EVALUATION OF MOST SENSITIVE BENEFICIAL USE

The environmental threat associated with contaminated sediments is caused by the tendency of many chemical substances discharged into marine waters to attach to sediment particles and thus accumulate to high concentrations in the bay bottom sediments. The bottom sediments support biological communities of benthic or bottom dwelling organisms, (e.g., worms, clams, bottom feeding fish), that live in and eat marine sediment. The marine sediments may also serve as a spawning habitat for many pelagic species that inhabit the water column (e.g., invertebrates and fish). The elevated concentrations of chemicals in the sediment may cause acute mortality or can affect the reproductive behavior, egg hatching characteristics, and the early life development of these organisms. In addition to acute mortality and abnormal development phenomena, contaminated sediments can also lead to the accumulation of contaminants in organisms due to the effects of bioaccumulation. In addition, biomagnification of the contaminants can occur in the food chain when smaller contaminated organisms are consumed by higher trophic level species, including humans.

A fundamental step in the development of cleanup levels is the identification of the most sensitive beneficial use to be protected. The Regional Board is making the assumption that the benthic community covered under the marine habitat beneficial use (MAR) represents the most sensitive beneficial use needing protection from contaminated sediment at NASSCO and Southwest Marine shipyards. This assumption is based on the intimate contact and long duration of contact (in some cases entire life cycles). The Regional Board also recognizes that there is a potential threat to human health through three principal pathways of exposure. The primary and by far the most significant being the consumption of fish and shellfish contaminated by chemicals in the sediment through the processes of bioaccumulation and biomagnification.

The table below is derived from 40 CFR part 131, also known as the California Toxics Rule (CTR), and lists the numeric criteria established in the CTR that are protective for human health and saltwater organisms. The established human health criteria specifically take into account human health risks due to bioaccumulation.

Table 5
Establishment of Numeric Criteria for
Priority Toxic Pollutants for the State of California

Constituent	Protection of Organisms in Saltwater (μg/L)		Protection of Human Health (μg/L)	
	Acute	Chronic	Water and organism consumption	Organism consumption only
Copper	4.8	3.1	1300	*
Lead	210	8.1	*	*
Zinc	90	81	*	*
Mercury	[reserved]	[reserved]	0.050	0.051
PCB	*	0.03	0.00017	0.00017

(Source: 40 CFR Part 131; Water Quality Standards; Establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California)

* No promulgated criteria.

The table provides the maximum concentrations of a pollutant that can be found in the water without resulting in adverse effects. For example, no copper toxicity to saltwater organisms should occur if chronic copper concentrations in the saltwater are equal to or less than 3.1 micrograms per liter (μg/L). Further, no adverse human effects should occur to humans drinking 2 liters a day of untreated water and eating 6.5 grams daily of fish or shellfish (see calculations below) from a source of water that has less than 1300 μg/L of copper.

The CTR established the human health criteria (HHC) using various equations. For example, to calculate the HHC for PCB when water and organisms are consumed, the following equation was used:

$$HHC = \frac{RF \times BW \times (1000\ \mu g/mg)}{q1^* \times [WC + (FC \times BCF)]}$$

Where: RF = Risk factor = 1×10^{-6}
BW = Body Weight = 70 kg
q1* = Cancer slope factor = 2 per mg/kg-day
WC = Water Consumption = 2L/day untreated surface water
FC = Total Fish and Shell Fish Consumption = 0.0065 kg/day
BCF = Bioconcentration Factor = 31,200

BCFs are used to relate pollutant residues in aquatic organisms to the pollutant concentration in ambient waters. For lipid soluble pollutants, the BCF is calculated from the weighted average percent lipids in the edible portions of fish and shellfish, which is about 3%. For non-lipid soluble compounds, the BCF is determined empirically. As indicated by the CTR criteria, mercury and PCBs are significantly bioaccumulative, while zinc, copper, and lead are generally not significant bioaccumulators. Data, such as those from the US Department of Health, indicate that copper, lead, and zinc have BCFs that are typically lower than 300. PCB and mercury have high BCFs; the BCF is 31,200 for PCBs and 3,765 for mercury in estuarine coastal waters.

In addition to ingestion of organisms that have bioaccumulation of a pollutant, two other pathways of exposure to contaminated sediments are:

- Direct contact with contaminated sediments by swimmers or divers
- Incidental ingestion of contaminated sediment or associated water by swimmers or divers

However, available literature suggests that even when conservative assumptions about direct human exposure are used, risks associated with dermal contact and incidental ingestion of contaminated sediments are minimal and contribute less to the total risk than other pathways such as fish consumption.

As indicated by the CTR, Regional Board staff is aware that mercury and PCBs are significantly bioaccumulative; therefore, it is required that NASSCO and Southwest Marine conduct bioaccumulation tests to address human health risks. Mercury was identified as a chemical of concern at NASSCO, and mercury and PCBs were identified as chemical of concerns at Southwest Marine.

CLEANUP LEVEL OPTIONS

Regional Board staff has considered six options for establishing final sediment cleanup levels at NASSCO and Southwest Marine. The six options consist of the following:

- Option 1 – Background Reference Station
- Option 2 – Effects Range Median
- Option 3 – Campbell Shipyard & Shelter Island Boatyard AET Levels – 20% Safety Factor (Pre-Sampling Program)
- Option 4 - Campbell Shipyard & Shelter Island Boatyard AET Levels (Pre-Sampling Program)
- Option 5 – Site-Specific AET Levels (Comprehensive Chemical Analysis)
- Option 6 – No Action

Each option was evaluated based on the degree of environmental protection provided by the cleanup levels, costs associated with cleanup activities, dredge volume, percentage of leasehold dredged, pros/cons associated with dredging to the respective cleanup levels, and the outcome for selecting each proposed option. The cleanup levels, dredge volume, percentage of leasehold dredged, and estimated costs for each option are summarized in Tables 1 and 2.

Regional Board Staff also considered four other cleanup level options prior to selecting the proposed six options. These cleanup level options were discussed in a staff report dated February 17, 1999 (Establishment of Shipyard Sediment Cleanup Levels for NASSCO and Southwest Marine) and is presented in Appendix D. The four options include the cleanup levels developed for the boatyards in America's Cup Harbor, Paco Terminals, Teledyne Ryan Aeronautical, and the Bay Protection and Toxic Cleanup Program.

I. Option 1 – Background Reference Station

Regional Board Staff considered the use of three reference stations (REF-01, REF-02, and REF-03) as the background reference station. These reference stations are designated as NPDES sampling locations for all shipyard and boatyard facilities located in San Diego Bay and are located in areas that would not be influenced by shipyard discharges. Reference station REF-01 is located on the west side of San Diego Bay off the Naval Ocean Systems Center pier, reference station REF-02 is located on the north side of San Diego Bay at the Cortez Marina in Harbor Island's west basin, and reference station REF-03 is located on the northeast side of San Diego Bay at the end on the Broadway pier.

Regional Board Staff conducted a statistical analysis using the Student's t-test to compare the sediment conditions from the three NPDES reference stations to the sediment conditions at NASSCO and Southwest Marine from urban runoff. Sediment conditions from urban runoff is evaluated on a yearly basis at NASSCO and Southwest Marine as required by the NPDES monitoring programs for the shipyards. Station NSS-STD-01 is sampled in the vicinity of stormdrain SW-9 and is located on the south side of the NASSCO facility near Chollas Creek. Station SWM-STD-01 is sampled in the vicinity of stormdrain SW-4 and is located near the bulkhead between Piers 3 and 4 at Southwest Marine.

The objective of the statistical analysis was to identify a reference station that most closely represents sediment conditions that would exist within the NASSCO and Southwest Marine leaseholds prior to waste discharges (per Resolution No. 92-49, *Policies and Procedures for Investigation and Cleanup and Abatement of Discharges under Water Code Section 13304*). The sediments in the vicinity of NPDES stations NSS-STD-01 and SWM-STD-01 are assumed to be mostly affected by watershed runoff and have minimal influence by shipyard discharges. The contaminants that were used in the statistical analysis consist of five metals

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD

SAN DIEGO REGION

IN RE THE MATTER OF)
)
TENTATIVE CLEANUP AND ABATEMENT)
ORDER NO. R9-2011-0001)
)
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______________________________________)

EXHIBIT BOOK TWO OF THREE TO THE

DEPOSITION OF DAVID BARKER

Volume I - IV

San Diego, California

2011

Reported By: Anne M. Zarkos, RPR, CRR, CSR No. 13095

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Barker
jmsteno.com

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN DIEGO REGION

ADDENDUM NO. 1 TO CLEANUP AND ABATEMENT ORDER NO. 85-91

PACO TERMINALS, INC.
NATIONAL CITY
SAN DIEGO COUNTY

The California Regional Water Quality Control Board, San Diego Region (hereinafter Regional Board) finds that:

1. On December 12, 1985, the Regional Board Executive Officer issued **Cleanup and Abatement Order No. 85-91, Paco Terminals, Inc., National City, San Diego County.** Order No. 85-91 contained findings establishing that copper ore loading and storage operations at Paco Terminals Inc. had resulted in discharges of inorganic copper ore to San Diego Bay. The inorganic copper ore consisted of a rendered form of cupric ferrous sulfide ore known as chalcopyrite. The discharges of copper ore to San Diego Bay were in direct violation of discharge prohibitions contained in Order Nos. 79-72 and 84-50, **Waste Discharge Requirements for Paco Terminals Inc., National City, San Diego County.** Order No. 85-91 directed Paco Terminals to submit a report identifying the lateral and vertical extent of copper ore in sediments near Paco Terminals and cost estimates associated with three cleanup alternatives to remove the copper ore from San Diego Bay.

2. In March, 1986 Paco Terminals Inc. submitted a report entitled **An Evaluation of the Impact of Copper Ore in the Marine Environment in the Vicinity of Paco Terminals Inc. on the Beneficial Uses of San Diego Bay**, prepared by Westec Services Inc. (hereinafter referred to as the March, 1986 Westec Report). The March, 1986 Westec Report was submitt d in response to Directive 1 of Cleanup and Abatement Order No. 85-91 and was a continuation of a previous report submitted by Paco Terminals Inc. to the Regional Board in September, 1985. The March, 1986 Westec Report presented an evaluation of the cost and feasibility of three alternative cleanup options, provided additional information on the vertical and horizontal distribution of copper contaminated sediments and presented an evaluation of the effects of the copper contaminated sediments on the marine habitat beneficial use (the beneficial use potentially most affected by the copper ore discharge) of San Diego Bay.

3. In August, 1985 and January, 1986 Westec Services Inc. conducted sediment sampling in San Diego Bay to establish the vertical and horizontal distribution of the copper ore in the bay sediments. The study area extended approximately 1 nautical mile north and south and 0.5 nautical miles west of Paco Terminals Inc.. The vertical profile of copper ore in the bay sediments was obtained by collecting core samples at 9 different sites in the study area. The vertical core sediment samples were collected to depths up to the maximum core penetration depth. The maximum vertical core sample depths ranged from 12 inches to 52 inches. The horizontal distribution of copper ore in the bay sediments was determined based on 34 station sites sampled in August, 1985 and 77 stations sampled in January, 1986.

4. One vertical core sample collected at Station G-16 immediately adjacent to the Paco Terminals Inc. pier face contained a copper concentration of 12,500 milligrams per kilogram (mg/kg) at the top portion and 4,780 mg/kg in the bottom portion at a depth of 40 inches. Copper concentrations determined at the remaining 8 sample sites located 240, 480, 720, 1500, and 3000 feet from the pier face ranged from 3.0 to 9.0 mg/kg. With the exception of the vertical core sample collected from Station G-16, the vertical core sample values showed that the copper contamination in the affected bay sediments decreased markedly with depth and thus was primarily a surface phenomena.

5. The surficial sediment samples collected to determine the surficial areal extent of the copper ore contamination revealed that copper concentrations at stations 9, 15, 16, 22, and 23 along the Paco Terminals Inc. pier face ranged from 2300 mg/kg to 28,600 mg/kg. A surface sediment sample collected at Station 8, adjacent to the mouth of a storm drain tributary to Paco Terminals Inc., had a copper concentration of 9300 mg/kg. Copper concentrations in sediment samples collected along the Paco Terminals Inc. pier face and adjacent to the storm drain pipe were markedly higher than elsewhere in the study area. Sample stations located from 250 to 750 feet from the pier face (Stations 10, 11, 12, 17, 18, 19, 24, and 26) had copper concentrations ranging from 47 mg/kg to 372 mg/kg. Sample stations located 1500 to 3000 feet from the pier face (Stations 13, 14, 20, 21, 27, and 28) had copper concentrations ranging from 29 mg/kg to 45 mg/kg. Sediment sample stations located approximately 0.5 miles to the north and south of Paco Terminals Inc. had copper concentrations ranging from 118 mg/kg to 141 mg/kg and 209 mg/kg to 325 mg/kg.

6. Directive 1(a) of Cleanup and Abatement Order No. 85-91 required Paco Terminals Inc. to examine the cost and feasibility of removal and/or treatment of the copper contaminated sediment to attain sediment copper concentrations essentially equivalent to the copper concentrations occurring prior to commencement of operations by Paco Terminals Inc.. In April, 1979 Regional Board staff collected sediment samples adjacent to 24th Street Marine Terminals, prior to the occupation of the site by Paco Terminals Inc.(The site was occupied by Paco Terminals Inc. in early 1980.) The six sediment samples collected by Regional Board staff at that time had copper concentrations ranging from 91.7 mg/kg to 177.9 mg/kg. The average copper concentration of the six sediment samples was 110 mg/kg.

7. Directive 1(a) of Cleanup and Abatement Order No. 85-91 stated that any other data obtained by Paco Terminals Inc. to describe the copper concentrations occurring in the sediments prior to 1980 would be considered if sufficient documentation were provided. The March, 1986 Westec Report stated that baseline copper concentrations were as high as 398 mg/kg in the vicinity of 24th Street Marine Terminal prior to the occupation of the site by Paco Terminals Inc.. This conclusion was based on bioassay studies conducted on bay sediments at the nearby 32nd Street Naval Station, Piers 1 through 13 by the Naval Oceans Systems Center in 1979 in support of a proposed dredging project. Sediment copper concentrations contained in the Naval Ocean Systems Center studies show that copper concentrations averaged 385 mg/kg at Navy Piers 1 to 13 in 1979. Navy Piers 10 to 13, which were included in the Paco Terminals Inc. study area, had sediment copper concentrations ranging from 27 mg/kg to 397.8 mg/kg. In 1982, Lockheed Ocean Science Laboratories conducted a bioassay of sediments midway

between the 24th Street Marine Terminal and Navy Pier 13 in support of a proposed dredging project. The average sediment copper concentration determined at this location in the Lockheed Ocean Science Laboratories studies was 290 mg/kg.

8. The sediment copper concentration of 397.8 mg/kg referenced in Finding No. 7 occurred on the south side of Navy Pier 10 near the shoreline approximately 4000 feet north of Paco Terminals Inc.. Navy Pier 13 is located approximately 1200 feet north of Paco Terminals Inc.. The copper concentrations for Navy Pier 13 contained in the 1979 Naval Ocean Systems Center study referenced in Finding 7 ranged from 27 mg/kg to 161 mg/kg with an average copper concentration of 116 mg/kg. The Regional Board does not believe that the 1979 Naval Ocean Systems Center and the 1982 Lockheed Ocean Science Laboratories data referenced in Finding 7 conclusively demonstrate that the level of copper concentrations existing at 24th Street Marine Terminal in 1979, prior to the occupation of the site by Paco Terminals Inc. could be characterized by a copper concentration of 385 mg/kg. The Naval Ocean Systems Center data cited in the March, 1986 Westec report indicates that the average copper concentration in sediments adjacent to Navy Pier 13, located approximately 1200 feet north of the 24th Street Marine Terminal averaged 116 mg/kg in 1979 - prior to the occupation of the 24th Street Marine Terminal site by Paco Terminals Inc.. The Lockheed Ocean Systems Center study sediment data collected in 1982 - after the occupation of the 24th Street Marine Terminal site by Paco Terminals Inc. - at an area approximately 600 feet north of a storm drain receiving storm runoff from Paco Terminals Inc., indicates that sediment copper concentrations in that area increased to 290 mg/kg. The increase of copper in the bay sediment in that area may have been the result of the discharge of storm runoff containing elevated concentrations of copper to the storm drain during storm events. The Regional Board believes that the Regional Board staff data, collected in 1979 in the bay sediments adjacent to the 24th Street Marine Terminal, and referenced in Finding 6 is the best available data to establish baseline copper concentrations existing at that point prior to the occupation of the site by Paco Terminals Inc.. Accordingly the Regional Board finds that the baseline copper concentration existing in sediments adjacent to the 24th Street Marine Terminal prior to the commencement of operations at the site by Paco Terminals Inc. was 110 mg/kg.

9. Directive 1(b) of Cleanup and Abatement Order No. 85-91 directed Paco Terminals Inc. to examine the cost and feasibility of removing the copper ore contaminated sediment to attain a) a six-month median copper concentration of 5 ug/l; b) a daily maximum copper concentration of 20 ug/l; and c) an instantaneous maximum copper concentration of 50 ug/l in San Diego Bay waters. This copper water quality objective was obtained from the **Water Quality Control Plan, Ocean Waters of California, 1983** (hereinafter referred to as the Ocean Plan), adopted by the State Water Resources Control Board on November 17, 1983. The Ocean Plan is applicable in its entirety to point source discharges of waste to ocean waters. The plan is not applicable to waste discharges to enclosed bays such as San Diego Bay. The **Water Quality Control Policy for the Enclosed Bays and Estuaries of California, 1974**, (hereinafter referred to as the Bays and Estuaries Policy), adopted by the State Water Resources Control Board on May 16, 1974, contains water quality standards applicable to waste discharges to enclosed bays and estuaries such as San Diego Bay. The Bays and Estuaries Policy requires that discharges of municipal wastewaters and industrial process waters to enclosed bays and estuaries

be phased out at the earliest practicable date. The Bays and Estuaries policy does not contain numerical water quality standards for waste discharges to bays and estuaries. The beneficial uses of San Diego Bay are similar, if not identical to those of the ocean. San Diego Bay waters are in hydrologic continuity to waters of the open ocean; however, the bay waters are generally subject to less dilution than ocean waters. Thus the water quality standard to protect the beneficial uses of San Diego Bay waters should be at least as stringent as the standards in the Ocean Plan which provide for the protection of open ocean waters. Accordingly the Regional Board believes that, in the absence of numerical water quality standards specifically applicable to San Diego Bay, any cleanup level selected by the Board should not cause the Ocean Plan water quality standard for copper to be exceeded in bay waters in order to provide for the protection of the beneficial uses of San Diego Bay.

10. The March, 1986 Westec Report contained an evaluation of the extent to which the copper ore in the bay sediment may be migrating from the sediments into the bay water column. Sample station 43, which had a sediment copper concentration of 19,800 mg/kg, was selected as the sampling point for the evaluation. Westec Services Inc. felt that this station represented the worst case situation in that this station had the highest sediment copper concentration in the study area based on the results of sampling conducted by Westec Services Inc. on January 29, 1986. Westec Services believed that if copper concentrations in the water column fell below the copper water quality objective referenced in Finding 9, it was reasonable to assume that copper concentrations in the water column overlying sediments with copper concentrations lower than Station 43 would also not exceed the copper water quality objective referenced in Finding 9. Westec Services Inc. also believed that the "worst case situation" would occur at high tide in San Diego Bay when copper-laden water from other possible discharge sources located between the bay entrance and Paco Terminals Inc. would enter the back bay and influence bay water samples collected adjacent to Paco Terminals Inc. Each water column sample collected was filtered through a 0.45 micron filter to remove the particulate matter. Westec Services Inc. analyzed the sample which passed through the filter to obtain the total "dissolved" copper concentration. Westec Services Inc. also analyzed the particulate matter retained on the 0.45 micron filter to obtain the total particulate copper concentration.

11. The average concentration of total dissolved copper in the water at Station 43 ranged from 3 ug/l (1 meter from the bay bottom under low tide conditions) to 4 ug/l (two meters from the bay bottom under high tide conditions). Westec Services Inc. maintained that these total dissolved copper concentrations were less than the copper water quality objective referenced in Finding 9. The average total particulate copper concentration in the water at Station 43 ranged from 6 ug/l (2 meters from the bay bottom under low tide conditions) to 18 ug/l (two meters from the bay bottom under high tide conditions). Westec Services Inc. maintained that the total particulate copper concentration was less than the 50 ug/l instantaneous maximum water quality objective referenced in Finding 9. Compliance with the copper water quality objective referenced in Finding 9 is only determined through analyses of water samples for total recoverable copper as defined in Title 40, Code of Federal Regulations, Part 136 (40 CFR 136). Total recoverable copper is defined as the concentration of copper determined on an unfiltered sample after vigorous digestion, or the sum of the copper concentrations in both the filtrable

and nonfilterable sample fractions. Accordingly, it is incorrect to measure compliance with the copper water quality objective referenced in Finding 9 by comparing the objective with only the copper concentration found in the filterable sample and excluding the copper concentration found in the nonfilterable sample or vice-versa. Compliance with the copper water quality objective can only be fully determined through comparison with the total recoverable copper concentration of the Station 43 sample results; this value is obtained by summing the copper concentration found in the filterable and nonfilterable sample fractions. The average total recoverable copper concentrations for Station 43, determined by the Regional Board by summing the filterable and nonfilterable copper concentrations reported by Westec Services Inc., ranged from 10 ug/l (2 meters from the bay bottom under low tide conditions) to 21 ug/l (two meters from the bay bottom at high tide conditions). The average total recoverable copper concentrations did not exceed the instantaneous maximum copper water quality objective of 50 ug/l which applies to grab sample determinations. However, the average total recoverable copper concentration did exceed the six month median copper water quality objective of 5 ug/l under both high tide and low tide conditions. Compliance with the six month median objective is measured by calculating the median of daily values during any 180 day period. While a one day sample event is insufficient to determine compliance with a six month median copper water quality objective, it is significant to note that the 5 ug/l six month median objective was exceeded under both high and low tide conditions. Additional sample values would be required to fully confirm that the copper ore contaminated sediment is causing the 5 ug/l six month median objective to be exceeded in the water column.

12. The March, 1986 Westec Report contained data on the copper concentrations in the interstitial water lying in the bay sediment immediately adjacent to the sediment grains. The sampling plan was designed to evaluate the worst case conditions by conducting the sampling at Station 43 which had the highest sediment copper concentration of the January, 1986 sediment samples. Four replicate samples were collected by Westec Services Inc. by inserting syringes into the bay sediment and withdrawing a water sample. The samples were filtered through a 0.45 micron filter to remove particulates, thus sample analysis only determined the total dissolved copper concentration in the interstitial water. The total dissolved copper concentration in the interstitial water ranged from 80 ug/l to 480 ug/l with an average concentration of 214 ug/l.

13. The Regional Board compared the interstitial water concentrations referenced in Finding 12 with the Ocean Plan copper water quality objective referenced in Finding 6. Under this approach it was assumed that the interstitial water was the primary source of contaminants to benthic biota. It was also assumed that the exceedance of the six month median copper water quality objective of 5 ug/l in the interstitial water could adversely affect benthic biota and thus also adversely affect the marine habitat beneficial use of San Diego Bay. Based on the interstitial water copper concentrations discussed in Finding 12 the Regional Board believed that the existing sediment copper concentration appeared to be 1) causing the interstitial water concentrations to greatly exceed the 5 ug/l copper water quality objective, and 2) threatening to adversely affect benthic biota in the copper ore contamination area. By letter dated July 31, 1986 the Regional Board directed Paco Terminals Inc. to collect additional interstitial water samples to determine the areal extent of elevated copper concentrations in the

interstitial waters. Paco Terminals Inc. was also directed to gather sufficient data to define the relationship between sediment copper concentration and interstitial water copper concentration.

