQ-15** What are the extent of natural and anthropogenic sources of hypoxia?



- WSQ-16** What are the limiting nutrients in both freshwater and estuarine environments?
- WSQ-17** Are marine and freshwater organisms in Chorro and Los Osos Creeks and in the Morro Bay estuary impacted by concentrations of metals or toxic chemicals?
- WSQ-18** Does dredging cause toxic substances to be re-suspended?
- WSQ-19** Do metals degrade any surface water beneficial uses?

Habitat Health (HH)

- HH-8** What are the sediment plume effects on Morro Bay and Estero Bay?
- HH-9** What is the effective minimum width for fenced riparian buffer to improve water quality improvement?
- HH-10** Is there a positive correlation between salt and freshwater flow mixing zone and spatial particle size deposition?
- HH-11** Is the lack of water clarity positively correlated with decreasing eelgrass productivity?
- HH-12** Perform Wetland Delineation using Satellite Imagery Analysis and groundtruthing.
- HH-13** What are the most critical habitats impacted by recreation and economic uses?
- HH-14** What is the temporal species richness and relative abundance of benthic invertebrates in Morro Bay?
- HH-15** What is the extent of acreage of the most invasive exotic species? What are the trends over time?
- HH-16** What function does nutrient and turbidity variances have on Eelgrass productivity in Morro Bay? (Comparison of Instantaneous And Comprehensive Methodologies)
- HH-17** What are the ecological effects of algal blooms (Freshwater And Estuarine)?
- HH-18** What is the extent of natural and anthropogenic sources of hypoxia?
- HH-19** What are the ecological impacts of Morro Bay Power Plant?
Air Deposition, Entrainment, Circulation (Data Stream Tracking)
- HH-20** What are the impacts of changes in freshwater inflow on oligohaline habitats?

Tracking Species Diversity (SD)

- SD-9** What habitats are crucial to special species? Are there recreational activities that interfere with their critical habitat needs?
- SD-10** What exotic species are in the estuary and watershed? Are they increasing or decreasing? what impacts do exotic species have on native species?

Point Source (PS)

- PS-8** How do changes in wastewater management affect distribution of freshwater instream and terrestrial wetland habitats?
- PS-9** What are the effects of Morro Bay Power Plant on bay circulation patterns?
- PS-10** What are the effects of Morro Bay Power Plant on bay entrainment of larvae?
- PS-11** What are the effects of Morro Bay Power Plant on bay air deposition?



Budget

The allocation of funds (approximately \$82,000/year) for the laboratory/equipment costs of the TREND monitoring program is illustrated in Figure 5.2. This figure represents only the Trend parameters that will be initiated by the MBNEP EMP and funding sources will need to be continually sought. Satellite imagery provided by MBNEP funding will be on a five-year basis and is not included in the pie chart representation. It also does not represent the cost for coordination of the monitoring activities, which include MBNEP, FOE, and CCRWQCB. The Volume II: MBNEP Environmental Monitoring Plan provides further detailed information regarding cost per parameter, including quality assurance costs and coordination. Potential funding sources are included in CC-6 and Chapter 7.

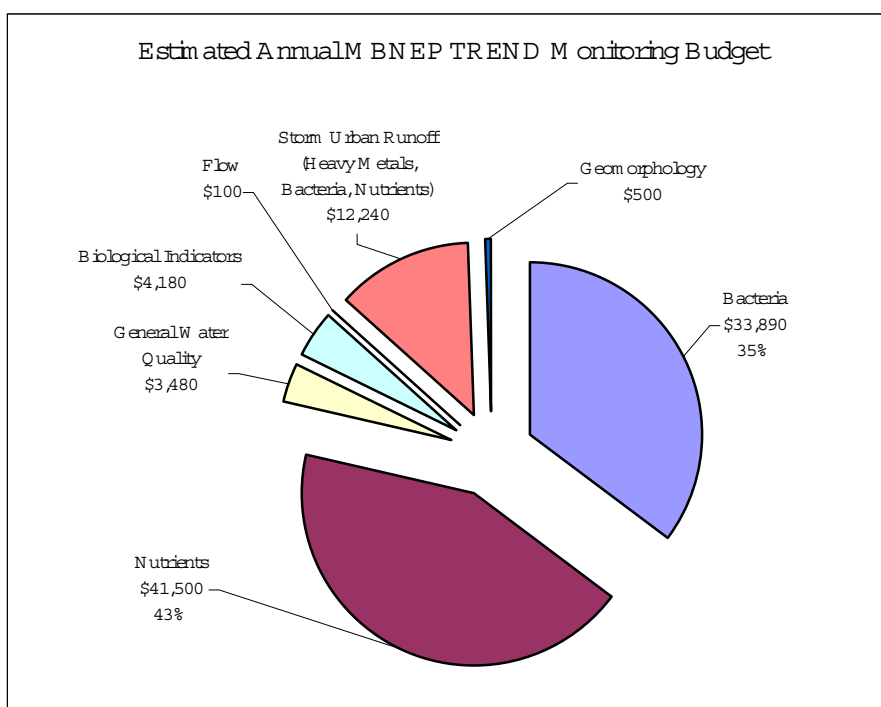


Figure 5.2 Estimated Annual MBNEP Trend Monitoring Budget, based upon February 2000 Certified Laboratory Costs. This chart represents laboratory analysis and equipment only, and excludes coordination costs.