14. By letter dated September 11, 1987 Paco Terminals Inc. objected to the Regional Board's application of the Ocean Plan copper water quality objective referenced in Finding 6 to interstitial water. Paco Terminals Inc. maintained that interstitial waters from most sediments from embayments typically exceed Ocean Plan limits for many chemical variables such as sulfides, ammonia, and biological oxygen demand, because the interstitial water is relatively restricted compared to the overlying water column with reduced opportunity for dilution. The Regional Board believes that concentrations of some chemical constituents would be expected to be naturally greater in interstitial water than in the overlying water column. However, Paco Terminals Inc. has not demonstrated that the interstitial water copper concentrations in the affected area are within the range of concentrations which could be expected to naturally occur.

15. On March 24, 1987, Paco Terminals, Inc. submitted a report prepared by Westec Services, Inc. entitled **Evaluation of Copper in Interstitial Water from Sediments at Paco Terminals, San Diego Bay, Phase II**(hereinafter referred to as the March, 1987 Westec Report. The stated objectives of this report were to 1) define the relationship between copper concentrations in the sediment and interstitial water, and 2) if such a correlation does exist, use the correlation to determine the horizontal distribution of copper in the interstitial water adjacent to Paco Terminals Inc.. Westec Services Inc. collected 36 core samples on February 4, 1987 at distances up to 170 feet from the Paco Terminals Inc. pier face. Westec Services Inc. reported that due to probable interferences from salts in the sea water, interstitial water samples had to be diluted with deionized water to reduce the interference. The dilution process reduced the level of detection for copper from 2 ug/l to 20 ug/l. Thus the interstitial water copper concentration could not be compared with the Ocean Plan 5 ug/l copper water quality objective due to the reduction in the level of detection to 20 ug/l. The interstitial water concentrations ranged from <20 ug/l to 300 ug/l (one of the 36 interstitial water samples was not analyzed due to an insufficient sample volume). The sediment copper concentration ranged from 21 ug/l to 21,700 ug/l.

16. The March, 1987 Westec Report contained the results of a linear regression analysis of the data referenced in Finding 15. The purpose of the evaluation was to determine if there was a statistically significant relationship between copper concentrations in the interstitial water and the sediment. Two correlation relationships between the copper concentration in the interstitial water and sediment were developed. One of the correlation relationships employed all 35 sample results. The second correlation relationship employed only 33 sample results; two sample results were removed from consideration because of possible sample contamination. Both correlation relationships assumed that 16 sample results, with reported interstitial water copper concentrations of <20 ug/l, were actually 20 ug/l - a worst case assumption. The sediment copper concentrations at

which the 50 ug/l instantaneous maximum Ocean Plan copper water quality objective is attained in the interstitial water as predicted by the two correlation relationships are presented below:

Linear Regression Analysis	Correlation Value	Number of Samples	Sediment Copper Concentration
1	0.369	35	3,950 mg/kg
2	0.593	33	7,050 mg/kg

Westec Services Inc. believed that Analysis 2, which determined that removing the copper contaminated sediment to a copper concentration of 7,050 mg/kg would result in a interstitial water concentration of 50 ug/l, was the best estimate due to the higher correlation value.

17. The March, 1987 Westec Report did not establish a clearly defined relationship between the sediment copper concentration and either the Ocean Plan copper water quality objective six-month median limitation of 5 ug/l or the daily maximum limitation of 20 ug/l. However, as shown in Finding 16, the available data does indicate that a relationship exists between the Ocean Plan copper water quality objective instantaneous maximum limitation of 50 ug/l and the sediment copper concentration. Based on the regression analysis referenced in Finding 16, an interstitial water copper concentration of 50 ug/l is associated with a sediment copper concentration of 7,050 mg/kg. The Regional Board believes that although the available data do not provide a clearly defined relationship between the six-month median copper concentration limit of 5 ug/l and a particular sediment copper concentration, the data indicates that the sediment copper concentration corresponding to the Ocean Plan six month median concentration limit would likely be no greater than 1000 mg/kg.

18. The March, 1986 Westec Report examined the effects of the copper contaminated sediment on the benthic biota in the vicinity of Paco Terminals Inc. The report characterized the benthic community as impoverished with low numbers of species and individuals and low species diversity. The report found that 93.5 percent of the area influenced by the copper contaminated sediment was already influenced by shipyard operations and other harbor activities prior to the commencement of operations at Paco Terminals Inc. The impoverished condition of the benthic community was attributed in part to disturbances from harbor activities such as ship movement, with the attendant propeller wash and scour, and maintenance dredging. The impoverished condition of the benthic community was cited as a historic condition in that it had been noted in other studies in the general vicinity of 24th Street Marine Terminal in 1974 and 1977- prior to the commencement of operations by Paco Terminals Inc. No statistically significant relationship between sediment copper concentration and total number of species, total number of individuals and species diversity was found.

19. The March, 1986 Westec Report does not conclusively demonstrate that the copper ore does not have the potential to adversely affect benthic communities. As previously stated in Finding 18, the vitality of the benthic community was

depressed prior to the deposition of copper ore in the sediment. It is possible that a direct correlation between sediment with a high copper concentration and benthic community indices might be found in areas which have more diverse benthic communities. The Regional Board also believes that some of the environmental stresses which were responsible for the depressed condition of the benthic community prior to the commencement of operations by Paco Terminals Inc. may be reduced in the future. Improved controls over anti-fouling boat hull paints and painting techniques and other changes in vessel activities could provide conditions conducive to an increase in the diversity and numbers of marine organisms in the vicinity of Paco Terminals Inc. However if copper ore is allowed to remain on the floor of San Diego Bay in the present high concentrations, the potential vitality of future biological communities might be limited long after other environmental stresses have been reduced or eliminated.

20. By letter dated September 11, 1987 Paco Terminals Inc. submitted information pertaining to the potential for migration of the copper ore contaminated sediment to other portions of San Diego Bay. It was reported that the probability for significant migration of the copper contaminated sediment is low due to the following factors:

    a) The copper ore is very dense and sinks rapidly. Any copper ore re-suspended by tidal action or ship propeller wash would probably not travel very far before sinking to the bay bottom;

    b) Tidal currents adjacent to 24th Street Marine Terminal are generally low;

    c) The number of large vessels capable of re-suspending the copper ore contaminated sediment while passing over the area is small due to it's location near the terminus of the main San Diego Bay navigation channel; and

    d) A review of 10 sets of quarterly NPDES permit monitoring reports covering the period 1985 - 1987 and other data indicates that the copper ore contaminated sediment is not migrating.

    The Regional Board believes that migration of the copper ore contaminated sediment can be expected to remain quite slow unless increases in tidal currents and/or vessel activities occur. However, any dredging activities in the area near Paco Terminals could contribute significantly to the migration of the copper ore within the bay.

21. The March, 1986 Westec Report evaluated State Mussel Watch data contained in the **California State Mussel Watch Report, 1981-1983.** Data provided by the State Mussel Watch Program shows that mussels held at Station 882, located adjacent to Paco Terminals Inc., had some of the highest copper concentrations found in the mussel watch program. The mussel watch sample results (dry weight) showed an average copper concentration of 58.1 ug/g in January, 1982, 60.3 ug/g in December, 1982, 78.7 ug/g in January, 1984, and 88.1 ug/g in January, 1985. All mussel watch sampling data at Station 882 exceeded both the 85 and 95 percent Elevated

Data Level (EDL)[1] for copper of 12.1 ug/g dry weight and 24.4 ug/g dry weight, respectively; thus the mussel copper concentrations represent very elevated concentrations. Westec Services Inc., citing data from the 1981-83 Mussel Watch, conclude that a 38.4 percent reduction in copper concentration found between depurated[2] and undepurated mussel samples collected from Station 882 is due to the elimination of inorganic particulate matter in the mussel digestive tract. With the particulate copper removed, the remaining results provide a more accurate reflection of actual copper concentrations in the mussel tissue. Westec Services Inc. maintains that much of the copper found in the tissues of the mussels held at Station 882 is from discharges from the nearby shipyard operations.

22. The Regional Board believes that because the sediment near Paco Terminals Inc. contains a high proportion of copper ore, any sediment which is found within the digestive tract of mussels at Station 882 might also contain a high proportion of copper ore. As noted in Finding 21, the effect of this ingested sediment on the analytical results for Station 882 was documented in the 1981-83 Mussel Watch. During that program ten mussel watch stations, including Station 882, were selected statewide and were analyzed in both a depurated and a non-depurated condition. Depuration was found to reduce copper concentrations at Station 882 by 38.4%, while reductions found at the other nine stations ranged between 7.5 % and 25.1%, and averaged only 13.2%. (Subsequent Mussel Watch samples have not been depurated.)

23. As previously stated in Finding 21, Westec Services Inc. believes that the high State Mussel Watch copper concentrations found near Paco Terminal Inc. may be due in large part to the proximity of the terminal to the 32nd Street Naval Station and other commercial ship repair facilities. These vessel repair areas start at Pier 13 of the 32nd Street Naval Station, approximately 1000 feet north of the 24th Street Marine Terminal, and extend approximately three and one-half miles north to the Coronado Bridge. Five Mussel Watch stations have been located in that area during the Mussel Watch Program. Of these five stations, Station Nos. 886 and 887 are near the NASSCO ship repair facility approximately 3 miles north of Paco Terminals; Station No. 885 is located at Buoy 30 on the west side of the navigation channel approximately 1.5 miles north Paco Terminals; Station No. 882.6 is located at the extension of Sampson Street approximately 2 miles north of Paco Terminals; and Station No. 882.4 is located near the end of Pier 13 less than 2000 feet north of Paco Terminals. Since Station No. 882.4 is located at the extreme south end of the vessel repair facilities, less than 2000 feet from Paco Terminal's ore transfer facility, any copper-based anti-fouling paints which

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1 The Elevated Data Level (EDL) has been developed by the State Mussel Watch Program to identify locations where levels of toxic substances are significantly higher than the levels measured statewide. The 85 or 95 percent EDL is that concentration of a substance that equals or exceeds 85 or 95 percent of all State Mussel Watch measurements of the substance in the same mussel type throughout the State.

2 Depuration is a process whereby mussels are placed in aerated or circulating "clean" sea water essentially free of trace metals and synthetic organic compounds as soon after sample collection as possible.

originate in the ship repair yards north of Paco Terminals and affect Station 882 at Paco Terminals Inc. should have at least as great an impact on mussels at Station No. 882.4. Mussel Watch data provided in the table below reveal that the copper concentration in mussels at Station 882.4 is less than the concentration found at Stations 882 and 882.2. This condition exists even after the data have been adjusted to compensate for the elevated level of particular copper contained within the mussels at the 24th St Marine Terminal station(s). The unusually high concentration of particulate copper entrained within the digestive tracts of the mussels at Station No. 882 indicate that there is a high level of particulate copper within the waters near that station. Although the particulate copper which is contained within the digestive tract is not a measure of the copper which is incorporated into mussel tissue, it can be viewed as a potential source of copper, which might, in part, become assimilated into the mussel tissue.

STATE MUSSEL WATCH COPPER CONCENTRATION DATA

Station Number	Date	Copper Conc.(ug/g) Non-Dep	Dep[3]	Distance (ft) and Direction from Station G-16[4]	
882.4	12/29/82	32.67	30.22	1,880	North
882.2	12/29/82	50.27	30.94	710	North
882.0	12/29/82	60.32	37.13	330	South
882.4	01/04/84	31.8	29.4	1,880	North
882.0	01/04/84	78.7	48.4	330	South
882.4	01/04/85	21.20	19.61	1,880	North
882.0	01/04/85	88.10	54.23	330	South

3 Sample values are also shown reduced by the proportion indicated in the 1981-83 Mussel Watch depuration study in order to simulate the copper concentrations which might be expected to exist if all mussels had been depurated. Station No. 882.4, which is not expected to be heavily influenced by copper ore, is reduced by 7.5% and Station Nos. 882 and 882.2, which are expected to be heavily influenced by copper ore, are reduced by 38.4%.

4 Station G-16 is located along the pier face of Paco Terminals, Inc. The exact location of this station is described in the March 1986, Westec Report.

24. The March, 1986 Westec Report examined the cost and feasibility of five different cleanup options for removal of the copper contaminated sediment to sediment copper concentrations of 110 mg/kg, 350 mg/kg and 1000 mg/kg. The five cleanup options, in order of increasing cost, were: (1) dredging of sediment with ocean disposal of the dredged material, (2) dredging of sediment with disposal at Otay Sanitary Landfill, (3) dredging of sediment with truck shipment to mine for reclamation of copper ore, (4) dredging of sediment followed by rail shipment to mine for reclamation of copper ore, and (5) dredging of sediment with disposal at Casmalia landfill. The projected costs to achieve the three alternative cleanup levels is summarized as follows:

Sediment Copper Concentration	Dredge Volume	Cleanup Cost Range
110 mg/kg	575,186 yds^3	$3,709,094 - $176,547,735
350 mg/kg	246,481 yds^3	$1,661,358 - $75,727,434
1000 mg/kg	57,402 yds^3	$472,922 - $17,722,649

The method to be employed by Paco Terminals Inc. for disposal of the dredged copper ore sediment is not known at this time. Westec Services Inc. reported that from an operational, logistic, and cost viewpoint, ocean disposal of the dredged material was the most feasible alternative at this time. However significant problems could arise in obtaining the necessary dredge spoil ocean disposal permit from the Army Corps of Engineers. Land disposal of the dredged material is also a possibility; however significant problems could arise in transporting large amounts of dredge material by truck and in gaining approval to dispose of the material in a landfill. Two of the dredge spoil disposal options involved returning the copper ore contaminated sediment to the mine where it originated for reclamation of the copper ore. These disposal options would be contingent on the quality of the copper ore and its potential for reclamation using the leaching process employed at the mine.

25. The preponderance of evidence in this matter demonstrates that operations at Paco Terminals Inc. resulted in the discharge of copper ore to San Diego Bay in direct violation of waste discharge requirements prescribed by the Regional Board and contained in Order Nos. 79-72 and 84-50. Therefore, under the terms and conditions of California Water Code Section 13304, the Regional Board is not required to demonstrate that the copper ore contaminated sediment is causing, or is threatening to cause, a condition of pollution in San Diego Bay in order to require its removal from the waters of the state. However, the Regional Board believes that the copper ore contaminated sediment is threatening to adversely affect the marine habitat beneficial use of San Diego Bay. The Regional Boards review of the available information indicates that the copper ore contaminated sediment significantly contributes to the very elevated copper concentrations found in mussels at Mussel Watch Station 882. The copper ore contaminated

sediment also appears to have caused the exceedance of Ocean Plan copper water quality objectives in both the water column and interstitial water of the affected portion of San Diego Bay.

26. The Regional Board, in determining the appropriate level of cleanup in this matter, is guided by the State Water Resources Control Board's Resolution 68-16, **Statement of Policy with Respect to Maintaining High Quality of Waters in California.** This policy provides that existing water quality be maintained when it is reasonable to do so. This policy further provides that any change in water quality be consistent with maximum public benefit and not unreasonably affect beneficial uses. The Regional Board has determined that discharges of copper ore from Paco Terminals Inc. have resulted in a change in water quality in the affected portion of San Diego Bay; the change in water quality threatens to adversely affect the marine habitat beneficial use of San Diego Bay. The Regional Board, based on the available information, is directing Paco Terminals Inc. to remove the copper ore contaminated sediment from the affected portion of San Diego Bay to attain a cleanup level sediment copper concentration of less than 1000 mg/kg. This cleanup level represents less than 100 percent removal of the copper ore contaminated sediment. The Regional Board has determined that this cleanup level is reasonable, consistent with maximum public benefit, and will not unreasonably affect beneficial uses.

27. This enforcement action is exempt from the provisions of the California Environmental Quality Act (Public Resources Code, Section 21000, et seq.) in accordance with Section 15321, Chapter 3, Title 14, California Administrative Code.

It is hereby ordered that, pursuant to California Water Code Section 13304:

1. Paco Terminals, Incorporated, shall reduce the sediment copper concentration in the affected portion of San Diego Bay identified in the March, 1986 Westec Report to a sediment copper concentration less than 1000 mg/kg by January 3, 1989.

2. Paco Terminals Inc. shall submit a technical report to the Regional Board no later than February 4, 1988 containing a discussion of the proposed procedures to cleanup the copper contaminated sediment. The report shall contain a detailed time schedule for completion of all activities associated with the cleanup of the copper ore contaminated sediment. The report shall also include the sampling procedures that will be used to determine the completion of the cleanup.

3. Paco Terminals Inc. shall submit cleanup progress reports to the Regional Board on a quarterly basis, until in the opinion of the Regional Board Executive Officer, the cleanup of the copper contaminated sediment has been completed. The progress reports shall include information on a) the percent completion of the cleanup project, b) the status of requests for permits and their expected approval dates, c) any anticipated deviation from the time schedule submitted in accordance with

Directive 2 of this Addendum, and d) any other relevant information. The progress reports shall be submitted in accordance with the following reporting schedule:

Reporting Period	Report Due
January, February, March	April 30
April, May, June	July 30
July, August, September	October 30
October, November, December	January 30

4. Paco Terminals Inc. shall no later than December 3, 1988 submit a post-cleanup sampling plan to verify the attainment of the prescribed cleanup standards in the area of sediment copper contamination identified in the March, 1986 Westec Report. Upon approval of the sampling plan by the Regional Board Executive Officer, Paco Terminals Inc. shall collect and analyze the samples prescribed in the sampling plan. The post-cleanup sample results shall be submitted to the Regional Board no later than April 3, 1989.

5. Directive No. 5 of Cleanup and Abatement Order No. 85-91 is hereby rescinded.

PROVISIONS

1. Paco Terminals Inc. shall submit to the Regional Board on or before each completion date a report of compliance or noncompliance with the specific task. If noncompliance is being reported, the reasons for such noncompliance and an alternative compliance schedule shall be stated. The discharger shall notify the Regional Board by letter upon return to compliance with the time schedule.

Ordered by Ladin H. Delaney
Ladin H. Delaney
Executive Officer

Dated: November 13, 1987

DTB:GBP:LKM

1233

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN DIEGO REGION

STAFF REPORT
FOR
CLEANUP AND ABATEMENT ORDER NO. 98-08

ISSUED TO

THE AEROSTRUCTURES GROUP OF BF GOODRICH AEROSPACE (formerly ROHR, INC.) AND THE BF GOODRICH COMPANY

Written By

Karen Travis Zachary
Water Resource Control Engineer
Site Mitigation and Cleanup Unit

March 26, 1998

EXHIBIT NO. 1233
Barker
jmsteno.com

EXECUTIVE SUMMARY

Cleanup and Abatement Order (CAO) No. 98-08 was issued to require the Aerostructures Group of BF Goodrich Aerospace, formerly called Rohr, Inc. (Rohr) and Rohr's owner, The BF Goodrich Company of Ohio, to address the effects of contaminated discharges to San Diego Bay and sitewide ground water contamination. San Diego Bay waters flow in and out the storm water conveyance system beneath Rohr's operations daily. Rohr has affirmed that approximately 1/3 of the storm water conveyance system has been cleaned to date. Areas of known ground water contamination are in close proximity to these storm drains and other potential preferential pathways and may explain the elevated levels of metals reported in storm water/tidal water at Rohr's property line. While some areas of petroleum, chlorinated solvent, and metals contamination have been identified and characterized over many years, the sources and sitewide extent of all known problems have not been found. The SDRWQCB has asked Rohr, in coordination with the County of San Diego, for improved assessment efforts including performing 'sitewide assessment,' and Rohr has not responded voluntarily.

In addition to the direct and continuing threat to the beneficial uses of San Diego Bay, there are additional reasons why CAO No. 98-08 has been issued:

- Longstanding concerns about historic discharges or infiltration of contamination into the aged storm water conveyance system serving the site,
- Sensitive riparian areas, including a National Wildlife Refuge, lie on three sides of their facility,
- The City of Chula Vista and Port of San Diego has active redevelopment plans for the Chula Vista waterfront area,
- Rohr has already publicly disclosed to shareholders that the SDRWQCB was conducting an investigation, and
- Potential for site management instability due to recent merger with BF Goodrich.

Because protection of the beneficial uses of San Diego Bay and riparian areas are critical, the primary focus of this limited order is to assess both the storm water quality and the integrity of the storm water conveyance system. Presently, in addition to requiring improved storm water testing (already required by the General Industrial Storm Water Permit) and investigation of the storm water conveyance system itself, CAO No. 98-08 requires submissions of environmental 'due diligence' information, a compilation of isolated monitoring data, and a development of a sitewide assessment workplan to prepare for holistically addressing the ground water contamination. Rohr already has an extensive amount of environmental due diligence data, an onsite environmental staff, and sophisticated maps to employ in their efforts to comply with the CAO. Once the required submissions are made and the prospective scope of environmental problems becomes known, future requirements may or may not be issued.

BACKGROUND AND AGENCIES CURRENTLY INVOLVED

Rohr, Inc.(Rohr) was founded in Chula Vista as Rohr Aircraft Corporation in 1940. Still headquartered in Chula Vista, Rohr has continuously engineered and manufactured structural assemblies for aircraft for nearly 60 years. In fiscal 1996, Rohr reported total revenue of $771 million and was a public corporation listed on the New York Stock Exchange. Rohr has eight operations facilities across the United States that variously perform engineering, design, tooling, manufacturing, assembly, and delivery of aircraft engine components. Rohr also operates internationally and manages "an overhaul and repair presence spanning three continents."

Rohr's Chula Vista operational activities include metal parts fabrication, degreasing, cleaning, anodizing, plating, chemical milling, conversion coating, and painting as well as leading edge manufacturing technologies. A zinc and lead foundry and a sludge treatment/recycling facility also operate onsite. In September 1997 Rohr announced a pending stock acquisition by BFGoodrich Company of Richfield, Ohio. In December 1997 BFGoodrich finalized the transaction and incorporated Rohr into the corporation as the Aerostructures Group of the Aerospace Division of BFGoodrich. Since the merger, Rohr has continued operations under the name "Aerostructures Group of BFGoodrich Aerospace" (hereinafter Rohr).

Rohr has operated continuously at this Chula Vista waterfront location. In the early 1950s, the Chula Vista shoreline was expanded by land created from Bay fill. By the mid-1960s, Rohr had expanded westward onto the new tidelands. Subsequent fill activities over the years has resulted in the present shoreline configuration. Rohr has historically owned or leased up to 176 contiguous acres in Chula Vista. By 1969 Rohr had constructed 47 buildings. Today Rohr controls approximately 160 acres although not all the existing buildings are in use.

Rohr is currently regulated by the County Department of Environmental Health's Industrial Compliance Program, Department of Toxic Substances Control (DTSC), the Air Pollution Control District, and the SDRWQCB. Rohr is currently under the *Industrial Activities Storm Water General Permit (NPDES No. CAS000001)* and has been since July 1993. Since 1988, Rohr's known ground water contamination cleanup activities have been overseen by the County of San Diego's Local Oversight Program until July 1997 when Rohr transferred several cases to the SDRWQCB. Presently, the Site Mitigation and Cleanup Unit has taken responsibility for non-tank and chlorinated solvent issues while the County Site Assessment and Mitigation Unit continues toward resolution of tank-related petroleum and one hexavalent chrome contaminant issues.

In addition to experience with local cleanup oversight, Rohr has been directly involved in a number of larger environmental cleanups. In September 1997, Rohr's SEC 10-K disclosed that Rohr has been involved in the Stringfellow and Casmalia CERCLA Superfund cleanups and with the Rio Bravo Deep Injection Well Disposal Site State Superfund cleanup. Rohr reported that the resolution of these matters "will not have a material adverse effect on the financial position or results of operations." In the 10-K Rohr also disclosed that the DTSC was demanding $30,000 in unpaid cost recovery that was still outstanding, and that this was after DTSC had accepted a reduced monetary claim settlement on the site a year earlier. Additional disclosures regarding Rohr's Chula Vista headquarters facility describes that investigations such as spills and underground tank closures are typically conducted and named the SDRWCB and the County of San Diego as two agencies that were already "conducting certain investigations." Rohr reports that they "intend to cooperate fully with the various regulatory agencies."

SITE DESCRIPTION

The site subject to this order, is approximately bounded by F Street to the North, J Street to the South, Bay Boulevard to the East, and Sandpiper Way to the West. Approximately half of the Site is publicly owned, primarily by the San Diego Unified Port District. The balance is privately owned, primarily by Rohr. A narrow strip of land owned by San Diego Gas and Electric and San Diego and Arizona Eastern railway bisects the Site just South of Bay Boulevard. A tidal marsh, protected as a National Wildlife Refuge lies immediately west of Rohr's corporate office buildings.

The site elevation is between approximately 3 -8 feet above mean sea level throughout the site. The ground water is shallow (2' to 5' below surface) and the ground water flow gradient is east/southeast towards San Diego Bay. There are currently no public or private water supply wells located at the site or west of Interstate 5 in the surrounding area. Any sustained well production of shallow ground water at the site would likely result in saltwater intrusion. However, there are ongoing studies by the Sweetwater Authority and the County Water Authority just east of Interstate 5 in Chula Vista on the viability of ground water storage and deep water supply production within the San Diego Formation. The San Diego Formation is a large geologic formation lying approximately 50 feet beneath the surface alluvium and is over 800 feet thick. The San Diego Formation underlies the site.

APPLICABLE WATER QUALITY OBJECTIVES

The Site is located within the La Nacion Hydrologic Subarea (HSA) 9.12 of the Sweetwater Hydrologic Unit *Water Quality Control Plan for the San Diego Region 9* (Basin Plan) as amended, which was adopted by the SDRWQCB on September 8, 1994. The designated beneficial uses for ground water established by the Basin Plan in HSA 9.12 include:

Agricultural Supply (AGR)
Industrial Service Supply (IND)
Municipal and Domestic Supply (MUN)

Because of the direct threat to San Diego Bay, requirements that address surface water concerns will be the initial focus of this order. Federal and State drinking water standards called Maximum Contaminant Levels (MCLs) are used for the protection of municipal beneficial use of ground water. In fact, water quality standards for protecting many surface water beneficial uses (e.g. marine aquatic life) are generally more stringent than drinking water standards applied to ground water.

The following are designated surface water beneficial uses have been established in the Basin Plan for Sweetwater River HSA 9.12 of the Sweetwater River Watershed:

Industrial Service Supply (IND)
Potential Contact Water Recreation (REC1)
Non-contact Water Recreation (REC2)
Warm Freshwater Habitat (WARM)
Wildlife Habitat (WILD)

The Recreation and Habitat beneficial uses are the primary focus of protection in this Order.

The following are designated beneficial uses of San Diego Bay:

Commercial and Sportfishing (COMM)
Contact Water Recreation (REC1)
Estuarine Habitat (EST)
Industrial Service Supply (IND)
Marine Habitat (MAR)
Migration of Aquatic Organisms (MIGR)
Navigation (NAV)
Non-contact Water Recreation (REC2)
Preservation of Biological Habitats of Special Significance (BIOL)
Rare, Threatened, or Endangered Species (RARE)
Shellfish Harvesting (SHELL)
Wildlife Habitat (WILD)

The Commercial, Recreation, Habitats, and Rare Species beneficial uses are the primary focus of protection in this Order.

The following *are USEPA National Ambient Water Quality Criteria Saltwater Aquatic Life Protection* standards which may apply to non-storm water discharges as receiving water quality objectives for San Diego Bay:

(Micrograms/Liter = µg/L)

Constituents	*4 Day Average*	*1-Hour Average*
Arsenic	36	69
Cadmium	9.3	43
Chromium (Hexavalent)	50	1100
Copper	-	2.9
Cyanide	-	1.0
Lead	5.6	140
Mercury (inorganic)	-	2.1
Nickel	8.3	75
Selenium	71	300
Silver	-	2.3

Constituents	*4 Day Average*	*1-Hour Average*
Zinc	86	95

The following are select 1997 *California Ocean Plan* Standards which may apply to non-storm water discharges as either effluent limits or receiving water quality objectives or both for San Diego Bay:

(Micrograms/Liter= µg/L and Milligrams/Liter = mg/L)

Constituents	*Daily Maximum*	*Instantaneous Maximum*
Total Chlorine Residual (µg/L)	8	60
Cyanide (µg/L)	4	10
Phenolic Compounds (µg/L)	120	300
Chlorinated Phenolics (µg/L)	4	10
Grease and Oil (mg/L)	-	75
Settleable Solids (mg/L)	-	3.0
Acute Toxicity (TUa)	-	2.5
Chronic Toxicity (TUc)	1	-
pH (no units)	-	6.0 to 9.0

The "California Toxics Rule" (62 FR 42193 Proposed Section 131.38 *Establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California*) proposed by US Environmental Protection Agency as replacement for the rescinded SWRCB Enclosed Bays and Estuaries and Inland Surface Water Policies may be adopted in the future. Other water quality standards already established but not listed here may also apply.

Pursuant to SWRCB Resolution No. 68-16, the SDRWQCB is required to ensure that Dischargers are required to clean up and abate the effects of discharges in a manner that promotes the attainment of background water quality, or the highest water quality which is reasonable if background levels can not be restored, considering all demands being made and to be made on those waters and the total values involved, beneficial and detrimental, economic and social tangible and intangible; any alternative levels less stringent than background shall:

a) be consistent with the maximum benefit to the people of the state;
b) not unreasonably affect the present and anticipated beneficial use of such water; and
c) not result in water quality less than that prescribed in the Water Quality Control Plans and Policies adopted by the State and Regional Water Boards.

SWRCB regulations governing waste discharges to land, contained in the California Code of Regulations (CCR) Title 27, require that cleanup and abatement actions intended to contain waste at the place of release shall implement the applicable provisions of that chapter, to the extent feasible

(CCR Title 27, §20090(d)). CCR Title 27 §20400 will be considered in establishing cleanup levels and undertaking corrective actions where discharges of waste are subject to CWC §13304

Pursuant to SWRCB Resolution No. 92-49, the SDRWQCB may require Rohr to conduct investigations to determine the nature and horizontal and vertical extent of a discharge(s) in a progressive sequence. The phased sequence is typically comprised of the following steps:

a) preliminary site assessment.
b) soil and water investigation,
c) proposal and selection of cleanup and abatement action (to evaluate feasible and effective cleanup and abatement actions);
d) implementation of cleanup and abatement action; and
e) monitoring of short-and long-term effectiveness of cleanup and abatement.

The requirements of this order to date are for the *preliminary site assessment* phase. Rohr has a relatively large site, a significant amount of isolated data, and apparently few environmental due diligence reports, so the SDRWQCB is initially requiring that all available records be compiled and evaluation on a sitewide approach. One of the requirements in this order is to develop a site assessment workplan for review and approval to initiate the next phase of *soil and water investigation*. Once the required submittals are reviewed and any immediate mitigation measures needed are taken, then a phased investigation that considers all site issues including cost-effectiveness, environmental impacts, and redevelopment priorities will be addressed.

VIOLATIONS

Based on the chronology of events and known contaminant concentrations existing in the environment at the Site, Rohr has caused or permitted to be caused a condition of pollution in both surface waters and ground water. Specifically, Rohr has discharged chlorinated solvents, metals, and fuel hydrocarbons to soil and ground water in multiple locations and metals into the storm water conveyance system serving the site. Other wastes associated with metal melting, metal casting, metal parts fabrication, degreasing, cleaning, anodizing, plating, chemical milling, conversion coating, painting, and sludge treatment/recycling activities may have been discharged. Discharges of waste from the storm water conveyance system (SWCS), whether from within the system or infiltrative, are carried to San Diego Bay by daily tidal flux and storm water. Discharges of waste from Rohr have caused an exceedance of water quality objectives in ground water and surface water.

EVIDENCE OF VIOLATIONS

1. A 1952 San Diego Regional Water Pollution Control Board report entitled *"Extent, Effects and Limitations of Waste Disposal into San Diego Bay"* described the then "Rohr Aircraft Company" as discharging industrial wastes directly into San Diego Bay. The report noted the now Rohr had its own separate storm drain system that discharged into the Bay. Wastes listed as being discharged include

metal-treating rinse solutions, paint, oils and solvents. Sewage and potentially other wastes from Rohr were apparently processed by the City of Chula Vista and discharged to the Bay in close proximity to the Site. In 1963, the City of Chula Vista joined the then San Diego Metropolitan Wastewater system and ceased discharging to the Bay. After 1963 through today, the City of Chula Vista no longer had any storm drain or other point source drainage system discharging to the Bay. It is not known if or when Rohr stopped discharging process wastes into its separate storm drain system.

2. In May 1974, the State Water Resources Control Board (SWRCB) adopted a *Water Quality Control Policy for the Enclosed Bays and Estuaries of California* that essentially prohibited the discharge of industrial wastewaters, exclusive of clean brine, into enclosed bays and estuaries. Subsequently Rohr applied to the SDRWQCB for an NPDES permit to discharge up to 22,500 gallons per day of filtered brine via a storm drain to San Diego Bay. In 1976 NPDES Order No. 76-39 was adopted. The permit was renewed twice (Order Nos. 81-30 and 85-42, entitled *National Pollutant Discharge Elimination System (NPDES) Order No. 85-42 CA0107859 Waste Discharge Requirements for Rohr Industries, Inc.*). Pursuant to these Orders, from 1976 to 1994, Rohr was required to implement Best Management Practices for eliminating non-storm water discharges to all storm drains. However, the Monitoring Program Requirements were limited to sampling for conventional pollutants.

3. In 1989 a San Diego Bay storm drain outfall sediment study was conducted by the San Diego State University Foundation, on behalf of the SDRWQCB. The sediment sampling was conducted outside storm drains around San Diego Bay. The Foundation's report commented on the high concentration and the combination of chromium, zinc, nickel, and copper in one sample taken from a natural Bay channel outside of one of Rohr's storm water outfalls and recommended that a 'metal fabrication' point source be investigated.

4. Since 1987, the San Diego County Department of Environmental Health Site Assessment and Mitigation Unit (County SA/M) has opened nine cases of the reported releases from Rohr. Of the nine cases, six involve fuel hydrocarbons discharged via tanks or sumps, one involves chromium releases from a below-grade salt bath, and two were opened from prior cases because chlorinated solvents were discovered. General practice by the County SA/M is to oversee each release cleanup at a given site as isolated events. County SA/M generally oversees smaller sites than Rohr's large area and Rohr's release cases were located fairly broadly over the site. Apparently since 1994, only the tank cases have been actively overseen and of those, only fuel hydrocarbons and the obvious chrome salt bath constituent releases have been investigated. Rohr has consistently declined the County SA/M and SDRWQCB requests to sample for chlorinated solvents in ground water at fuel release case sites.

5. In May 1991, the San Diego County's Hazardous Materials Management Division (County HMMD) observed zinc-contaminated wastewater entering a storm drain east of Building 1. This problem was described by the County as "recurring" and "first found in 1987." In June, the SDRWQCB joined the County HMMD to have Rohr address zinc waste inside the storm drain system. Analytical results

of storm drain sediment samples indicated that Priority Pollutant Toxic Metals were present in over 35 locations within the storm water conveyance system. Several samples exceeded the Total Threshold Limit Concentration which would characterize the sediment as hazardous waste. By letter Rohr acknowledged the storm water conveyance system contamination and proposed remedial actions including accelerating storm drain cleanout plans, removing various pipelines from the system. and investigating both "upgradient" sources and "possible contamination from coming on-site via the bay and estuary." Rohr reported in July 1992 that a portion of their storm drains had been pressure washed and some drain inlets sealed. To date, no evidence that adequately verifies the degree of cleanliness has been received by the SDRWQCB. Rohr recently concluded that one third of its known storm drain system has been pressure washed and that storm drain catchment basin cleanouts are conducted periodically.

6. Rohr notified the SDRWQCB in July 1991, that it no longer required an NPDES permit because the brine discharge was replumbed to the sanitary sewer. The SDRWQCB subsequently agreed to rescind Order No. 85-42 if Rohr would obtain coverage under the SWRCB *General Industrial Activities Storm waterPermit Order No. 91-13 DWQ* (Industrial Storm Water Permit) since there remained a potential for waste to enter the storm water conveyance system. On April 6, 1992 the SWRCB received Rohr's Industrial Storm Water Permit application. Due to continuing SDRWQCB concerns over storm drain contamination and other outstanding issues, the SDRWQCB did not adopt *An Order Rescinding Order No. 85-42 for Rohr Industries, Inc.* until October 13, 1994. [illegible]

7. From a 1992 San Diego Bay sediment sampling study, some sample stations in proximity to the Site sediment were assigned a "low priority" ranking relative to other stations in the Bay. However, the *"Chemistry, Toxicity, and Benthic Community Conditions in Sediments in the San Diego Bay Region Final Report"* dated September 1996 recommended that a toxicity identification evaluation be considered in the future for Station No. 90036, the station approximately 400 feet from Rohr storm water Outfall #1). This recommendation was based on the fact that 1992 sediment and porewater toxicity testing was questionable and no benthic community analysis was known to have been performed for the area.

8. In 1996 and 1997, the County HMMD has been concerned about the large number of above ground and underground tanks that Rohr continues to claim are "exempt" from specific state regulations. In August 1997, a County HMMD inspector observed the filling of large vaults (up to 25 feet deep) that formerly held 10,000 -25,000 gallon tanks of Trichloroethane. The inspector's concern was whether proper 'closure sampling' had been performed to ensure that no releases had affected the soil and ground water beneath the deep vaults. Over 25 "tanks" are the subject of ongoing discussions with County HMMD and Rohr.

9. In 1997 the San Diego Unified Port District (Port), in conjunction with the City of Chula Vista Redevelopment Agency, issued proposed changes to the Port's Master Plan for tidelands within the City of Chula Vista. Two proposed redevelopment scenarios involving the Site, including lands

presently occupied by Rohr, are described in the *"Chula Vista Business Park Expansion and Port Master Plan Amendment" Environmental Impact Report"* dated July 1997. The scenarios involve establishing a biomedical/pharmaceutical technology park and resort hotel facilities while planning to preserve marsh areas and encourage further public use of the waterfront. The Port Master Plan Amendment was recently approved. Currently, the Port and City of Chula Vista Redevelopment Agency are actively negotiating with prospective developers and tenants and are planning to begin significant street and utility improvements at the Site.

10. In 1998, the SDRWQCB discovered that the U.S. National Wildlife Service has performed ecological and sediment monitoring of its wildlife preserves in both the Sweetwater and Tijuana River Marshes from 1989 to 1992. There are two monitoring points in the study within the F&G Street Marsh located just west of Rohr. The ecological and sediment data from the intended study is still in raw form due to funding redirections. However, review of the raw data indicates that priority pollutant metal concentrations in the sediment of the F&G Street Marsh ranked among the highest concentrations consistently observed during the monitoring period. Specifically cadmium, chromium, copper, nickel, and zinc were found to be elevated. The study needs to be completed prior to reaching any conclusions from the data however no funding is foreseen in the near future.

FINDINGS OF SURFACE WATER CONTAMINATION:

11. Since 1993, Rohr has submitted Annual Reports of storm water monitoring results pursuant to the Industrial Storm Water General Permit (superceded in April 1997 by updated SWRCB Order No. 97-03-DWQ). Rohr has delineated four primary "catchment" basins for the storm water conveyance system (SWCS). Rohr's SWCS outfall opening(s) are variously lying within the F&G Street Marsh, from 0 to 30 feet into identified tidal marine ecologies, and from approximately 400 to 1500 feet of San Diego Bay. The SWCS from Rohr primarily drains to San Diego Bay and to and several marsh areas tributary to San Diego Bay from six pipes ranging in size from 42" to 84" in diameter. Tidal waters of San Diego Bay are reportedly present inside the storm drains over 1000 feet inland beneath the Site. The SWCS collects runoff only from lands within the Site with two minor exceptions. There are apparently two upgradient or "incoming" drainage areas that contribute runoff to the system. One incoming storm drain collects runoff from a single block of Lagoon Drive. The other incoming storm drain apparently collects runoff from a limited portion of Interstate 5. Currently, Rohr collects 'storm water samples' from six "primary" outfalls near the boundaries of its operating area and also samples "incoming" storm water stations.

12. Rohr recently acknowledged that some of the storm water samples "are diluted to a greater or lesser degree by water from San Diego Bay." Storm water sampling results in Rohr's Annual Reports consistently show elevated concentrations of Total Dissolved Solids (TDS) and Priority Pollutant Toxic Metals (Metals) in nearly all samples. Many samples have TDS concentrations equivalent to seawater concentrations. In other words, Rohr confirmed that its samples results are representative of storm water commingled with tidal water beneath its site. Rohr explains that they had thought the

permit required that storm water *had* to be sampled *at the property line*. [The permit requires sampling at locations which are "representative of runoff from a site during the storm.] The incoming storm water samples from Lagoon Drive and Interstate 5 have low TDS concentrations. In addition, Rohr has not specifically acknowledged the level of metals concentrations in its samples. There has been no decrease in metal concentrations in the commingled storm water/Bay water leaving its property since Rohr began sampling in 1992/93. Of the incoming storm water sample results, the Lagoon Drive location shows relatively low metals and the Interstate 5 location has elevated metals concentrations.

13. The following are the results of commingled storm water/Bay water from recent Rohr Annual Reports submitted under the above described Industrial Storm Water General Permit. The sample results from the two identified incoming storm water flows are also listed. Because there are presently no numerical water quality standards for storm water runoff, for comparison purposes, the 1996 *USEPA National Industrial Storm Water Parameter Benchmark Values* (Benchmark Values) are listed alongside of Rohr. These Benchmark Values represent the national averages of reported storm water quality results for industrial sites across the nation.

	Outgoing Conc.	Incoming Conc:		*USEPA Nat'l Industrial*
Constituent	*Rohr*	*Lagoon Dr*	*Int. I-5*	*Benchmark Values*[1]:
Oil and Grease (mg/L)	<1 - 174	4.6	<1 - 17	15 mg/L & 7.8 mg/L[2]
Tot.Susp.Solids (mg/L)	34 - 815	22	50 - 184	100 mg/L & 163 mg/L
Cadmium (µg/L)	<1 - 38	<100	<5- <100	15.9 µg/L
Total Chromium (µg/L)	<3 - 760	<100	10- <100	(no value)
Copper (µg/L)	<3 - 740	<100	75- <100	63.6 µg/L
Lead (µg/L)	<5 -1700	<100	50- 410	81.6 µg/L
Silver (µg/L)	<5 - 57	<200	<5- <100	31.8 µg/L
Zinc (µg/L)	20 - 8110	<100	160- 590	117 µg/L

USEPA compiled these Benchmark Values for comparison (or benchmarking) purposes. Benchmark Values are not promulgated water quality standards or objectives for protecting water bodies. Review and comparison of these results have lead the SDRWQCB to suspect that, despite a 'dilution' effect of tidal water with Rohr's storm water runoff, the metals concentrations are at anomalously high levels. There is very likely additional sources of contamination that have not yet been identified. The water quality impacts to San Diego Bay and nearby marshes are of significant concern.

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1 The USEPA has collected multi-sector industrial storm water permit data from states and compiled the data into national averages for use as "benchmarks" for general comparison purposes. California RWQCBs use these published statistics for reviewing industry Sampling Reduction Certification applications.

2 Statistics from the USEPA National Storm Water Permit results solely from industries in Standard Industrial Classification Codes that manufacture transportation equipment and industrial or commercial machinery.

14. In an effort to compare Rohr's storm drain discharge quality with other San Diego Bay outfall discharges, two City of San Diego municipal storm drain outfalls were selected for comparison. One outfall is located at California Street and one is located at Crosby Street, closer to Rohr. Although these are municipal outfalls with multiple land users discharging into the system, they both discharge to the Bay and have similarly sized drainage basins with a significant proportion draining from industrial and commercial operations. [The previous finding related compared other industrial site dischargers with Rohr's data.]

The chart on the following page displays some storm drain outfall discharge quality results for comparison with Rohr:

Mean Values Measured At Outfalls During Storm Events:
1996/97 Rainy Season

Constituent	*San Diego Municipal Storm Drain at Crosby Street* 11/26/96 (Composite)	*San Diego Municipal Storm Drain at California Street* 11/21/96 (Composite)	*Rohr Sample Date: 11/21/96* (Grab)
	One Drain from ~118 acres (~52% is commercial & industrial land use)	One Drain from ~648 acres (~15% is commercial and industrial land use)	Six Drains measured from total of ~166 ac (~estimated 90% comm./industrial)
Tot. Diss. Solids (mg/L)	24	52	19,900
Tot. Susp. Solids (mg/L)	28	66	161
Cadmium (µg/L)	0.7 (Dissolved)	0.4 (Total Recov)	12 (Total Recov))
Copper (µg/L)	10 "	15 "	59 "
Lead (µg/L)	4 "	17 "	73 "
Zinc (µg/L)	120 "	60 "	1203 "

While the municipal storm drain datasets are not directly comparable, it is a 'red flag' that a single industrial facility might be causing greater impacts to marine waters than municipal storm drains.

FINDINGS OF GROUND WATER CONTAMINATION:

15. Ground water flow direction at the Site flows west-southwest towards San Diego Bay. Depth to ground water reportedly ranges from 2 to 5+ feet below ground surface. Ground water elevation beneath the Site ranges from mean sea level to 3 feet above mean sea level. A Rohr study has documented tidal influence on ground water elevation near Building 57. Contaminated ground water may be hydrologically connected to San Diego Bay through saturated soils, may follow subsurface preferential pathways, or may be entering and/or is influenced by marine and fresh waters in the storm water conveyance system.

16. The following are some of the most elevated ground water concentrations reported to date:

Constituent	Max. Conc.at Rohr	California MCLs	Nat'l Ambient Saltwater Aq Life. Std
	(micrograms per liter -µg/L)		(4 day average)
Arsenic	40	50	36
Barium	420	1000	
Chromium (Hexavalent)	1800	50 (Total)	50
Copper	40	1300**	
Lead	50	15**	5.6
Nickel	640	100	8.3
Zinc	140	(no MCL)	86
Benzene	46	1	-
Trichloroethene	320,000	5	
1,1,1-Trichloroethane	10,000	200	
cis 1,2-Dichloroethene	150,000	6	-
Vinyl Chloride	25,000	0.5	-

** (are USEPA Primary Maximum Contaminant Levels)

Some of the above contaminant concentrations exceed drinking water standards for municipal beneficial use of ground water. If it is determined that contaminated ground water is hydrologically connected to surface waters, all of the above concentrations would also indicate exceedances of water quality objectives for both the neighboring tidal marshes and for San Diego Bay.