5.6 ASSESSING EMP PERFORMANCE

Technical Advisory Committee

A Technical Advisory Committee, coordinated by MBNEP staff and made up of interagency and stakeholder technical experts, will convene at a minimum of four times a year to review current EMP progress, Quality Assurance standards, exchange pertinent technical knowledge and to prioritize and take action on needed research



actions. In addition to these roles, the TAC will also be responsible for communicating outcomes to the Task Force at quarterly meetings as needed. Other possible agenda items may include:

- ✓ Setting topics for biennial State of the Bay conference,
- ✓ Regional monitoring workshop agendas,
- ✓ Reviewing technical proposals to the MBNEP,
- ✓ Refining study design,
- ✓ Assisting in developing local bioindicators to track implemented actions, and overall health of the ecosystem.
- ✓ Assisting in extramural funding to support the EMP and prioritized research needs.

The initial TAC meetings for transition into implementation are scheduled for late September and March. Committee chair, and workgroup chairs must be selected by the January 2001 Task Force meeting to proceed with normal agenda items.

Expected Performance of EMP

Site placement for the Morro Bay watershed monitoring program was based upon historical sites from the NMP. As illustrated by Figure 5.3, seventeen sites have been monitored bimonthly since 1993 for conventional water quality parameters. Of these, ten sites at major confluences with Chorro Creek or Los Osos Creek will be sampled past the NMP ending year of 2001. Phasing down of sample frequency and number of sites will coincide with the FOE's VMP taking over the NMP sites. Additional sites were added on both major drainages to add power of spatial change detection to the data set, which are detailed further in Volume II: The Environmental Monitoring Plan.

Quantitative changes in the watershed that occurs during implementation will be easily detected due to the statistically powerful large data set ($n \approx 272$ for any given parameter at a site) from the Morro Bay National Monitoring Program (MBNMP). The large watershed data set also adds to the strength of detecting various changes in the watershed as it has spanned various weather and fire events.

Little consistent sampling efforts have been focused on the Morro Bay estuary. Many limited-term studies have been executed from the Morro Bay Volunteer Monitoring Program (MBVMP), CCRWQCB and County Department of Health. The only long term monitoring has come from regulated economic bases such as NPDES dischargers and shellfish harvesters, with focused data collection not expanded to the entire estuary. The aim of the EMP is to take monthly water quality samples throughout the estuary, and perform annual ecological data collection to evaluate freshwater, saltwater, urban and background wildlife pollutant input.

Site selection for estuarine sites (Figure 5.4) was based upon habitat type (mudflat, fresh/marine inflow channels, salinity gradients), tidal circulation (mid-incoming tide and mid-outgoing tide) and input (urban areas, wildlife, outer bay, watershed). As little data exists in the bay, change detection in the Morro Bay estuary will be reliant upon frequent data collections to increase sample size and pre-implementation trends.



Figure 5.3 Locations of TREND Workplan Morro Bay Watershed Sampling Sites



Figure 5.4 Location of TREND Workplan Morro Bay Estuary Sampling Sites



Timetable for Analyzing Data & Assessing Program Performance

Within staff resources, data entry for any data collected will be inputted electronically within 30 days of sample date. This time frame is to prevent disorganization as well as to allow the database to be always available to query or test.

The MBNEP staff will be responsible for the monitoring tasks displayed Table 5.8 below. This table lists deliverable tasks that are identified in the Project Management Chapters 5-13 of Volume II: The Environmental Monitoring Plan, and their relative timeframe. Data reports from monitoring organizations will be summarized quarterly and presented at the quarterly Task Force meetings. Applicable data will then be incorporated into the Morro Bay National Estuary Program Implementation Tracking System, and the quarterly newsletters to be available to the public.

Monitoring adjustments made at the Technical Advisory Committee (TAC) will be incorporated within thirty days, and reported quarterly as well in the Annual Monitoring Reports. Overview reports, such as the Annual Monitoring Reports will serve as the basis for State of the Bay 2002, as well as the biennial review process.