CONCLUSIONS

There is a significant amount of evidence on isolated areas ground water contamination and both direct and indirect evidence that more extensive ground water contamination exists. Despite almost 10 years of working on contaminant releases at the site, little is known about the historic source(s) of discharges that have affected ground water quality. There is also a significant amount of water quality data on the commingled storm water/Bay water. Analytical laboratory results on priority pollutant metals from SWCS samples indicate that Rohr has anomalously elevated concentrations, over and above that of others in similar industries and above comparable municipal storm water discharge quality. Rohr's SWCS ultimately discharges to San Diego Bay and, because of the shallow gradient of the aged SWCS, discharges not only during storm events but daily due to tidal flux.

Because storm water runoff from industrial activities has not been tested separately from tidal waters to date, the SDRWQCB does not know if storm water runoff is contaminated prior to reaching the storm drains or if other flows or wastes within the storm drains contribute most of the contamination. Based on recent site inspections by multiple environmental agencies, the SDRWQCB has reason to believe that the quality of Rohr's storm water runoff may turn out to be 'normal' as compared to benchmark levels for similar facilities and that storm water runoff is not the main source of the priority pollutant metals found in the storm drain discharges. A subsurface source or sources of toxic metals, possibly contaminated soil and ground water, is suspected of contributing to the high metals concentrations found in the storm drains.

A subsurface source(s) is suspected because the integrity of the SWCS is unknown, the groundwater is shallow and contaminated in many areas, and San Diego Bay waters ebb and flow daily within the storm drains, and tidal influence has been shown in ground water in at least one portion of the site. It is generally accepted that if the conditions are right, ground water will flow in and along many subsurface preferential pathways (e.g. backfilled utility trenches) throughout a site. Historic releases of zinc and other contaminants into the SWCS have been documented. Further, the SDRWQCB has evidence to suspect that other constituents, including chlorinated solvents, polyaromatic hydrocarbons, other volatile and semi-volatile organic compounds, and other, more exotic aerospace metals may be present in both the ground water and in the SWCS. Since the SWCS has not been fully assessed or cleaned, historic contaminant sources likely still remain in portions of the SWCS.

The SDRWQCB finds the need for Rohr to investigate the site and discover/determine the extent of impacts to the environment.

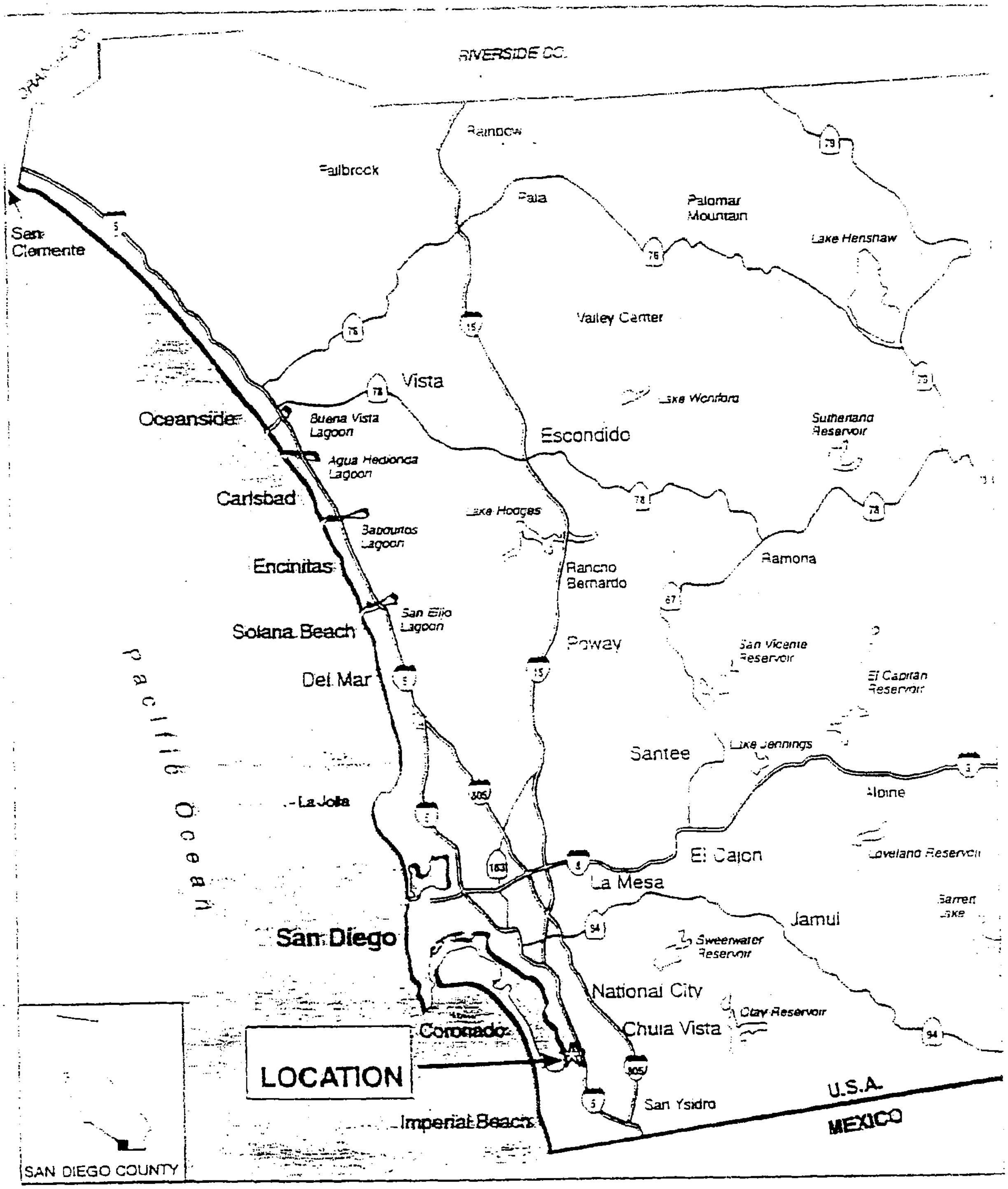

Figure 3-1

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Regional Location of Project Site

Not to Scale

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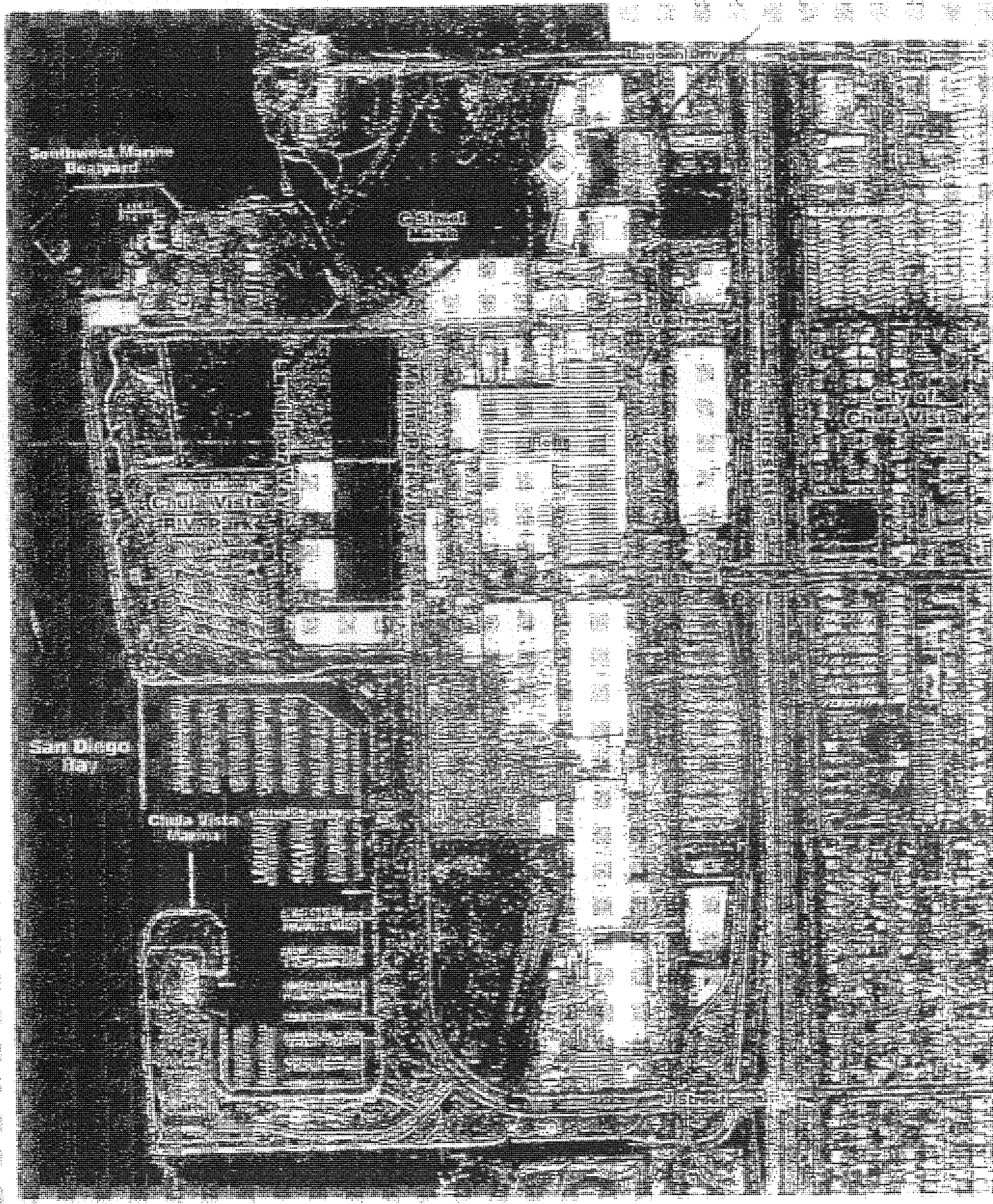
Southwest Marine
Boatyard
G Street
Mole
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Marina
City of
Chula Vista

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San Diego Region - San Diego Bay Contaminated Marine Sediments Assessment and Remediation Workshop

On June 18, 2002 Regional Board staff held a public workshop to update the Regional Board members on current efforts to address contaminated marine sediments in San Diego Bay. Regional Board members in attendance were Vice Chairman Gary Stephany, Ms. Terese Ghio, Ms. Janet Keller, and Mr. Eric Anderson.

View the Workshop Agenda and Slide Presentations.

San Diego Region - June 18, 2002 Sediment Workshop Presentation

STATE OF CALIFORNIA
REGIONAL WATER QUALITY CONTROL BOARD
SAN DIEGO REGION

WORKSHOP AGENDA

SAN DIEGO BAY CONTAMINATED MARINE SEDIMENTS
ASSESSMENT AND REMEDIATION

Tuesday, June 18, 2002
9:00 a.m. – 5:00 p.m.

Water Quality Control Board
Regional Board Meeting Room
9174 Sky Park Court
San Diego, California

Workshop includes informal discussion of items to be presented for action at a future business meeting. Persons who are interested in items on the agenda are urged to attend workshops as they may miss valuable discussion that will not be repeated at future Regional Board meetings. There is no voting at workshops. Items requiring Regional Board action must be scheduled for consideration at Regional Board meetings.

1. Roll Call and Introductions (Chairman Minan)

2. Overview and Perspective (David Barker, RWQCB)

3. Bight'98 Regional Monitoring Study - Results (Steve Bay, SCCWRP)

4. NASSCO and Southwest Marine Contaminated Sediment Assessment and Remediation (Suggested order of presentation)

   Regional Board Approach (Tom Alo, RWQCB)
   Environmental Group Perspective (San Diego Bay Council)
   Preliminary Results (NASSCO & Southwest Marine)
   Southern California Water Research Project Perspective (Steve Bay, SCCWRP)
   Resource Agency Perspective and Involvement (Michael Martin, Fish & Game)
   What's Next (Craig Carlisle, RWQCB)
   Speaker Discussion

5. Contaminated Sediment Containment

   Campbell Shipyard - Remedial Alternatives (Tentative-Port of San Diego)
   Convair Lagoon PCB Cap (Craig Carlisle, RWQCB)

6. Bay Sediment TMDLs and Toxic Hot Spots Remediation

   Current & Upcoming TMDLs (Alan Monji, RWQCB)
   Preliminary Results for Chollas Creek and 7th Street Channel (Bart Chadwick, SPAWAR/Navy and Steve Bay, SCCWRP)

7. DoD Sites - NASNI, Boat Channel, and NAB Coronado. (Charles Cheng, RWQCB)

8. SLIC Sites – Solar Turbines and Goodrich Aerostructures (Peter Peuron, RWQCB)

9. Questions and Comments from Interested Persons

Status of Sediment Cleanup Activities at Solar Turbines & Goodrich Aerostructures

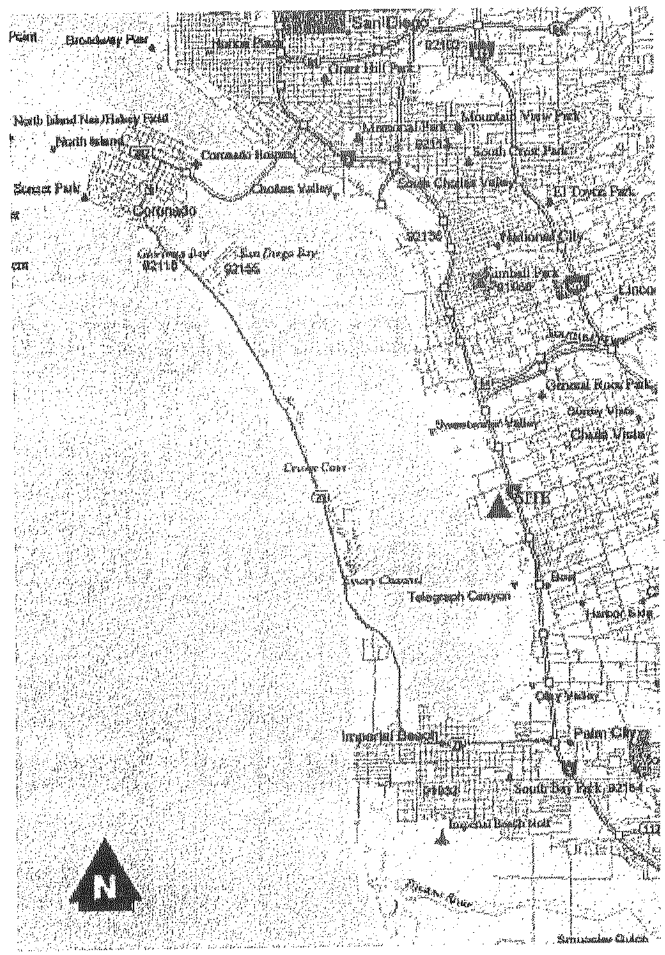
Peter Peuron

SLIC Program

Site Mitigation Unit

San Diego Regional Water Quality Control Board

Goodrich Aerostructures
Chula Vista, CA



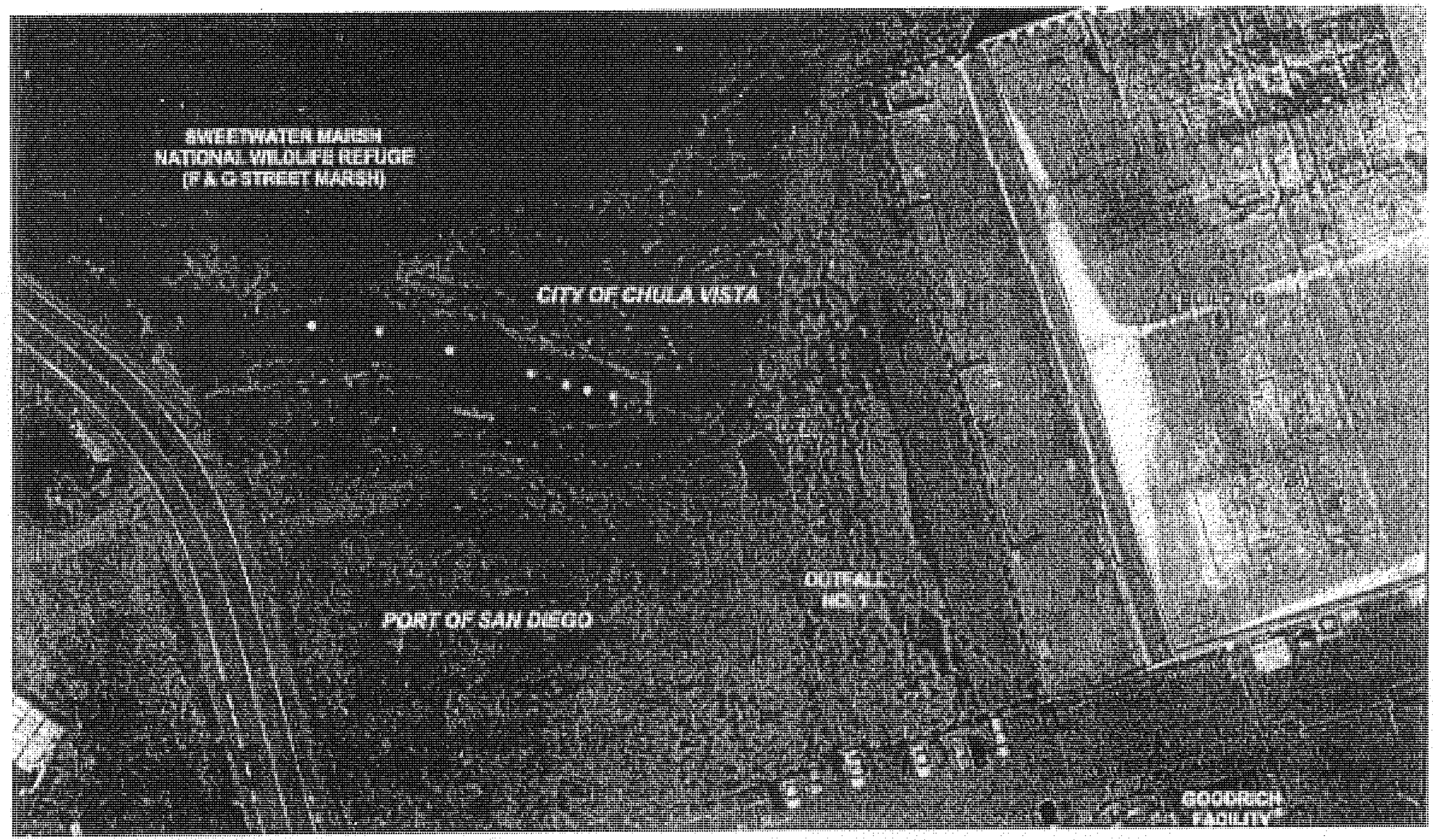
Regulatory Context

- RWQCB is the informal lead agency

- The California Department of Fish & Game and the US Fish & Wildlife Service are support agencies

Goodrich Aerostructures Site Location Map

Aerial View of Outfall 1 Estuary



View Looking Toward Outfall 1

Big Differences Between This Site & Other Sediment Sites

- Estuarine conditions
  - Different receptors
  - Different physical & chemical environment
  - Dynamic, often non-equilibrium conditions
- Small impacted area
- Easy access to sediment

Processes Associated With Aerospace Production Activities

- Foundry operations, metal melting, metal casting, degreasing, parts cleaning, plating, anodizing, milling and painting operations
- Hazardous waste treatment units
- Underground storage tanks

Major Contaminant Impacts - Goodrich Aerostructures

- Chlorinated Solvents (TCE, PCE, TCA, etc.)
- Metals (chromium, lead, zinc, copper & nickel)
- Petroleum Hydrocarbons (Benzene, Polynuclear Aromatic Hydrocarbons)

Sediment Contaminants

- Metals (chromium, lead, zinc, copper & nickel)
- Polychlorinated Biphenyls (PCBs)
- Polynuclear Aromatic Hydrocarbons (PAHs)

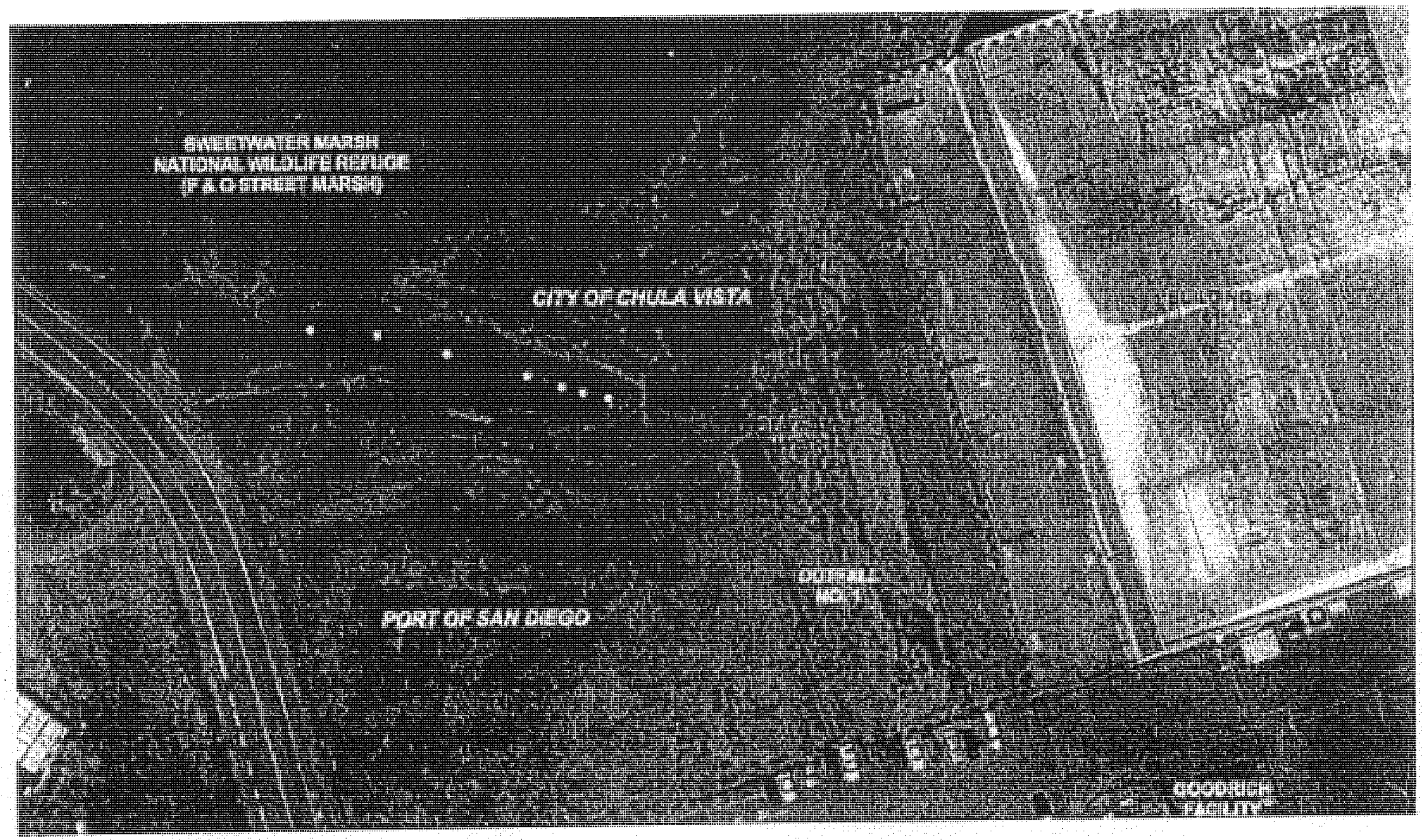
Metals Levels Found in Sailfin Mollies From Marsh (2000 Data)

	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Nickel (mg/kg)
Tissue Level (mg/kg)	0.89	4.39	0.472	0.232
95% EDL (mg/kg)	0.25	3.96	0.53	0.42

Summary of Results of Sediment Testing Near Outfall 1

- 10 samples obtained within 160 feet of the outfall exceeded ERLs for at least one contaminant
- 8 out of 10 samples obtained within 160 feet of the outfall exceeded ERMs for at least one contaminant
- All 5 samples obtained from 178 feet to 500 feet downstream were below ERLs

Aerial View of Outfall 1 Estuary



Status of Sediment Approach at Goodrich Aerostructures

- Work plan is currently under review by SDRWQCB, the Department of Fish and Game and the US Fish & Wildlife Service
- The work plan proposes:
  - Additional site assessment
  - Approach to ecological risk based on DTSC's Guidance for Ecological Risk Assessment

Additional Assessment

- Resampling to determine lateral and vertical extent of impacts
- Benthic community data
- Sampling of reference areas to determine background concentrations

Risk Assessment Protocol

- Scoping Assessment
- Tier 1 -
  - (1) Assess feasibility of cleaning up to background levels
  - (2) Assess feasibility of cleaning up to ERLs
  - (3) Determine bioaccumulative risks using TRVs
- Tier 2 -
  - (1) Sediment Quality Triad
  - (2) Impacts Assessment

Scoping Assessment

- Conceptual Site Model which links contaminant pathways to receptors
- Important receptors include:
  - Fiddler crab
  - Fish (Sailfin Molly)
  - Great blue heron
  - Coyote
  - Endangered species (least tern & clapper rail)

Tier 1 - Assessment of feasibility of cleaning up to background

- Will obtain background samples in similar areas and compare with sediment chemistry They propose:
  - Two locations at Gunpowder Point
  - One location near the Sweetwater River

- If it is feasible they will excavate all impacts - no further actions required

Tier 1 - Assessment of the feasibility of cleaning up to ERLs

- If it is feasible and acceptable they will remove all contamination that exceeds ERL
- Would still need to evaluate bioaccumulative risks separately
- Alternative screening criteria for contaminants that don't have ERLs can be proposed

Tier 1 - Screening Level Assessment of Bioaccumulative Risks

- Risks will be determined using appropriate Toxicity Reference Values (TRVs)
- Tissue concentrations will be calculated using EPA standard partitioning values and/or measured tissue concentrations
- HQ = Tissue Concentration/TRV

Possible Outcomes of Tier 1 Screening Analysis

1. No further action

2. Removal of sediment to meet cleanup levels

3. Additional assessment of risks

Tier 2 - Baseline Risk Assessment

- Sediment Quality Triad
  - Chemistry
  - Benthic community analysis
  - Toxicity testing
- Possible outcomes:
  - No further action
  - Removal of sediment to meet cleanup levels
  - Additional Risk Assessment

Tier 2 - Impacts Assessment

- Fill any data gaps in Triad analysis
- Bioacummulation tests may be done
- Additional tissue tests may be performed

Goodrich Aerostructures Issues

- Much depends on determination of background concentrations - a difficult task
- Still need to complete assessment of the extent of contamination
- Still need to address three other outfalls at this facility

1235

Anchor QEA, L.P.
Cost Estimate for Remedial Footprint
San Diego Shipyards Sediment Site
July 12 ,2010

ANCHOR QEA

Item	Probable Quantity	Unit	Unit Cost	Probable Cost	Assumptions
DESIGN AND PERMITTING					
Additional Pre-Design Site Characterization	1	LUMP SUM	$348,000	$348,000	
Surveys and Engineering Design	1	LUMP SUM	$675,000	$675,000	
Permitting	1	LUMP SUM	$400,000	$400,000	See Note 1.
CEQA EIR - if required	1	LUMP SUM	$900,000	$900,000	As discussed in Note 1, we do not believe an EIR will be required; however in the event that a EIR is required, we have added in estimated costs for the preparation and submittal of an EIR.
CONSTRUCTION PREPARATION					
Mobilization(s) and Demobilization(s)	3	CONSTRUCTION SEASONS	$300,000	$900,000	Estimate assumes work is completed in 3 construction seasons.
Demolition	1	LUMP SUM	$500,000	$500,000	Includes demolition of dormant BAE pier.
DREDGING					
Unconstrained open-water dredging (outside of leasehold area)(12.5% of dredge area)	17,925	CY	$10	$179,250	Unit costs are typical for unconstrained dredging outside of shipyard area.
Constrained dredging from inner shipyard (within leasehold area)(87.5% of dredge area)	125,475	CY	$18	$2,258,550	Higher cost for dredging within leasehold line, near piers, in areas of ship traffic, etc.
Dredging Surface/Subsurface Debris	7,170	CY	$120	$860,400	Unknown quantity. Estimates assume 5% of total dredge volume. Pricing includes landfill disposal.
Engineering Controls (silt curtain, oil boom)	3	CONSTRUCTION SEASONS	$32,000	$96,000	Estimate assumes work is completed in 3 construction seasons.
Additional Dredging (as needed for 2nd pass)	28,100	CY	$18	$505,800	Two feet of dredging over one-half the remedial area. Same unit costs as for constrained dredging from inner shipyard.
MARINE STRUCTURES					
Placement of Quarry Run Rock for Protection of Marine Structures	21,887	TON	$45	$984,915	No structural retrofit of structures is assumed to be necessary. Estimated costs assume setback of dredging from marine structures and revetments, and placement of quarry run blankets or berms to reinstate lateral resistance.
SEDIMENT OFFLOADING AND DISPOSAL					
Acquisition/Lease of Sediment Offloading Area	3	CONSTRUCTION SEASONS	$300,000	$900,000	An off-site sediment staging area will be needed in the vicinity of the project area. Location is unknown at this time. Costs assume a three-year construction period.
Preparation of Sediment Offloading Area	1	LUMP SUM	$300,000	$300,000	Preparation of sediment handling and dewatering area.
Rehandling and Dewatering	171,500	CY	$25	$4,287,500	Assumes stockpiling of sediments prior to transport to landfill and addition of lime or cement admixture to facilitate dewatering.

EXHIBIT NO. 1235
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SAR384578

Item	Probable Quantity	Unit	Unit Cost	Probable Cost	Assumptions
Transportation and Disposal at Landfill	257,250	TON	$75	$19,293,750	Assumes disposal at regional hazardous waste landfill outside of San Diego County (Copper Mountain in Nevada).
UNDERPIER REMEDIATION					
Purchase and place 3 feet of clean sand/gravel beneath piers and overwater structures	103,705	SF	$30	$3,111,150	Assumes 3 foot thick layer of sand placed only under pier areas in the dredging footprint, quarry run rock assumed to be placed on the setback areas.
PLACEMENT OF CLEAN SAND COVER	42,211	CY	$40	$1,688,422	Assumes one half of dredged area receives 1-3 feet of sand.
SW04 cleanout, BMP Installation, Investigation	1	LS	$703,048	$703,048	
TOTAL DIRECT CONSTRUCTION COSTS				$38,891,785	
BID MANAGEMENT AND SUPPORT	1	LUMP SUM	$25,000	$25,000	
CONSTRUCTION MANAGEMENT	3	CONSTRUCTION SEASONS	$450,000	$1,350,000	Estimate assumes work is completed in 3 construction seasons.
CONTINGENCY	30%	Percent		$12,080,036	Unquantifiable or identifiable unknowns
MONITORING COSTS					
Water Quality Monitoring during construction	24	WEEK	$18,000	$432,000	Consistent with project approach per mediation discussions.
Post-Dredging Confirmational Sampling	45	SAMPLES	$8,000	$360,000	Consistent with project approach per mediation discussions.
Long-Term Monitoring of Remediated Areas	30	LOCATIONS	$60,000	$1,800,000	Consistent with project approach per mediation discussions.
SW04 long term monitoring	1	LUMP SUM	$595,437	$595,437	PV for 100 years $20K/year, 5% discount rate
OTHER (NON-CONSTRUCTION) COSTS					
Eel Grass Habitat Mitigation (if needed) Construction and maintenance)	0.87	ACRES	$600,000	$522,000	Assumes 5% of dredged acreage will require mitigation
Eel Grass land lease costs in perpetuity (LS)	0.87	ACRES	$1,500,000	$1,305,000	
Internal Shipyard Costs	1	LUMP SUM	$250,000	$250,000	
RWQCB Oversight Costs	10	YEARS	$45,000	$450,000	Duration covers periods of design, construction, and long-term monitoring oversight.
GRAND TOTAL				$58,100,000	

Note 1:
This is inclusive of all requried permits. Required permits will be identified with legal assistance. Implementation of the cleanup program requires resource agency permits and environmental review under state [California Environmental Quality Act (CEQA)] and possibly federal [National Environmental Policy Act (NEPA)] guidelines.

1236

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN DIEGO REGION

In the matter of Tentative Cleanup and Abatement Order No. R9-2011-0001 (Formerly R9-2010-0002) Shipyard Sediment Cleanup	Regional Board Cleanup Team's Responses & Objections to Designated Party San Diego Unified Port District's First Set of Requests for Admissions

Propounding Party: San Diego Unified Port District (the "Port")

Responding Party: California Regional Water Quality Control Board, San Diego Region Cleanup Team

Set Number: One (1)

Pursuant to the Presiding Officer's February 18, 2010 Order Issuing Final Discovery Plan for Tentative Cleanup and Abatement Order No. R9-2010-0002 and Associated Draft Technical Report, the Presiding Officer's October 27, 2010 Order Reopening Discovery Period, Establishing Discovery Schedule, and Identifying Star and Crescent Boat Company as a Designated Party for Purposes of Tentative Cleanup and Abatement Order R9-2011-0001 (the "10.27.10 Order"), the Parties' August 9, 2010 Stipulation Regarding Discovery Extension and all applicable law, Designated Party the San Diego Water Board Cleanup Team ("Cleanup Team"), hereby responds and objects to the Port's First Set of Requests for Admissions (the "Requests") as follows:

EXHIBIT NO. 1236
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GENERAL STATEMENT OF OBJECTIONS

The Cleanup Team makes the following general objections, whether or not separately set forth in response to each Request, to each and every Request by the Port, all as set forth herein and incorporated specifically into each of the responses below:

1. Privilege Objection. The Cleanup Team objects to each Request to the extent it requests information protected by the attorney-client privilege, joint prosecution privilege, common interest privilege, mediation privilege, official information privilege and/or deliberative process privilege, and to the extent it requests information subject to the work-product exemption, collectively referred to herein as the "privilege" or "privileged." The Cleanup Team contends that all communications exchanged between it and its counsel are privileged. The Cleanup Team objects to identifying or producing any and all products of investigations or inquiry conducted by, or pursuant to the direction of counsel, including, but not limited to, all products of investigation or inquiry prepared by the Cleanup Team in anticipation of this proceeding, based on the attorney-client privilege and/or the work-product doctrine. The Cleanup Team further objects to providing information subject to or protected by any other privilege, including, but not limited to, settlement communications, the joint prosecution privilege, the common interest privilege, the mediation privilege, the official information privilege and/or the deliberative

process privilege. Inadvertent provision of privileged information shall not constitute a waiver of said privileges.

2. Scope of Discovery Objection. The Cleanup Team objects to each Request to the extent it purports to impose any requirement or discovery obligation other than as set forth in Title 23 of the California Code of Regulations, sections 648 et seq., the California Government Code, sections 11400 et seq. and/or applicable stipulations, agreements and/or orders governing this proceeding, including, but not limited to, the limitations on the proper subject matter for the Port's discovery to the Cleanup Team, as specifically set forth in the 10.27.10 Order; to wit: "[T]he scope of additional discovery allowed by this Order is limited to revisions to the TCAO/DTR released on September 15, 2010 as compared to the December 2009 versions of these documents." The Cleanup Team further objects to instructions set forth in the Port's "DEFINITIONS" that are inconsistent with, and/or to the extent they purport to impose obligations on the Cleanup Team not specifically set forth in, Title 23 of the California Code of Regulations, sections 648 et seq., the California Government Code, sections 11400 et seq. and/or applicable stipulations, agreements and/or orders governing this proceeding.
3. Irrelevant Information Objection. The Cleanup Team objects to the Requests to the extent they are overbroad and/or seek information that is not relevant to the claims or defenses asserted in this proceeding and is not reasonably calculated to lead to the discovery of admissible evidence.
4. Burdensome and Oppressive Objection. The Cleanup Team objects to each Request to the extent that it seeks information that has

already been provided, or that otherwise is equally available to the Port, or is already in the Port's possession, which renders the Request unduly burdensome and oppressive. The Cleanup Team has already provided the Port with a copy of the electronic, text searchable administrative record and supplemental administrative record for this matter. Therefore, the burden of providing information that is equally accessible to the Port is no greater on the Port than it would be on the Cleanup Team, and the Cleanup Team will not provide again the information it has already provided and which is contained in the electronic, text searchable administrative record, or that is otherwise already in the Port's possession, custody or control.

5. Overbroad Objection. The Cleanup Team objects that certain Requests are overbroad, and are framed in a manner that prevents any reasonable ability to provide responsive information. Such Requests create an unreasonable risk of inadvertent noncompliance as framed.
6. Cleanup and Abatement Order Proceeding is Ongoing. The instant Cleanup and Abatement Order proceeding is ongoing, and the Cleanup Team expects that additional evidence will be provided by the Designated Parties hereto in accordance with governing statutes, regulations and applicable hearing procedures. While the Cleanup Team's response to each of these Requests is based on a reasonable investigation and the state of its knowledge as of this date, additional information may be made available to or otherwise obtained by the Cleanup Team subsequent to the date of this response. These responses are provided without prejudice to the Cleanup Team's right to supplement these responses, or to use in

this proceeding any testimonial, documentary, or other form of evidence or facts yet to be discovered, unintentionally omitted, or within the scope of the objections set forth herein.

OBJECTIONS TO DEFINITIONS

1. The Cleanup Team objects to the defined term "DOCUMENT" on the ground and to the extent that it seeks information protected by settlement confidentiality rules, the attorney-client privilege, the joint prosecution privilege, the work product doctrine, the mediation privilege, the common interest privilege, the official information privilege, the deliberative process privilege, and/or any other privilege or confidentiality protection.
2. The Cleanup Team objects to the defined term "COMMUNICATIONS" on the ground and to the extent that it seeks information protected by settlement confidentiality rules, the attorney-client privilege, the joint prosecution privilege, the work product doctrine, the mediation privilege, the common interest privilege, the official information privilege, the deliberative process privilege, and/or any other privilege or confidentiality protection.
3. The Cleanup Team objects to the defined term "IDENTIFY" on the ground and to the extent it purports to impose requirements and/or obligations on the Cleanup Team in preparing these Responses not otherwise required by Title 23 of the California Code of Regulations, sections 648 et seq., the California Government Code, sections 11400 et seq. and/or applicable stipulations, agreements and/or orders governing this proceeding.

4. The Cleanup Team objects to the defined term "MS4 SYSTEM" as hopelessly overbroad, unduly burdensome, not reasonably calculated to lead to the discovery of admissible evidence and beyond the scope of permissible discovery. The Cleanup Team will respond herein as if the term "MS4 SYSTEM" was defined to include those components of the Municipal Separate Storm Sewer Systems under Order No. 2007-001, NPDES No. CAS0108758 that RELATE TO the Cleanup Team's bases for naming the Port as a DISCHARGER in the CURRENT TCAO and CURRENT DTR.

RESPONSES TO REQUESTS FOR ADMISSIONS

REQUEST FOR ADMISSION NO. 1:

Admit that the Port District itself never contributed directly to the DISCHARGE of waste to the SITE.

RESPONSE TO REQUEST NO. 1:

The Cleanup Team objects to this Request on the ground that it is not full and complete in and of itself, in violation of Code of Civil Procedure section 2033.060, subdivision (d). The Cleanup Team further objects to this Request on the ground that it is vague and ambiguous with respect to the terms "Port District itself" and "contributed directly."

Subject to and without waiving the preceding objections, the Cleanup Team responds as follows: Denied.

The Port contributed to the DISCHARGE of waste to the SITE as a co-permittee under its currently applicable MS4 permit, and the preceding permits. The Port has filed Reports of Waste Discharge with the Regional Board. The Port also contributed to the DISCHARGE of waste to the SITE because it has the ability and legal responsibility to control the activities and DISCHARGES of its tenants. The Port's tenants' DISCHARGES could not have occurred without the Port allowing the discharging tenants to operate and conduct the activity on the land. The source of the DISCHARGE is the land controlled by the Port, which land held and managed as trust property on behalf of the People of the State of California. Further facts supporting the Cleanup Team's denial to this Request are set forth in Finding 11 of the TCAO and Chapter 11 of the DTR and will not be repeated here.

REQUEST FOR ADMISSION NO. 2:

Admit that the Port District itself never DISCHARGED storm water that contained waste into the City of San Diego MS4 SYSTEM onto the SITE.

RESPONSE TO REQUEST NO. 2:

The Cleanup Team objects to this Request on the ground that it is not full and complete in and of itself, in violation of Code of Civil Procedure section 2033.060, subdivision (d). The Cleanup Team further objects to this Request on the ground that it is vague and ambiguous with respect to the terms "Port District itself," "contributed directly" and "City of San Diego MS4 SYSTEM."

Subject to and without waiving the preceding objections, the Cleanup Team responds as follows: Denied.

The Port is responsible for DISCHARGED storm water that contained waste to the SITE as a co-permittee under its currently applicable MS4 permit, and the preceding permits. The Port has filed Reports of Waste Discharge with the Regional Board. Further facts supporting the Cleanup Team's denial to this Request are set forth in Finding 11 of the TCAO and Chapter 11 of the DTR and will not be repeated here.

REQUEST FOR ADMISSION NO. 3:

Admit that the Port District itself never contributed directly to the DISCHARGE of storm water containing waste to the SITE through the City of San Diego MS4 SYSTEM.

RESPONSE TO REQUEST NO. 3:

The Cleanup Team objects to this Request on the ground that it is not full and complete in and of itself, in violation of Code of Civil Procedure section 2033.060, subdivision (d). The Cleanup Team further objects to this Request on the ground that it is vague and ambiguous with respect to the terms "Port District itself," "contributed directly" and "City of San Diego MS4 SYSTEM."

Subject to and without waiving the preceding objections, the Cleanup Team responds as follows: Denied.

The Port contributed to the DISCHARGE of storm water containing waste to the SITE as a co-permittee under its currently applicable MS4 permit, and the preceding permits. The Port has filed Reports of Waste Discharge with the Regional Board. Further facts supporting the Cleanup Team's denial to this Request are set forth in Finding 11 of the TCAO and Chapter 11 of the DTR and will not be repeated here.

REQUEST FOR ADMISSION NO. 4:

Admit that the City of San Diego owns and operates the MS4 SYSTEM Storm Drain Outfalls identified as SW4 and SW9 in the CURRENT TCAO and CURRENT DTR that are alleged to have DISCHARGED storm water containing waste onto the SITE.

RESPONSE TO REQUEST NO. 4:

The Cleanup Team objects to this Request on the ground that it is not full and complete in and of itself, in violation of Code of Civil Procedure section 2033.060, subdivision (d). The Cleanup Team further objects to this Request as compound, conjunctive, and/or disjunctive in violation of Code of Civil Procedure section 2033.060, subdivision (f). The Cleanup Team further objects to this Request on the ground that it is vague and ambiguous with respect to the term "Storm Drain Outfalls... DISCHARGED." The Cleanup Team further objects to the Request on the ground that NPDES Permit No. CAS0108758 speaks for itself and is the best evidence of its contents with regard to ownership and operation of the various components of the MS4

SYSTEM.

Subject to and without waiving the preceding objections, the Cleanup Team responds as follows: The Cleanup Team admits that the City of San Diego owns the Storm Drain Outfalls identified as SW4 and SW9 in the CURRENT TCAO and CURRENT DTR which are the point sources from which it is alleged storm water containing wastes were DISCHARGED onto the SITE. The Cleanup Team also admits that the City of San Diego is one of the operators of the MS4 SYSTEM identified in NPDES Permit No. CAS0108758, which MS4 SYSTEM includes Storm Drain Outfalls SW4 and SW9. Except as specifically admitted, the remainder of the Request is denied.

REQUEST FOR ADMISSION NO. 5:

Admit that the Port District does not own or operate the MS4 SYSTEM Storm Drain Outfalls identified as SW4 and SW9 in the CURRENT TCAO and CURRENT DTR that are alleged to have DISCHARGED urban storm water containing waste onto the SITE.

RESPONSE TO REQUEST NO. 5:

The Cleanup Team objects to this Request on the ground that it is not full and complete in and of itself, in violation of Code of Civil Procedure section 2033.060, subdivision (d). The Cleanup Team further objects to this Request as compound, conjunctive, and/or disjunctive in violation of Code of Civil Procedure section 2033.060, subdivision (f). The Cleanup Team further objects to this Request on the ground that it is vague and ambiguous with respect to the term "Storm Drain Outfalls... DISCHARGED." The Cleanup Team further objects to the Request on the ground that NPDES Permit No. CAS0108758 speaks for itself and is the best evidence of its contents with regard to ownership and operation of the various components of the MS4 SYSTEM.

Subject to and without waiving the preceding objections, the Cleanup Team responds as follows: The Cleanup Team admits that the Port does not own the Storm Drain Outfalls identified as SW4 and SW9 in the CURRENT TCAO and CURRENT DTR. Except as expressly admitted, the Request is denied.

REQUEST FOR ADMISSION NO. 6:

Admit that PERSONS located upgradient from the Port District tidelands have DISCHARGED urban storm water containing waste into the MS4 SYSTEM FACILITIES which was conveyed through the Storm Drain Outfalls identified as SW4 and SW9 in the CURRENT TCAO and CURRENT DTR onto the SITE.

RESPONSE TO REQUEST NO. 6:

The Cleanup Team objects to this Request on the ground that it is not full and complete in and of itself, in violation of Code of Civil Procedure section 2033.060, subdivision (d). The Cleanup Team further objects to this Request as compound, conjunctive, and/or disjunctive in violation of Code of Civil Procedure section 2033.060, subdivision (f). The Cleanup Team further objects to the Request on the ground that NPDES Permit No. CAS0108758 speaks for itself and is the best evidence of its contents with regard to PERSONS who DISCHARGE to the MS4 SYSTEM. The Cleanup Team further objects to this Request as vague and ambiguous with respect to the term "Port District tidelands." The Cleanup Team further objects to this Request as hopelessly overbroad with respect to "PERSONS located upgradient from the Port District tidelands." The Cleanup Team further objects to this Request as beyond the scope of permissible discovery under the 10.27.10 Order.

Subject to and without waiving the preceding objections, the Cleanup Team responds as follows: Admit.