Table 5.8 Timeline for Deliverable Monitoring Tasks and Evaluation

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
TAC Meetings												
Task Force / Quarterly Summaries												
Quarterly Newsletter												
Annual Data displays Estuary Day												
Website Tracking Update (ITS)												
Annual Monitoring Reports												



5.7 DATA MANAGEMENT STRATEGY

The Central Coast Ambient Monitoring Program (CCAMP of the CCRWQCB) database will house data and metadata for all programs. This database and selected analytic tools will be available on the Internet as well as linked to the MBNEP website (see Figure 5.5). Individual programs can input data directly into the CCAMP software to facilitate quarterly data reviews and annual reports (see Figure 5.6). The analyses from this database will provide feedback to the MBNEP to evaluate action effectiveness and long-term trends. CCAMP also provides basic statistical tools, such as t-tests and Analysis of Variance, which will be available to the MBNEP to detect significant changes in data sets.

CCAMP includes data from projects within the CCRWQCB's jurisdiction (northern Ventura to southern San Mateo counties). The availability of this data provides opportunities for valuable data comparisons between the Morro Bay watershed and other similar areas. The database can also be used to track non-CCMP projects within the Morro Bay watershed and their potential impact on CCMP project evaluation. The data will also be available on the MBNEP website (www.MBNEP.org) for individual implementers and the Morro Bay National Estuary Program to track progress. These tools should prove to be very useful for MBNEP analysis and decision-making, as well as for providing information to the public. Further information can be found in Volume II: The Environmental Monitoring Plan document, Chapter 13: Implementation Tracking System.

Figure 5.5 CCAMP Web Site Options Menu

Central Coast Regional Water Quality Control Board
Central Coast Ambient Monitoring Program
Volunteer Data Screening Version 1.2 alpha

Center for Marine Conservation **Coastal Watershed Council**

Project Gazos Creek Project **Number of Organisms**

Analyte Air Temperature **Benthic Invertebrates**

Expression Mean Average

Site Bridge at Hwy 1 **Site to Site Comparison Chart** **Check Spreadsheet Structure**

Time to Time Comparison Chart **Check Sites** **Set up H2OData Sheet**



Quality Assurance For Sampling And Laboratory Analysis

Quality Assurance (QA)/Quality Control (QC) for the EMP will be based off the existing MBNEP QA/QC which will be amended to the EMP no later than October 10, 2000. All field data will be collected under the MBNEP QA, and all TREND and PROJECT-SPECIFIC monitors will be tested by standards listed. Laboratory data will strictly adhere to the Quality Control procedures detailed in the QA/QC submitted. Data entry will be checked by the protocols listed in the CCMP Data Management Strategy. Metadata will be stored for all data through CCAMP, and can be accessed as read only through the Internet. Passwords will be given to those trained to check or add data to the database.

Figure 5.6 Data Entry Fields for CCAMP Data Management System

ProjId	SiteTag	DateTime	pH	Cond_uS	Cond_ppt	Turb_N	DO_ppm	DO_SA T	H2O Temp
Demo1	NTR	12/19/97 15:20	7.0	342.000		5.000	7.600		9.000
Demo1	EST	4/3/98 14:30	6.5	200.000		410.000	10.600		10.000
Demo1	BRI	4/3/98 14:45	6.5	210.000		25.000	10.200		10.000
Demo2	SOQ	6/7/01 10:30	8.1	808.600	0.316	28.000	6.700	68.000	16.600
Demo2	APT	6/7/02 10:00	7.4	900.000	0.350	130.000	9.800	93.000	16.100
Demo2	SAN	6/7/02 10:45	7.7	921.000	1.520	168.000	8.500	87.000	16.700
Demo2	SOQ	7/5/02 9:45	8.2	731.000	0.277	16.600	5.900	59.000	16.200

Reporting Data to the Public

Participants in the MBNEP recognize that the value of monitoring lies in the ability to communicate meaningful results to appropriate managers and the public. The MBNEP will regularly assess progress towards completing the action plans contained in the CCMP. The goal of the MBNEP EMP is to collect data to make informed management decisions and to evaluate implemented actions, and to inform the community. The data tracked by MBNEP staff will be available to the community in various formats to insure accessibility to information as well as further understanding of the current status of the Morro Bay estuary and watershed. Table 5.9 presents a summary overview of the ways that monitoring data can be used to inform and educate the public.

Table 5.9 Summary of Public Reporting Venues for EMP

Public Reporting Venues	
Media	Quarterly "Turning the Tide" newsletter, articles in local newspapers (EDU-7)
Internet	Monthly MBNEP webpage update (www.mbnep.org) (EDU-7)
	Central Coast Ambient Monitoring Program (CCAMP) data management storehouse (CC-6)
	CCMP Implementation Tracking System (ITS)
Speakers Bureau	Public Outreach Group (POW) task (EDU-1)
Display	Natural history Museum interactive estuarine monitoring exhibit (EDU-6)
	Creek Day, Baywood Oktoberfest, Harbor Festival, Earth Day, Environmental Education Faire, Estuary Day
Conferences	State of the Bay 2002 (EDU-5)
Technical Reporting	Annual EMP status reports and Biennial Reviews



Chapter 5