REQUEST FOR ADMISSION NO. 7:

Admit that for the tidelands and submerged lands in or adjacent to the SITE that the State of California has ultimate authority over the Port District to specify the permitted uses of the SITE, how title to the SITE may be held, and to whom title to the

SITE may revert or be transferred.

RESPONSE TO REQUEST NO. 7.

The Cleanup Team objects to this Request on the ground that it is not full and complete in and of itself, in violation of Code of Civil Procedure section 2033.060, subdivision (d). The Cleanup Team further objects to this Request as compound, conjunctive, and/or disjunctive in violation of Code of Civil Procedure section 2033.060, subdivision (f). The Cleanup Team further objects to this Request as vague, ambiguous and grammatically unintelligible. The Cleanup Team further objects to this Request on the ground that the term "ultimate authority" is vague and ambiguous. The Cleanup Team further objects to this Request on the ground that the San Diego Unified Port District Act speaks for itself and is the best evidence of its contents..

Subject to and without waiving the preceding objections, the Cleanup Team responds as follows: The Cleanup Team lacks information sufficient to form a belief as to: (1) whether the State of California has ultimate authority over the Port District to specify the permitted uses of the SITE; (2) how title to the SITE may be held; (3) to whom title to the SITE may revert; and (4) to whom title to the SITE may be transferred, and based thereon denies this Request.

REQUEST FOR ADMISSION NO. 8:

Admit that the State of California is in effect the equitable and beneficial property owner of the tidelands in or adjacent to the SITE.

RESPONSE TO REQUEST NO. 8:

The Cleanup Team objects to this Request on the ground that it is not full and complete in and of itself, in violation of Code of Civil Procedure section 2033.060, subdivision (d). The Cleanup Team further objects to this Request as compound, conjunctive, and/or disjunctive in violation of Code of Civil Procedure section 2033.060, subdivision (f). The Cleanup Team further objects to this Request on the ground that the term "is in effect the equitable and beneficial property owner" is vague and ambiguous. The Cleanup Team further objects to this Request on the ground that the San Diego Unified Port District Act speaks for itself and is the best evidence of its contents.

Subject to and without waiving the preceding objections, the Cleanup Team responds as follows: The Cleanup Team lacks information sufficient to form a belief as to: (1) whether the State of California is in effect the equitable owner of the tidelands in the SITE; (2) whether the State of California is in effect the equitable owner of the tidelands adjacent to the SITE; (3) whether the State of California is in effect the beneficial owner of the tidelands in the SITE; and (4) whether the State of California is in effect the equitable owner of the tidelands adjacent to the SITE, and based thereon denies this Request.

REQUEST FOR ADMISSION NO. 9:

Admit that there were no new facts discovered by YOU between December 2009 and September 2010 to support YOUR revision of the PRIOR TCAO and PRIOR DTR to name the Port District as a DISCHARGER in the CURRENT TCAO and CURRENT DTR.

RESPONSE TO REQUEST NO. 9:

The Cleanup Team objects to this Request on the ground that it is not full and complete in and of itself, in violation of Code of Civil Procedure section 2033.060, subdivision (d). The Cleanup Team further objects to this Request as compound, conjunctive, and/or disjunctive in violation of Code of Civil Procedure section 2033.060, subdivision (f).

Subject to and without waiving the preceding objections, the Cleanup Team responds as follows: Denied.

With respect to naming the Port as a discharger based on its status as an MS4 co-permittee, the Cleanup Team determined after December 2009 that its recommendation to the San Diego Water Board in the PRIOR TCAO and PRIOR DTR that the Port not be named as a Discharger was inconsistent with previous State Water Resources Control Board and SDRWQCB orders concerning the naming of co-permittees in cleanup and abatement orders. With respect to naming the Port as a discharger based on its status as a trustee/landowner, the Cleanup Team determined to change its recommendation to the SDRWQCB from the PRIOR TCAO based on the following facts: (1) In December 2009, the Cleanup Team believed the Port would cooperate with the San Diego Water Board's efforts to clean up the Site by contributing money towards the cost of cleanup, including potential insurance proceeds from its responsible, yet absentee and/or non-participating tenants whose policies name the Port as an additional insured, whereas by the time the CURRENT TCAO was issued, the Port's representatives made it clear it does not intend to do so; (2) Prior to the release of the PRIOR TCAO in December 2009, the Port cooperated with the San Diego Water Board's efforts to clean up the Site by providing expertise to the Cleanup Team regarding scientific and technical issues, whereas by the time the CURRENT TCAO was issued, such cooperation was withdrawn by the Port's representatives; (3) Prior to December 2009, the Cleanup Team believed the Port would cooperate with the San Diego Water Board's efforts to clean up the Site by identifying and making available (at fair market lease rates) potential sediment staging and dewatering locations, whereas by the time the CURRENT TCAO was issued, the Port's representatives made it clear it will not voluntarily do so; (4) Prior to December 2009, the Cleanup Team believed the Port would cooperate with the San Diego Water Board's efforts to clean up the Site by designating percipient and expert witnesses to testify in support of the proposed cleanup, whereas on July 19, 2010, the Port's representatives advised the San Diego Water Board that the Port was not designating a single witness to testify in support of the cleanup; (5) Prior to December 2009, the Cleanup Team believed the Port would cooperate with the San Diego Water Board's efforts to cleanup up the Site by assisting both financially and technically with California Environmental Quality Act compliance, whereas by the time the CURRENT TCAO was issued, in spite of repeated requests to the Port's representatives by the Cleanup Team for CEQA assistance, the Port's representatives have refused.

REQUEST FOR ADMISSION NO. 10:

Admit that no changed circumstances or conditions occurred from December 2009 to September 2010 to support YOUR revision of the PRIOR TCAO and PRIOR DTR to name the Port District as a DISCHARGER in the CURRENT TCAO and CURRENT DTR.

RESPONSE TO REQUEST NO. 10:

The Cleanup Team objects to this Request on the ground that it is not full and complete in and of itself, in violation of Code of Civil Procedure section 2033.060, subdivision (d). The Cleanup Team further objects to this Request as compound, conjunctive, and/or disjunctive in violation of Code of Civil Procedure section 2033.060, subdivision (f).

Subject to and without waiving the preceding objections, the Cleanup Team responds as follows: Denied.

With respect to naming the Port as a discharger based on its status as an MS4 co-permittee, the Cleanup Team determined after December 2009 that its recommendation to the San Diego Water Board in the PRIOR TCAO and PRIOR DTR that the Port not be named as a Discharger was inconsistent with previous State Water Resources Control Board and SDRWQCB orders concerning the naming of co-permittees in cleanup and abatement orders. With respect to naming the Port as a discharger based on its status as a trustee/landowner, the Cleanup Team determined to change its recommendation to the SDRWQCB from the PRIOR TCAO based on the following changed circumstances: (1) In December 2009, the Cleanup Team believed the Port would cooperate with the San Diego Water Board's efforts to clean up the Site by contributing money towards the cost of cleanup, including potential insurance proceeds from its responsible, yet absentee and/or non-participating tenants whose policies name the Port as an additional insured, whereas by the time the CURRENT

TCAO was issued, the Port's representatives made it clear it does not intend to do so; (2) Prior to the release of the PRIOR TCAO in December 2009, the Port cooperated with the San Diego Water Board's efforts to clean up the Site by providing expertise to the Cleanup Team regarding scientific and technical issues, whereas by the time the CURRENT TCAO was issued, such cooperation was withdrawn by the Port's representatives; (3) Prior to December 2009, the Cleanup Team believed the Port would cooperate with the San Diego Water Board's efforts to clean up the Site by identifying and making available (at fair market lease rates) potential sediment staging and dewatering locations, whereas by the time the CURRENT TCAO was issued, the Port's representatives made it clear it will not voluntarily do so; (4) Prior to December 2009, the Cleanup Team believed the Port would cooperate with the San Diego Water Board's efforts to clean up the Site by designating percipient and expert witnesses to testify in support of the proposed cleanup, whereas on July 19, 2010, the Port's representatives advised the San Diego Water Board that the Port was not designating a single witness to testify in support of the cleanup; (5) Prior to December 2009, the Cleanup Team believed the Port would cooperate with the San Diego Water Board's efforts to cleanup up the Site by assisting both financially and technically with California Environmental Quality Act compliance, whereas by the time the CURRENT TCAO was issued, in spite of repeated requests to the Port's representatives by the Cleanup Team for CEQA assistance, the Port's representatives have refused.

REQUEST FOR ADMISSION NO. 11:

Admit that in connection with California State Water Resources Control Board Order No. WQ 90-3, *In the Matter of the Petition of San Diego Unified Port District*, YOU advised the State Water Board that the SDRWQCB would take enforcement action against the Port District only as a last resort after the Port had ample opportunity to compel the Port District's tenants to comply with SDRWQCB orders.

RESPONSE TO REQUEST NO. 11:

The Cleanup Team objects to this Request on the ground that it is not full and complete in and of itself, in violation of Code of Civil Procedure section 2033.060, subdivision (d). The Cleanup Team further objects to this Request as compound, conjunctive, and/or disjunctive in violation of Code of Civil Procedure section 2033.060, subdivision (f). The Cleanup Team further objects to this Request on the ground that the terms "in connection with," "as a last resort" and "ample opportunity" are vague and ambiguous. The Cleanup Team further objects to this Request on the ground that it is irrelevant what the Cleanup Team may have stated to the State Water Resources Control Board regarding its Order No. WQ 90-3 because Order No. WQ 90-3 speaks for itself and is the best evidence of its contents; therefore, the Request is not reasonably calculated to lead to the discovery of admissible evidence.

Subject to and without waiving the preceding objections, the Cleanup Team responds as follows: Denied. The Cleanup Team never commented to the State Board on the cited Order.

REQUEST FOR ADMISSION NO. 12:

Admit that YOUR determination not to name the Port District as a Discharger in the PRIOR TCAO and PRIOR DTR was consistent with previous California State Water Resources Control Board and SDRWQCB orders concerning the naming of non-operating public agencies in cleanup and abatement orders.

RESPONSE TO REQUEST NO. 12:

The Cleanup Team objects to this Request on the ground that it is not full and complete in and of itself, in violation of Code of Civil Procedure section 2033.060, subdivision (d). The Cleanup Team further objects to this Request as compound, conjunctive, and/or disjunctive in violation of Code of Civil Procedure section 2033.060, subdivision (f).

Subject to and without waiving the preceding objections, the Cleanup Team responds as follows: The Cleanup Team admits that its recommendation to the San Diego Water Board in the PRIOR TCAO and PRIOR DTR that it not name the Port as a discharger was consistent with previous California State Water Resources Control Board and SDRWQCB orders concerning the naming of non-operating public agency landowners in cleanup and abatement orders based on the facts known to the Cleanup Team as of December 22, 2009. Except as expressly admitted, the Request is denied. The Cleanup Team's recommendation to the San Diego Water Board in the PRIOR TCAO and PRIOR DTR that the Port not be named as a Discharger was inconsistent with previous State Water Resources Control Board and SDRWQCB order concerning the naming of co-permittees in cleanup and abatement orders.

REQUEST FOR ADMISSION NO. 13:

Admit that YOUR determination to name Port District as a Discharger in the CURRENT TCAO and CURRENT DTR is inconsistent with previous California State Water Resources Control Board and SDRWQCB orders concerning the naming of non-operating public agencies in cleanup and abatement orders.

RESPONSE TO REQUEST NO. 13:

The Cleanup Team objects to this Request on the ground that it is not full and complete in and of itself, in violation of Code of Civil Procedure section 2033.060, subdivision (d). The Cleanup Team further objects to this Request as compound, conjunctive, and/or disjunctive in violation of Code of Civil Procedure section 2033.060, subdivision (f).

Subject to and without waiving the preceding objections, the Cleanup Team responds as follows: Denied.

New facts and circumstances developed between December 22, 2009, and September 15, 2010 that made the Cleanup Team's previous recommendation inconsistent with previous California State Water Resources Control Board and SDRWQCB orders concerning the naming of non-operating public agency landowners in cleanup and abatement orders. The facts and circumstances are detailed in the Cleanup Team's responses to Request Nos. 9 and 10. Additionally, naming the Port as a Discharger based on its status as a co-permittee under NPDES Permit No. CAS0108758 is consistent with previous State Water Resources Control Board and SDRWQCB orders.

REQUEST FOR ADMISSION NO. 14:

Admit that YOU do not allege in the CURRENT TCAO and CURRENT DTR that any of Port District's TENANTS at the SITE DISCHARGED waste into the SITE in violation of any of the TENANTS' applicable waste discharge permit requirements that were issued by YOU since February 1963.

RESPONSE TO REQUEST NO. 14:

The Cleanup Team objects to this Request on the ground that it is not full and complete in and of itself, in violation of Code of Civil Procedure section 2033.060, subdivision (d). The Cleanup Team further objects to this Request as compound, conjunctive, and/or disjunctive in violation of Code of Civil Procedure section 2033.060, subdivision (f).

Subject to and without waiving the preceding objections, the Cleanup Team responds as follows: Denied.

It is a violation of each and all of the applicable permits of the Port's TENANTS, as well as the Port's MS4 permit, to cause or permit, or threaten to cause or permit waste to be discharged or deposited where it is, or probably will be, discharged into waters of the state and creates, or threatens to create, a condition of pollution or nuisance.

REQUEST FOR ADMISSION NO. 15:

Admit that Campbell Industries, Inc., is the corporate successor of former SITE TENANT San Diego Marine Construction Corporation, formerly known as MCCSD.

REPONSE TO REQUEST NO. 15:

The Cleanup Team objects to this Request on the ground that it is not full and complete in and of itself, in violation of Code of Civil Procedure section 2033.060, subdivision (d). The Cleanup Team further objects to this Request as compound, conjunctive, and/or disjunctive in violation of Code of Civil Procedure section 2033.060, subdivision (f). The Cleanup Team further objects to this Request on the ground the term "corporate successor" is vague and ambiguous.

Subject to and without waiving the preceding objection, the Cleanup Team responds as follows: The Cleanup Team admits that Campbell Industries is legally responsible for the acts and omissions of former SITE TENANT San Diego Marine Construction Corporation, also known as MCCSD, from June 23, 1972 through 1979, when it operated a shipyard at what is now known as the BAE leasehold.

REQUEST FOR ADMISSION NO. 16:

Admit that San Diego Marine Construction Corporation, a wholly owned subsidiary of Campbell Industries, Inc., is the corporate successor of San Diego Marine Construction Company's marine division's shipyard operations.

RESPONSE TO REQUEST NO. 16:

The Cleanup Team objects to this Request on the ground that it is not full and complete in and of itself, in violation of Code of Civil Procedure section 2033.060, subdivision (d). The Cleanup Team further objects to this Request as compound, conjunctive, and/or disjunctive in violation of Code of Civil Procedure section 2033.060, subdivision (f). The Cleanup Team further objects to this Request on the ground the terms "corporate successor" and "marine division's shipyard operations" are vague and ambiguous.

Subject to and without waiving the preceding objections, the Cleanup Team responds as follows: Admit that San Diego Marine Construction Corporation was a wholly owned subsidiary of Campbell Industries. Except as expressly admitted, the Request is denied.

San Diego Marine Construction Corporation purchased the assets of what appears to be known as the "marine division" of the San Diego Marine Construction

Company.

REQUEST FOR ADMISSION NO. 17:

Admit that the Port District's TENANT Star & Crescent Boat Company, is the corporate successor of the operations of San Diego Marine Construction Company's boat division known as Star and Crescent Boat Company.

RESPONSE TO REQUEST NO. 17:

The Cleanup Team objects to this Request on the ground that it is not full and complete in and of itself, in violation of Code of Civil Procedure section 2033.060, subdivision (d). The Cleanup Team further objects to this Request as compound, conjunctive, and/or disjunctive in violation of Code of Civil Procedure section 2033.060, subdivision (f). The Cleanup Team further objects to this Request on the ground the term "corporate successor of the operations" is vague and ambiguous.

Subject to and without waiving the preceding objections, the Cleanup Team responds as follows: Admit.

REQUEST FOR ADMISSION NO. 18:

Admit that YOU are responsible for issuing permits regulating the discharge of storm water and other discharge point sources onto the SITE.

RESPONSE TO REQUEST NO. 18:

The Cleanup Team objects to this Request on the ground that it is not full and complete in and of itself, in violation of Code of Civil Procedure section 2033.060, subdivision (d). The Cleanup Team further objects to this Request as compound, conjunctive, and/or disjunctive in violation of Code of Civil Procedure section 2033.060, subdivision (f). The Cleanup Team further objects to this Request on the ground that the term "other discharge point sources" is vague and ambiguous.

Subject to and without waiving the preceding objections, the Cleanup Team responds as follows: While the Cleanup Team is not responsible for issuing permits, it admits that the SDRWQCB is responsible for issuing permits regulating the discharge of storm water and other pollutants from point sources to waters of the state, including those waters at the SITE.

REQUEST FOR ADMISSION NO. 19:

Admit that YOU issued permits to the Port District's TENANTS, who are currently leasing the tidelands in or adjacent to the SITE, including San Diego Gas & Electric Company, National Steel and Shipbuilding Company, and BAE Systems San Diego Ship Repair, Inc., regulating the TENANTS' storm and waste water DISCHARGES onto the SITE.

RESPONSE TO REQUEST NO. 19:

The Cleanup Team objects to this Request on the ground that it is not full and complete in and of itself, in violation of Code of Civil Procedure section 2033.060, subdivision (d). The Cleanup Team further objects to this Request as compound, conjunctive, and/or disjunctive in violation of Code of Civil Procedure section 2033.060, subdivision (f). The Cleanup Team further objects to this Request on the ground that the term "regulating the TENANTS' storm and waste water DISCHARGES onto the SITE" is vague and ambiguous and that the referenced permits speak for themselves and are the best evidence of their contents.

Subject to and without waiving the preceding objections, the Cleanup Team responds as follows: While the Cleanup Team did not issue permits, it admits that the SDRWQCB issued permits to the referenced TENANTS, which permits speak for themselves and are the best evidence of their contents.

REQUEST FOR ADMISSION NO. 20:

Admit that YOU issued storm and waste water DISCHARGE permits to the Port District's TENANTS, who are currently leasing the tidelands in or adjacent to the SITE, including San Diego Gas & Electric Company, National Steel and Shipbuilding Company, and BAE Systems San Diego Ship Repair, Inc., that contained water quality based effluent limitations which permitted the TENANTS to DISCHARGE waste onto the SITE that contained certain levels of contaminants of concern that are identified in the CURRENT TCAO and CURRENT DTR, including, but not limited to, chromium, copper, nickel, and zinc.

RESPONSE TO REQUEST NO. 20:

The Cleanup Team objects to this Request on the ground that it is not full and complete in and of itself, in violation of Code of Civil Procedure section 2033.060, subdivision (d). The Cleanup Team further objects to this Request as compound, conjunctive, and/or disjunctive in violation of Code of Civil Procedure section 2033.060, subdivision (f).

Subject to and without waiving the preceding objections, the Cleanup Team responds as follows: While the Cleanup Team did not issue permits, it admits that the SDRWQCB issued some permits to some of the TENANTS referenced in the Request that contain water quality based effluent limitations for chromium copper, nickel and zinc, while other issued permits to the TENANTS referenced in the Request are BMP based.

REQUEST FOR ADMISSION NO. 21:

Admit that the storm and waste water DISCHARGES that YOU permitted the Port District's TENANTS, who are currently leasing the tidelands in or adjacent to the SITE, including San Diego Gas & Electric Company, National Steel and Shipbuilding Company, and BAE Systems San Diego Ship Repair, Inc., to DISCHARGE onto the SITE contained waste that contributed to the alleged contamination of the sediment at the SITE.

RESPONSE TO REQUEST NO. 21:

The Cleanup Team objects to this Request on the ground that it is not full and complete in and of itself, in violation of Code of Civil Procedure section 2033.060, subdivision (d). The Cleanup Team further objects to this Request as compound, conjunctive, and/or disjunctive in violation of Code of Civil Procedure section 2033.060, subdivision (f). The Cleanup Team further objects to the Request on the ground that it is vague, ambiguous and grammatically unintelligible.

Subject to and without waiving the preceding objections, the Cleanup Team responds as follows: Denied.

The Cleanup Team does not permit DISCHARGES. While the SDRWQCB issues permits that allow certain DISCHARGES, it is a violation of each and all of the applicable permits of the Port's TENANTS, as well as the Port's MS4 permit, to cause or permit, or threaten to cause or permit waste to be discharged or deposited where it is, or probably will be, discharged into waters of the state and creates, or threatens to create, a condition of pollution or nuisance.

REQUEST FOR ADMISSION NO. 22:

Admit that the Port District does not have authority to impose more stringent requirements on its TENANTS' storm water discharges than those imposed by YOU.

RESPONSE TO REQUEST NO. 22:

The Cleanup Team objects to this Request as compound, conjunctive, and/or disjunctive in violation of Code of Civil Procedure section 2033.060, subdivision (f).

Subject to and without waiving the preceding objection, the Cleanup Team responds as follows: Denied.

The Cleanup Team does not impose requirements on storm water discharges. The Cleanup Team lacks information sufficient to form a belief about the scope of the Port's authority as a special government agency that holds and manages land in trust for the People of the State, or as a lessor engaged in a commercial transaction with its lessees, to impose requirements on its TENANTS storm water discharges, and based thereon denies this Request.

REQUEST FOR ADMISSION NO. 23:

Admit that the Port District has never been cited by YOU for violating the terms of the current or prior MS4 SYSTEM permits YOU issued to the Port District and the other

MS4 SYSTEM co-permitees RELATING TO DISCHARGES onto the SITE.

RESPONSE TO REQUEST NO. 23:

The Cleanup Team objects to this Request on the ground that it is not full and complete in and of itself, in violation of Code of Civil Procedure section 2033.060, subdivision (d). The Cleanup Team further objects to this Request as compound, conjunctive, and/or disjunctive in violation of Code of Civil Procedure section 2033.060, subdivision (f).

Subject to and without waiving the preceding objections, the Cleanup Team responds as follows: Admit.

REQUEST FOR ADMISSION NO. 24:

Admit that the Port District did not have knowledge of all of the waste DISCHARGES into the SITE, since February 1963, for which YOU seek to hold it primarily liable.

RESPONSE TO REQUEST NO. 24:

The Cleanup Team objects to this Request on the ground that it is not full and complete in and of itself, in violation of Code of Civil Procedure section 2033.060, subdivision (d). The Cleanup Team further objects to this Request as compound, conjunctive, and/or disjunctive in violation of Code of Civil Procedure section 2033.060, subdivision (f).

Subject to and without waiving the preceding objections, the Cleanup Team responds as follows: Denied.

The Port has sufficient knowledge of the activities of its TENANTS, which are controlled by the terms of its leases with those TENANTS, and the mechanics and operations of the MS4 SYSTEM of which it is a co-permittee, to name it as a Discharger.

Dated: January 5, 2010

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD, SAN DIEGO REGION, CLEANUP TEAM

By: ______________________
Christian Carrigan

SAN DIEGO UNIFIED PORT DISTRICT WRITTEN DISCOVERY RESPONSE VERIFICATION

I, David Barker, declare:

I am the Branch Chief of the Surface Waters Basins Branch and a Supervising Water Resource Control Engineer at the California Regional Water Quality Control Board, San Diego Region (San Diego Water Board). I am the designated manager of the Cleanup Team for the San Diego Water Board's proceedings to consider the development and issuance of a cleanup and abatement order for discharges of metals and other pollutant wastes to San Diego Bay marine sediments and waters at a Site referred to as the Shipyard Sediment Site. I am authorized to make this verification on behalf of the San Diego Water Board's Cleanup Team.

I have read the foregoing Regional Board Cleanup Team's Responses & Objections to Designated Party San Diego Unified Port District's First Set of Requests for Admissions, Regional Board Cleanup Team's Responses & Objections to Designated Party San Diego Unified Port District's First Set of Requests for Production of Documents and Regional Board Cleanup Team's Responses & Objections to Designated Party San Diego Unified Port District's First Set of Special Interrogatories, and know their contents. I am informed and believe that the matters stated therein are true and on that ground certify or declare under penalty of perjury under the laws of the State of California that the same are true and correct.

Dated: January 5, 2011

David Barker

1237

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SAN DIEGO REGIONAL WATER QUALITY CONTROL BOARD

2005 JUN 15 P 4: 48

Mr. John H. Robertus
Executive Officer
Regional Water Quality Control Board
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San Diego, CA 92123
fax (858) 571-6972
rb9agenda@waterboards.ca.gov

EXHIBIT NO. 1237
Barker
jmsteno.com

June 15, 2005

Attn: Agenda for Sediment Cleanup

Re: Comments on Tentative CAO R9-2005-0126 dated April 29, 2005

Dear Mr. Robertus:

We provide the following comments for consideration by the Regional Water Quality Control Board (RWQCB) members and staff. Please note that the following technical comments on the Tentative CAO are summary in nature, due to the RWQCB only releasing summary-level findings without supporting data and calculations, references or citations, or Staff Report. These comments were prepared by ENV America, consultant to SDG&E.

Comments on "PERSONS RESPONSIBLE," Finding 8 "SDG&E"

We disagree with the RWQCB finding that there are data or other technical information that support naming SDG&E as a discharger in the Tentative CAO. In Finding 8 the RWQCB makes statements about SDG&E's former operations at Silver Gate power plant, and concludes that these statements are the basis for naming SDG&E as a discharger. (While the RWQCB does not cite a reference for the statements made about SDG&E's operations, it appears that the RWQCB has taken these observations from SDG&E's Investigation Order (IO) reports prepared by ENV America Incorporated (2004a[1] and 2004b[2])).

The available data presents a compelling argument that SDG&E was not and is not a discharger to marine sediments. We draw your attention to the primary conclusion from

[1] ENV America, 2004a, Site Assessment Report, Landside Tidelands Lease Area, Silver Gate Power Plant, San Diego, California. July 14. Prepared for SDG&E. Provided to RWQCB in July 2004.
[2] ENV America, 2004b, Technical Report for RWQCB Investigation Order No. R9-2004-0026, Silver Gate Power Plant, San Diego, California. July 14. Prepared for SDG&E. Provided to RWQCB in July 2004.

the IO report, and SDG&E's pending site assessment work. The primary conclusion and recommendation from SDG&E's IO report was:

> *"The Exponent (2003) sediment sampling stations in the SDG&E wharf leasehold and the north portion of SWM's wharf leasehold were spaced over 100 feet apart* [very sparse], *and there were only three sediment sampling stations in SDG&E's leasehold. The* [available] *data indicate that SDG&E discharges were not a cause of sediment contamination. Additional data are recommended to conclude with certainty that SDG&E discharges were not a cause of sediment contamination."* (ENV America 2004b, page 34)

Recognizing that there is uncertainty, SDG&E is planning to conduct its own sampling of bay sediments. On May 16, 2005, the RWQCB was provided with SDG&E's workplan to independently sample and analyze sediments to determine if SDG&E operations contributed to sediment contamination (ENV America 2005[3]). SDG&E plans to conduct sampling in July of 2005, and to publish the results by November 2005.

Given that there is little evidence that SDG&E was or is a discharger, the RWQCB should refrain from considering SDG&E to be a discharger until SDG&E has completed its own sediment sampling, analysis and data evaluation, and there are sufficient data to conclude with certainty whether SDG&E was or was not a contributor to contamination in bay sediments.

The following explains why specific statements in Finding 8 of the Tentative CAO are erroneous or misleading.

The RWQCB erroneously concludes that operational history and site assessment data from former wastewater ponds indicates that the ponds discharged or threaten to discharge PCBs or other contaminants to San Diego Bay. The RWQCB correctly states that SDG&E operations included discharging of wastes to holding ponds, but the RWQCB errs when it states that the detection of PCBs in one of two former ponds is evidence that SDG&E was a source of PCBs detected in the bay sediments. Substantial data and information refute the RWQCB's linking of PCBs in bay sediments to SDG&E operations, and the data strongly indicate that PCBs and PCTs detected in sediment originated from releases in the vicinity of the shipyard marine railways and the landward end of Pier 1.

- The concentration trends in the sediment data strongly indicate that the primary source of PCBs and PCTs in the northern end of Exponent Sediment Investigation study area was in the vicinity of the shipyard marine railways at the landward end of Pier 1 (ENV America 2004b, 2005) (in particular, see Figure 5 in ENV America [2005], which presents and illustrates a more complete record of PCB data than was presented in Exponent's Sediment Investigation).

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[3] ENV America, 2005, Sediment Sampling Workplan, Silver Gate Power Plant, San Diego, California. March 29. Prepared for SDG&E. Provided to RWQCB on May 16, 2005.

- PCBs were detected in only two samples from one of SDG&E's former wastewater ponds, at a maximum concentration of 2.8 ppm Aroclor 1260 (ENV America, 2004a), which is a concentration far lower than was detected in bay sediments. The maximum concentration of total PCBs detected in bay sediments in the north end of the Exponent Sediment Investigation study area was 34 ppm (location SW08, which also had the highest concentration of PCTs) (ENV America 2005). If the former wastewater ponds were a source of PCBs detected in bay sediments, then one would expect to see the highest PCB concentrations in the former wastewater ponds. The concentration trends do not indicate that the former wastewater ponds were a source of PCBs – on the contrary, the concentration trends indicate that the shipyard was the primary source of PCBs. The concentration trends indicating that the shipyard is the primary source of PCBs is consistent with literature about PCBs and ships.

    - PCBs are a known problem in the shipbreaking industry, and in older vessels PCBs are encountered in a variety of materials, including "...rubber products such as hoses, plastic foam insulation, cables, silver paint, habitability paint, felt under septum plates, plates on top of the hull bottom, and primary paint on hull steel." (OSHA Fact Sheet, *"Shipbreaking,"* 2001)

    - "PCBs are found throughout older vessels and it is likely your ship scrapping facility will be faced with managing large quantities of PCBs." (*"Guide for Ship Scrappers,"* USEPA 315-B0-00-001)

- The affected soil beneath the former wastewater ponds does not threaten to discharge to the bay. ENV America (2004a) demonstrated that (1) the affected soil of the former wastewater ponds is buried beneath several feet of clean soil and pavement, which means the affected soil is not a current or potential future source of contaminated surface runoff, if left undisturbed; and (2) the groundwater samples collected from beneath the former wastewater ponds did not have detectable PCBs (PCBs generally do not migrate in groundwater). ENV America (2004a) demonstrated that the groundwater concentrations beneath the former wastewater ponds are below applicable regulatory criteria and there is no threat to the bay via the groundwater migration pathway.

- The plant records indicate that former wastewater ponds were used for treatment or disposal of the power plant bilge trench water; and given that no PCBs were detected in the power plant's bilge trenches, it is unlikely that the source of PCBs detected in the former wastewater pond was the power plant operations. The power plant's bilge trenches were the receiver or collector of many of the low volume liquid waste discharges from the power house. If PCBs had been released in the power house, then it is likely that PCBs would have been detected in the bilge trenches.

- A number of records (photographs, an engineering drawing and lease records) document that the shipyard subleased the land parcel containing the wastewater ponds, and in the late 1960s or early 1970s the shipyard operations are appears to have encompassed the open wastewater pond. Records also indicate that the shipyard constructed decking above the wastewater pond to enable shipbuilding or ship repair activities to be performed over the pond area.

- PCBs were not used in appreciable quantities in the power plant and substation. The only known uses of PCBs in the powerhouse were in small closed systems such as in capacitors and fluorescent light ballasts (similar to the use of PCBs in many older commercial or residential buildings). The transformers in SDG&E's Silver Gate substations and switchyard did not contain PCB dielectric fluids, and contained only trace PCBs.

SDG&E is continuing to research records on PCB uses and occurrences at Silver Gate power plant, and will provide additional supporting documentation to the RWQCB in a future transmittal.

There is no conclusive evidence linking SDG&E discharges to contamination in found in marine sediments. The IO report (ENV America 2004b) addressed the RWQCB's earlier allegations[4] that SDG&E's operations contributed to elevated concentrations of cadmium, chromium, mercury, nickel and PCTs in marine sediment. We note that the RWQCB through issuing the new Tentative CAO, without maintaining earlier allegations, concurs with ENV America's (2004b) conclusion that data indicate that SDG&E did not contribute to elevated concentrations of cadmium, mercury, nickel and PCTs in marine sediment.

The following comments address the RWQCB's new allegations in the Tentative CAO that SDG&E's non-contact cooling water discharges contributed pollutants to marine sediments, including chromium, iron, copper, total suspended solids (TSS) and petroleum hydrocarbon (on the basis of waste discharge monitoring records).

- The patterns of contaminant distribution in sediment do not indicate that the cooling water discharges were a source of contaminants in sediment – on the contrary, the concentration trends indicate that the shipyard and City storm water discharges were the source of contaminants in sediment. (see Exponent Sediment Investigation; and ENV America, 2004b and 2005.)

- SDG&E's historical chromium exceedances in cooling water were minor, and the form of chromium found in bay sediments at the shipyard is unlikely to have come from SDG&E's discharges, but is likely to have come from shipyard discharges. ENV America (2004b) documented that the only known use of

[4] Finding 10 of Investigation Order No. R0-2004-0026.

chromium at Silver Gate power plant was sodium dichromate, which was used as a corrosion inhibitor in the service water system. Exponent's Sediment Investigation and Technical Memorandum of April 6, 2004, documented that in sediments more than 80 percent of the relative mass of chromium was present as iron-chromium oxide, and 60 percent of the relative mass of chromium was present as chalcopyrite, copper-zinc oxide, and slag. The major source of the primary chromium forms found in sediment was most likely shipyard wastes, such as sand blasting grit (blasting grit is commonly ore slag, a source of the mineral chalcopyrite and other forms of chromium), alloy steels and other metal debris (most alloy steels contain chromium, and stainless steel contains over 10 percent chromium), and paint debris (chromium is used in many pigments). Major waste streams in current and historical shipyard operations are sand blast grit, steel debris and paint debris.

- SDG&E's historical iron and TSS exceedances in cooling water were minor, and are not relevant, because iron and TSS are not rare constituents, nor are they identified as chemicals of concern in the shipyard cleanup.

Comment on "FACTUAL BACKGROUND"
Finding 11 in the Tentative CAO in its entirety states:

> "**SEDIMENT QUALITY INVESTIGATION**. Unless otherwise explicitly stated, the RWQCB's finding and conclusions in this Cleanup and Abatement Order are based on the data and other technical information contained in the report prepared by NASSCO's and Southwest Marine's consultant, Exponent entitled *NASSCO and Southwest Marine Detailed Sediment Investigation, September 2003*."

Finding 11 is incorrect. We find that the RWQCB, in drafting the Tentative CAO, presents data and much other technical information that was not contained in the Exponent Sediment Investigation. For instance, the Tentative CAO presents a "Summary of Economic Feasibility Evaluation" (Finding 33) that appears to be based on engineering calculations by NOAA, presented in the following documents.

> Memorandum from NOAA to RWQCB, dated February 23, 2005. Re: Calculation of Dredging Volumes at the NASSCO and Southwest Marine Shipyards for Alternative Remedial Scenarios.
>
> Memorandum from NOAA to RWQCB, dated March 14, 2005. Addendum to Memorandum dated February 23, 2005, Re: Calculation of Dredging Volumes at the NASSCO and Southwest Marine Shipyards for Alternative Remedial Scenarios.
>
> Memorandum from NOAA to RWQCB, dated April 12, 2005. Re: Calculation of post-dredging area weighted averages at the NASSCO and Southwest Marine Shipyards for Alternative Remedial Scenarios.

Memorandum from NOAA to RWQCB, dated May 12, 2005. Re: Calculations of Dredging Volumes at the NASSCO and Southwest Marine Shipyards for Five Times Baseline Remedial Scenario Using TBT, PCB and Benzo(a)pyrene (BAP).

We observed that the Sediment Investigation report available to us (via posting on the RWQCB's website) is dated October 2003, and is not dated September 2003 as cited in the Tentative CAO. We request that the RWQCB provide us a copy of the September 2003 report, if the citation was correct.

Comment on Finding 15, "BASELINE SEDIMENT QUALITY CONDITIONS," and Finding 31, "BACKGROUND SEDIMENT QUALITY"

We note that the RWQCB has published background sediment chemistry levels that are different than those published in Exponent's Sediment Investigation. Please explain why and how the RWQCB calculated new background concentrations, particularly in light of the extensive plans, correspondence and discussion that preceded Exponent's development of background concentrations.

Comments on evaluation of baseline risk in

Aquatic life beneficial use impairment (Findings 12 to 21)
Aquatic-dependent wildlife beneficial use impairment (Findings 22 to 25)
Human health beneficial use impairment (Findings 26 to 29)

We note that the RWQCB and Exponent in evaluating baseline risk used substantially different assumptions and input values, and arrived at substantially different conclusions about impairment of beneficial uses. We found it difficult to review or understand the RWQCB's risk assessments, because the RWQCB did not provide explanations in the Tentative CAO to explain why and how the RWQCB deviated from project guidance, project plans, and Exponent's Sediment Investigation results. Please explain why and how the RWQCB chose to use different assumptions and input values for evaluating risk.

We noted a large number of apparent inadequacies in the risk evaluations, and to minimize the length of these comments we directed our comments to only the human health risk assessment (Findings 26-29). These same comments or similar comments also apply to the risk assessments the RWQCB performed for aquatic-dependent wildlife (Findings 22-25).

The RWQCB incorrectly used a fractional intake (FI) of 1 for the screening (Tier I) and baseline (Tier II) human health risk assessments. Given that the shipyard area is now and will continue to be an operating shipyard with strict, enforced prohibitions on public fishing access, it is inappropriate to use a fractional intake of 1 to conduct risk assessments using tissue concentrations from fish and shellfish with high site fidelity. The approach used to perform baseline risk assessments in California when there is no foreseeable change in site use is to conduct risk assessments using reasonable assumptions and inputs based on the current site use or planned future site use. The RWQCB should recalculate the baseline human health risk assessment using an appropriate exposure scenario and inputs based on the current and planned site use.

The RWQCB presents generalized conclusions that do not adequately portray baseline risks, and possibly incorrectly portray baseline risks. For instance, the RWQCB in Finding 29 states that they quantified (calculated) the baseline carcinogenic risks and hazard quotients for four assessment areas and one reference (background) area, but the RWQCB presented only one assumption (the FI) of the dozen or more the assumptions necessary to establish a baseline risk assessment and the RWQCB did not present the quantified results (the numerical results), except to say that the undisclosed numbers were above or below a particular risk index number. For instance, in just one example, the RWQCB in Finding 29 indicates that the concentrations from whole body Sand Bass caught inside the SWM leasehold had an undisclosed carcinogenic risk number above $1x10^{-6}$, the same fish species from the background area had an undisclosed carcinogenic risk number above $1x10^{-6}$, PCBs presented 96 percent of the cumulative cancer risk, and the RWQCB concluded that the area inside the SWM leasehold poses a theoretical increased cancer risk. Because the RWQCB did not presented the numerical results from the risk assessment, the RWQCB has not demonstrated whether there is a significant difference between background risk and site risk, the RWQCB has not revealed the amount of increase in the theoretical cancer risk, and the RWQCB has presented insufficient data to contribute to and initiate a meaningful and detailed discussion about baseline risk. We request that the RWQCB publish the full results of the risk assessment.

Comment on Finding 33, 'ECONOMIC FEASIBILITY CONSIDERATIONS"
The Tentative CAO does not present quantified risk levels associated with the cleanup levels of 5x, 10x, 15x and 20x background for TBT, BaP and PCBs. In the table in Finding 33, the RWQCB indicates that they determined what the "long-term effects" may be for cleanup to 5x, 10x, 15x and 20x background for TBT, BaP and PCBs. The "long-term effects" are ranked on a scale of 10 (+5 to -5), and the assigned scores appear to be qualitative scores. On a project of this magnitude having an abundance of scientific data, the RWQCB should evaluate effects on beneficial uses using scientific relationships between chemistry and risk (i.e. quantified risk assessments).

Comment on Finding 34, "ALTERNATIVE SEDIMENT CLEANUP LEVELS"
The cleanup levels proposed by the RWQCB are not consistent with Section II.a.9 of SWRCB Resolution No. 92-49, (*Policies and Procedures for Investigation and Cleanup and Abatement of Discharges Under Water Code Section 13304*), which states that the RWQCB shall... "Prescribe cleanup levels which are consistent with appropriate levels set by the RWQCB for analogous discharges that involve similar wastes, site characteristics, and water quality considerations..." The RWQCB is currently proposing cleanup levels that are based on baseline risk assessment exposure scenarios and assumptions that are inconsistent with the current practice in California, and the RWQCB is proposing cleanup levels that are far lower than previously set for analogous projects at Campbell Shipyard, Shelter Island Boat Yard, America's Cup Harbor, Paco Terminals and Teledyne Ryan. The RWQCB should revise its risk assessment models to use appropriate site-specific exposure scenarios and input values consistent with the standard practices used in California, and the RWQCB should prescribe cleanup levels consistent with the prior cleanups in San Diego Bay.

The cleanup levels that the RWQCB is proposing for metals are without precedence, and are probably not practical to achieve in the field. We note that the RWQCB is proposing cleanup levels that are approximately equal to background (see table below), and appear to have no foundation in risk assessment. The proposed cleanup levels for metals appear to have been chosen by selecting the predicted residual concentrations that would exist after cleanup of TBT, BaP and PCB. We recommend the RWQCB consider using risk-based cleanup levels for metals, and establish cleanup levels only for those metals that significantly contribute to risk.

Chemical	Units	RWQCB proposed CU level	RWQCB CU level as multiples of background	RWQCB background 95% UPL	Exponent background 95% UPL
Arsenic	mg/kg	10	1.33	7.5	9
Cadmium	mg/kg	1	3.03	0.33	0.29
Chromium	mg/kg	81	1.42	57	57
Copper	mg/kg	200	1.65	121	120
Lead	mg/kg	90	1.70	53	48
Mercury	mg/kg	0.7	1.23	0.57	0.56
Nickel	mg/kg	20	1.33	15	17
Silver	mg/kg	1.5	1.36	1.1	1
Zinc	mg/kg	300	1.56	192	210
Tributyltin	ug/kg	110	5	22	5.1
Benzo(a)pyrene	ug/kg	1010	5	202	–
PCB, total congeners	ug/kg	420	5	84	36

Thank you for the opportunity to submit these comments. We look forward to your response.

Sincerely,
ENV America Incorporated

for

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cc: Tom Alo, RWQCB
Ken Rowland, SDG&E
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Appendix C

ECONOMIC CONSIDERATIONS OF PROPOSED AMENDMENTS TO THE SEDIMENT QUALITY PLAN FOR ENCLOSED BAYS AND ESTUARIES IN CALIFORNIA

January 2011

State Water Resources Control Board
Division of Water Quality
1001 I Street
Sacramento, CA 95814

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Acronyms and Abbreviations

BAT	Best available technology economically achievable
BCT	Best conventional pollutant control technology
BMPs	Best management practices
BPTCP	Bay Protection and Toxic Cleanup Program
CACs	County Agricultural Commissioners
CalEPA	California Environmental Protection Agency's
Caltrans	California Department of Transportation
CCA	California Coastal Act
CCC	California Coastal Commission
CCLEAN	Central Coast Long-term Environmental Assessment Network
CDF	California Department of Forestry
cfs	Cubic feet per second
CTR	California Toxics Rule
CSTF	Contaminated Sediments Task Force
CWA	Clean Water Act
CWC	California Water Code
CZARA	Coastal Zone Act Reauthorization Amendments of 1990
DOC	Department of Conservation
DPR	Department of Pesticide Regulation
DTSC	Cal/EPA Department of Toxic Substances Control
EPA	U.S. Environmental Protection Agency
ERA	Ecological Risk Assessment
FPR	Forest Practice Rules
IPM	Integrated pest management
LCP	Local costal plan
LEAs	Local Enforcement Agencies
MEP	Maximum Extent Practicable
MLOE	Multiple lines of evidence
MBNEP	Morro Bay National Estuary Program
MMs	Management measures
MS4s	Municipal separate storm sewer systems
NPDES	National Pollutant Discharge and Elimination System
NPS	Nonpoint Source
OEHHA	Office of Environmental Health Hazard Assessment
OPA	Oil Pollution Act
PAHs	Polynuclear aromatic hydrocarbons
PBDEs	Polybrominated diphenyl ethers
PCBs	Polychlorinated biphenyls
Regional Water Board	Regional Water Quality Control Board
RHMP	Regional Harbors Monitoring Plan
RMP	Regional Monitoring Plan
RWB	Regional Water Board
SCCWRP	Southern California Coastal Water Research Program
SFEI	San Francisco Estuary Institute
SIYB	Shelter Island Yacht Basin
SMARA	Surface Mining and Reclamation Act
SSO	Site Specific Objective
SWRCB	State Water Resources Control Board (State Water Board)

SWAMP	Surface Water Ambient Monitoring Program
SWMP	Storm Water Management Plans
SWPPP	Storm Water Pollution Prevention Plan
SQOs	Sediment quality objectives
THPs	Timber harvest plans
TIE	Toxicity identification evaluation
TMDL	Total Maximum Daily Load
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
WDRs	Waste discharge requirements
WQBEL	Water Quality-Based Effluent Limits
WWQI	Westside Water Quality Improvement

Executive Summary

The State Water Resource Control Board (State Water Board) staff is proposing amendments to the state's Water Quality Control Plan for Enclosed Bays and Estuaries: Part 1 Sediment Quality (referred to in this report as either "Part 1" or "the Plan"). The amendments include additional sediment quality objectives (SQOs) and implementation procedures that apply to enclosed bays and estuaries in California. This report provides analysis of economic factors related to the Plan amendments.

Background

In 2008, the State Water Board adopted SQOs and an implementation policy for bays and estuaries in the state (Part 1). Part 1 integrates chemical and biological measures to determine if the sediment dependent biota are protected or degraded as a result of exposure to toxic pollutants in sediment and to protect human health. Part 1 includes narrative SQOs for the protection of aquatic life and human health; identification of the beneficial uses that these objectives are intended to protect; and a program of implementation that contains specific indicators, tools, and implementation provisions to determine if the sediment quality at a station or multiple stations meets the narrative objectives, description of appropriate monitoring programs, and a sequential series of actions that shall be initiated when a sediment quality objective is not met including stressor identification and evaluation of appropriate targets. The State Water Board is proposing amendments to the Plan to incorporate additional SQOs for the protection of wildlife and finfish and implementation policy.

In establishing water quality objectives, the State Water Board considers economic factors, among others. Specifically, these economic factors include whether the objectives and alternatives under consideration are currently being attained, the methods available to achieve compliance, and the costs of those methods. The State Water Board is considering these same factors in developing the SQOs. The available compliance methods and costs depend on the sources of the pollutants bioaccumulating in sediments in bays and estuaries, which could include municipal and industrial wastewater and storm water, agriculture, boats, and legacy sources.

Baseline conditions include current sediment quality objectives (e.g., benthic community and human health SQOs and narrative Basin Plan criteria), water quality objectives and policies regulating activities and pollutant discharges that affect sediment quality (e.g., CTR, Basin Plans, waste discharge requirements, and other policies), ongoing cleanup and remediation activities, and planned or anticipated cleanup and remediation actions that have not yet been completed [e.g., total maximum daily load development (TMDL) and implementation schedules]. Currently, Regional Water Boards have listed 45 bays and estuaries as impaired for toxic pollutants in sediments or fish tissue and another 124 bays and estuaries as impaired for toxic pollutants for which the effects from sediment are uncertain. There are also a number of impairments of fish and wildlife beneficial uses that Regional Water Boards have not yet identified the source of the pollutants and which could be attributable, at least in part, to pollutant concentrations in sediments.

Incremental Impacts of the Proposed Plan Amendments

The incremental economic impacts of the Plan include the costs of activities above and beyond those that would be necessary in the absence of the Plan under baseline conditions, as well as any cost savings associated with actions that will no longer need to occur (e.g., through more accurate assessment procedures). Note that assessments of impairment, controls, and sediment cleanups to reduce pollution in waters impaired under baseline conditions would continue in the absence of the Plan amendments. Thus, these existing impairments are not incremental impacts associated with the proposed SQO amendments.

Under the Plan, Regional Water Boards would list sediment as exceeding the narrative SQOs for wildlife and finfish if an ecological risk assessment indicates impairment. An ecological risk assessment may reflect any applicable and relevant ecological risk information including policies and guidance from the California Environmental Protection Agency's (Cal/EPA) Office of Environmental Health Hazard Assessment (OEHHA), Cal/EPA's Department of Toxic Substances Control (DTSC), the California Department of Fish and Game, the U.S. Environmental Protection Agency, the U.S. Army Corps of Engineers, the National Oceanographic Atmospheric Administration, and the U.S. Fish and Wildlife Service. The Water Boards will also consult with these agencies when threatened and endangered species are present to ensure that these species are adequately protected. Thus, the proposed Plan amendments could result in greater efforts to assess sediment quality in relation to fish and wildlife beneficial uses, which in turn could result in identification of new impairments or changes to existing impairments. **Exhibit ES-1** indicates the possible outcomes under the proposed Plan amendments.

Exhibit ES-1. Potential Incremental Impacts Associated with the Proposed Plan Amendments

Assessment of Attainment of Existing Beneficial Uses	Assessment Under Proposed SQO	
	Impairment not attributable to sediments	Impairment attributable to sediments
Impairment not attributable to sediments	• No change in sediment quality. • Potential incremental assessment costs.	• Sediment quality improvement. • Potential incremental assessment and control costs.
Impairment attributable to sediments	• Sediment quality remains the same, which may be lower than under implementation of baseline narrative objective. • Potential incremental assessment costs, but will avoid unnecessary control costs.	• Change in sediment quality if better data lead to change in control strategies. • Potential incremental assessment costs; potential incremental costs or cost-savings depending on differences in control strategies.

Monitoring and Assessment Costs

There are already extensive monitoring and assessment activities supporting the baseline regulatory framework. Absent the proposed Plan amendments, these activities will continue, and additional efforts will be undertaken (e.g., as Regional Boards assess compliance with existing objectives for sediment toxicity, and address sites currently impaired for sediment toxicity). That is, data is needed to determine whether sediments are in compliance with existing narrative objectives for sediment toxicity related to fish and wildlife. Similarly, in instances in which sediments exceed baseline objectives for sediment toxicity, assessment of the causes and sources will be needed in order to identify means of compliance with the objectives. These activities, which can include developing a work plan/project management, collecting additional data, conducting ERAs or toxicity identification evaluations (TIEs), surface water modeling, and other analysis, may be conducted as part of developing a TMDL (SCCWRP, 2005; Parsons, et al., 2002, as cited in WSPA, 2007).

SWRCB (2008) provided unit costs for monitoring to assess the SQOs to protect the benthic community (direct effects). Monitoring efforts for ERAs to assess indirect effects to wildlife and finfish beyond the monitoring necessary to assess water quality criteria and the SQOs for direct effects could involve collecting finfish and documenting the presence of deformities, irregularities in size, or population effects, and collection and analysis of wildlife tissue or bird eggs. **Exhibit ES-2** provides unit costs for these types of analyses. Sample collection costs may vary based on factors such as water depth, abundance of fish species, sediment characteristics (may cause unsuccessful grabs that need to be repeated), and distance between stations. Although data for some parameters may not be needed at each sampling site, the total costs per sampling event could be in the range of $7,400 to $11,700.

Exhibit ES-2. Incremental Sampling Costs to Assess Finfish and Wildlife Health[1]

Parameter	Unit Cost	Number per Event	Total Cost
Fish Collection (for sampling or observation)[2]	$1,500 – $1,800 per site	1	$1,500 – $1,800
Metals suite (tissue)	$175 – $225 per sample	6*	$1,050 – $1,350
Mercury (tissue)	$30 – $80 per sample	6*	$180 – $480
Chlorinated pesticides (tissue)	$200 – $575 per sample	6*	$1,200 – $3,450
PCBs suite (tissue)	$575 – $775 per sample	6*	$3,450 – $4,650
Total cost per sampling event	NA	NA	$7,380 – $11,730

Source: SCCWRP (2011) and SWRCB (2011a).

*Three fish per species and two species per site.

1. Incremental to sampling requirements to assess attainment of SQOs for direct effects in bays and estuaries. See SWRCB (2008)

2. Includes boat, materials, and labor for observing fish communities or collecting fish for sampling.

The number of stations needed to assess attainment of the proposed finfish and wildlife SQO for bays and estuaries will vary based on site-specific factors. Based on 5 to 30 sites per water body, depending on area, the State Water Board estimates that statewide monitoring costs to assess attainment of the proposed SQO may range from $5.5 million to $8.8 million.

For bays and estuaries not currently on the 303(d) list for sediment toxicity that would exceed the SQO under the proposed Plan amendments, the next step under the Plan would be a sequential approach to manage the sediment appropriately, including developing and implementing a work plan to confirm and characterize pollutant-related impacts, identify pollutants, and identify sources and management actions (including adopting a TMDL, if appropriate). The cost of this sequential approach will vary depending on a number of factors, including the extent of baseline efforts and studies underway to address other impairment issues, and the number of potential stressors to the area. Note that in the absence of the Plan amendments, Regional Water Boards could identify these waters as exceeding the narrative objectives, and thus incremental impacts associated with TMDL development and pollution controls would be zero.

The State Water Board (2001) estimates that development of complex TMDLs (including an implementation plan) may cost over $1 million. In addition, SWRCB (2003a) indicates that TMDL development and mercury reduction strategy cost for the San Francisco Bay could range from $10 million to $20 million. These estimates provide some indication of incremental costs that could be associated with sequential approaches to managing designated use impairments. Thus, the estimates provide an approximation of the potential magnitude of both costs (incremental listings for sediment contamination) and cost savings (incremental changes to existing listings for sediment contamination resulting from additional information) that may be associated with changes in the identification of impairments under the baseline objectives and the proposed Plan amendments.

Clean up and Control Costs

For waters that Regional Water Boards identify as being impaired based on the wildlife and finfish SQO under the Plan, remediation actions and/or source controls will be needed to bring them into compliance. Many bays and estuaries are already listed for sediment impairments or are exceeding the benthic community or human health SQOs and, therefore, would require controls under baseline conditions. When the baseline controls are identical to the ones that would be implemented for the wildlife and finfish SQO, there is no incremental cost or cost savings associated with the Plan amendments. When the baseline controls differ, there is potential for either incremental costs or cost-savings associated with the Plan amendments.

Because strategies to meet current objectives at many impaired sites are still in the planning stages and the overall effects of implementation strategies are unknown, estimates of incremental costs would be highly speculative. For incremental sediment remediation and/or cleanup activities to be required under the Plan, monitoring data would have to indicate adverse impacts to finfish and wildlife attributable to sediments in areas that would not be designated for clean up under existing objectives. However, it is likely that most sites with sediment conditions that would require cleanup and remediation under the Plan amendments would also exceed current objectives. To the extent that results differ, it is possible that the additional assessment activities under the Plan amendments could lead to cleanup strategies that are more cost effective compared to baseline activities. In addition, based on the implementation plans for existing TMDLs, Regional Water Boards are likely to pursue source controls for ongoing sources and only require remediation activities for historical pollutants with no known, ongoing sources.

If incremental remediation activities are necessary, costs are likely to be very specific to the particular site and project. Sediment remediation and cleanup costs may range from less than $1/cy to over $1000/cy for various alternatives with different feasibility and practicality considerations (SWRCB, 1998). Preliminary estimates for dredging sediments in San Diego Bay suggest that unit costs may range from $100/cy to $200/cy, depending on the volume of sediment removed (SDRWQCB, 2007b).

For an increased source control cost associated with additional pollution controls under the Plan, the concentration of toxic pollutants in discharges would have to meet levels that are more stringent than what is needed to achieve compliance with existing objectives (e.g., since they could have to control based on the benthic community and human health SQOs, narrative Basin Plan sediment objectives, or the CTR water quality criteria). Incremental costs for controls may also result from the identification of additional chemical stressors that are not included in the Phase I SQOs, Basin Plans, or CTR. Since many practices that may be employed under existing TMDLs are applicable for controlling the mobilization of pollutants in general, this situation is also difficult to estimate. For example, the TMDL for pesticides and PCBs in the Calleguas Creek watershed indicates that the BMPs needed to achieve the nutrient and toxicity TMDLs for the watershed would likely reduce pesticides and PCBs to necessary levels as well (LARWQCB, 2005c). Thus, without being able to identify the particular pollutants causing toxic effects to wildlife and finfish, and the development of discharge concentrations needed to achieve the objectives, the needed cleanups and/or controls to achieve those concentrations are site- and pollutant-specific, and therefore, difficult to estimate.

For any situation in which point sources are specifically required to control toxic pollutants to levels that are lower than what would be necessary in the absence of the Plan, it is likely that these facilities would implement source control to eliminate the pollutant from entering their treatment plant or industrial process, or pursue regulatory relief (e.g., a variance), rather than install costly end-of-pipe treatment. However, it is uncertain whether such a situation would arise as a result of the Plan amendments.

For agriculture, Regional Water Boards regulate farmers primarily through the conditional WDR waivers that require compliance with water quality standards. Regional Water Boards may also require farmers to meet more stringent criteria for specific pollutants where necessary (e.g., to meet a TMDL, site-specific objectives). All of the affected Regional Water Boards have narrative objectives that specifically prohibit the discharge of pesticides and/or toxic pollutants that cause detrimental effects in aquatic life or to animals and humans. Thus, even in the absence of the Plan amendments, farmers would be prohibited from causing or contributing to toxicity to wildlife and finfish.

Potential means of compliance for storm water sources include increased or additional nonstructural BMPs (e.g., institutional, education, or pollution prevention practices designed to limit generation of runoff or reduce the pollutants load of runoff); and structural controls (e.g., engineered and constructed systems designed to provide water quantity or quality control). Improving the effectiveness of nonstructural BMPs could be on the order of $26 per household (CSU Sacramento, 2005). Caltrans (2001) reports a range of costs for structural controls based construction costs from several transportation departments and jurisdictions. For example, average detention basin costs are approximately $7,000 and wetlands are $13,000. However, Delaware sand filter costs are approximately $118,000, on average (Caltrans, 2001).

For marinas and boating activities, potential means of compliance may include use of less toxic paint on boats; performing all boat maintenance activities above the waterline or in a lined channel to prevent debris from entering the water; removing boats from the water and clean in a specified location equipped to trap debris and collect wastewater; prohibiting hull scraping or any process that removes paint from the boat hull from being conducted in the water; and developing a collection system for toxic materials at harbors. For example, one marina spent $14,500 on a pollution prevention program in 1999 (MBNEP, 2000), and Carson, et al. (2002) estimated the cost of remaining life hull maintenance for 40 foot length, 11 foot width boats to range from a savings of $1,354 (new boat with nontoxic coating, good performance, and lower prices) to a cost of $6,251 (2.5 year old boat requiring stripping, fair performance, and higher prices). In addition, the cost of a unit that collects water that may contain toxic materials from boating maintenance operations so that it may be sent to the sanitary sewer could cost between $3,200 to $4,500 (Pressure Power Systems, 2007).

Wetlands controls may include aeration, channelization, revegetation, sediment removal, levees, or a combination of these practices. The extent of controls needed and the types of controls are unknown. The Central Valley Regional Water Board (2005b) provides one example of the cost of efforts underway in Anderson Marsh wetland on Cache Creek. Capital costs for controlling methylmercury export from Anderson March may range from $200,000 to $1 million, and O&M costs from $20,000 to $100,000 per year (CVRWQCB, 2005b).

1. Introduction

The State Water Resource Control Board (State Water Board) staff is proposing amendments to the state's Water Quality Control Plan for Enclosed Bays and Estuaries: Part 1 Sediment Quality (the Plan). The amendments include additional sediment quality objectives (SQOs) and implementation procedures that apply to enclosed bays and estuaries in California. This report provides analysis of economic factors related to the Plan amendments.

1.1 Background

In 1989, California amended the Porter-Cologne Water Quality Control Act (Porter-Cologne) to require the State Water Board to develop SQOs as part of a comprehensive program to protect existing and future beneficial uses within enclosed bays and estuaries (Section 13393). In 1991, the State Water Board prepared a work plan for the development of SQOs for enclosed bays and estuaries. This work plan included a schedule and specific tasks to develop direct effects tools that would protect benthic communities, and an element to assess the human and ecological risk in bays and estuaries from pollutants in sediments (indirect effects).

Due to significant delays, in 1999, petitioners filed a lawsuit against the State Water Board for failing, among other things, to adopt SQOs. As a result, the Superior Court ordered the State Water Board to develop SQOs for toxic pollutants as part of the Bay Protection and Toxic Cleanup Program pursuant to California Water Code (CWC) Section 13393 in accordance with a compliance schedule. In 2008, the State Water Board adopted SQOs and an implementation policy for bays and estuaries in the state (Part I of the Plan). Part 1 integrates chemical and biological measures to determine if the sediment dependent biota are protected or degraded as a result of exposure to toxic pollutants in sediment and to protect human health. Part 1 includes narrative SQOs for the protection of aquatic life and human health; identification of the beneficial uses that these objectives are intended to protect; and a program of implementation that contains specific indicators, tools, and implementation provisions to determine if the sediment quality at a station or multiple stations meets the narrative objectives, description of appropriate monitoring programs, and a sequential series of actions that shall be initiated when a sediment quality objective is not met including stressor identification and evaluation of appropriate targets.

The State Water Board is proposing amendments to the Plan to incorporate additional SQOs for the protection of wildlife and finfish and implementation policy.

1.2 Scope of the Economic Analysis

In establishing water quality objectives, the State Water Board considers economic factors, among others. Specifically, these economic factors include whether the objectives and alternatives under consideration are currently being attained, the methods available to achieve compliance, and the costs of those methods. The State Water Board is considering these same factors in proposing the SQO amendments. Thus, this report addresses whether the SQOs are currently being attained, the incremental impact of the Plan amendments on actions related to improving sediment quality, the pollution control and remediation methods available to achieve compliance the Plan amendments, and the costs of those methods. There may also be cost savings as a result of greater accuracy in identifying contaminated sediments.

The available compliance methods and costs depend on the types of sources that may be affected by the proposed SQOs. Potentially affected sources could include industries and municipal facilities discharging wastewater and storm water to surface waters (i.e., point sources) and nonpoint sources. Entities may also incur costs associated with monitoring and assessment to determine compliance with the objectives.

1.3 Organization of the Report

This report is organized as follows. Section 2 describes the economic and regulatory baseline for estimating the incremental impacts of the SQOs and implementation procedures. Section 3 describes the objectives and implementation procedures, and current attainment of the proposed objectives. Section 4 discusses potential means of compliance with the Plan and estimates of the potential costs of those methods. Section 6 provides a discussion of potential statewide costs and uncertainties of the analysis. Several appendices provide additional information related to the analysis.

2. Baseline for the Analysis

This section describes the baseline for identifying potential economic impacts of the Plan amendments. Baseline conditions include current objectives and policies regulating activities and pollutant discharges that affect sediment quality in bays and estuaries, ongoing sediment cleanup and remediation activities in bays and estuaries, and planned or anticipated actions to address sediment-related and other impairments in bays and estuaries [e.g., total maximum daily load development (TMDL) and implementation schedules].

2.1 Existing Objectives

In 2008, the State Water Board adopted the Water Quality Control Plan for Enclosed Bays and Estuaries: Part 1 Sediment Quality. The Plan is applicable to enclosed bays and estuaries and surficial sediments that have been deposited or emplaced below the intertidal zone. The Plan protects estuarine and marine habitat and rare and endangered species beneficial uses, and commercial and sport fishing, aquaculture, and shellfish harvesting beneficial uses by protecting benthic aquatic life and human health, respectively:

- Aquatic Life/Benthic Community Protection: Pollutants in sediments shall not be present in quantities that, alone or in combination, are toxic to benthic communities in bays and estuaries implemented using the integration of multiple lines of evidence (MLOE).
- Human Health: Pollutants shall not be present in sediments at levels that bioaccumulate in aquatic life to levels that are harmful to human health.

The Plan specifies procedures for implementing the narrative SQOs, including determining compliance, NPDES permitting procedures, and monitoring requirements.

In addition, to the Plan, individual Basin Plans for the nine Regional Water Quality Control Boards (Regional Water Boards), contain sediment toxicity and fish and wildlife protection criteria. None of the Regional Water Boards have adopted numeric objectives for sediments. Rather, the Regional Water Boards rely on narrative objectives to protect and manage ambient sediment quality. The current objectives in each Basin Plan are described in **Appendix A**. The Lahontan (Region 6) and Colorado River Basin (Region 7) Regions do not contain any enclosed bays or estuaries, and thus, are not included in this analysis.

Also, the California Toxics Rule (CTR) contains criteria for toxic pollutants applicable to inland surface waters, enclosed bays, and estuaries in the state. However, Regional Water Boards may adopt more stringent criteria for specific pollutants where necessary (e.g., to meet a TMDL, site-specific objectives). **Appendix B** shows the CTR criteria, and indicates where a Regional Water Board may have more stringent criteria in its Basin Plan.

2.2 Monitoring

Under existing objectives, policies, and programs, there are a wide range of monitoring efforts underway by Regional Water Boards, dischargers, and other organizations to characterize effluent, ambient water, and sediment quality, and fish and wildlife health. These efforts include regional and coordinated programs, as well as discharger monitoring requirements. Regional programs include:

- **Southern California Bight Regional Monitoring Surveys** – managed by the Southern California Coastal Water Research Project to evaluate the physical, chemical and biological impacts to ocean, bay and estuarine waters from Ventura to San Diego. These surveys are performed every 4 to 5 years. The most recent effort, "Bight 08 Survey" included chemical analysis of tissue and sediment, sediment toxicity, analysis of benthic invertebrate and fish community structure, and evaluation of gross pathology in trawl caught fish in a bays and coastal waters.

- **San Francisco Regional Monitoring Program for Trace Substances (RMP)** – managed by the San Francisco Estuary Institute (SFEI) to collect data to evaluate contaminant exposure within the San Francisco Bay ecosystem. Specific studies conducted in 2010 aimed at fish and wildlife exposure and effects include monitoring contaminant bioaccumulation in small fish and bird shells, and assessing sensitivity of terns to PBDEs (SFEI, 2009). The RMP is an annual effort, though individual parameters may be monitored more or less frequently.
- **Surface Water Ambient Monitoring Program (SWAMP)** – State Water Board program to provide decision makers and the public with the information necessary to evaluate surface water quality throughout California. SWAMP supports the collection of high quality data in all regions for 303(d) listing and 305(b) reporting on impaired waterbodies and waters supporting beneficial uses.
- **Mussel Watch Program** – National Oceanic and Atmospheric Administration program of national status and trends. Longest running contaminant monitoring program in the United States. Contaminant concentrations in mussel tissue are a direct measure of exposure for all similar filter feeders in those habitats where found, as well as an indicator of dietary exposure for biota the feed on these filter feeders.
- **Regional Harbors Monitoring Program (RHMP)** – collaborative program initiated in response to Regional Water Board request pursuant to CWC 13255 for water quality information for Dana Point Oceanside, Mission Bay, and San Diego Bay. The objectives of this program include assessing water and sediment quality to sustain healthy biota, and the long-term trends in harbor conditions (Weston, 2008).
- **Central Coast Long-term Environmental Assessment Network (CCLEAN)** – stakeholder program to maintain, restore, and enhance nearshore water and sediment quality and associated beneficial rare, including threatened, or endangered species, water contact recreation, and wildlife habitat uses in the Central Coast Region. CCLEAN satisfies the NPDES receiving water monitoring and reporting requirements of program participants. Concerns center around elevated concentrations of persistent organic pollutants (e.g., petroleum hydrocarbons, chlorinated pesticides, polychlorinated biphenyls) in fish from the Monterey Submarine Canyon, declines in sea otter populations, diseases in sea otters related to high concentrations of persistent organic pollutants, and bird and mammal deaths due to blooms of toxic phytoplankton.

Also, the California Water Quality Monitoring Council (Monitoring Council) has a 2010 plan to assemble the widest collection of water quality data ever available on the state's lakes, rivers, streams, wetlands, and ocean waters.

Indeed, as a result of existing monitoring efforts, there are over 5,000 samples of data related to sediment quality from 42 different agencies, for bays and estuaries in California (Weisberg and Bay, 2007). For example, under the State Water Board's Bay Protection and Toxic Cleanup Program (BPTCP), the San Francisco Bay Regional Water Board conducted a pilot RMP with the SFEI and is continuing participation in the RMP, conducted a fish tissue study to identify contaminant concentrations that would trigger a fish consumption advisory in the San Francisco Bay, and conducted baywide sediment assessments to identify toxic hot spots.

In addition, under the BPTCP, each Regional Water Board identified toxic hot spots in their area using a two step process designed to consider three measures (toxicity testing, benthic community analysis, and chemical analysis), plus an optional bioaccumulation component (SWRCB, 2003b). The first step was a screening phase that consisted of measurements using toxicity tests, benthic community analysis, chemical tests, or bioaccumulation data to provide sufficient information to list a site as a potential toxic hot spot. A positive result in any of the tests triggered the second, confirmation step (depending on available funding) which consisted of testing the previously sampled site of concern for all three measures (SWRCB, 2003b).

Individual dischargers are also required to monitor sediment quality. As described in the fact sheet for the revised tentative order (MS4 permit) for Orange County (SDRWQCB, 2007), the copermittees must conduct monitoring, including chemistry, toxicity, and bioassessment, and use the results to determine if impacts from urban runoff are occurring. If toxic pollutants are present in runoff, the copermittees are required to conduct a Toxicity Identification Evaluation (TIE). A TIE is a set of procedures used to identify the specific chemical or chemicals responsible for toxicity to aquatic organisms. When a TIE results in identifying a pollutant associated with urban runoff as a cause of toxicity, follow-up actions should analyze all potential sources causing toxicity, potential BMPs to eliminate or reduce the pollutants causing toxicity, and suggested monitoring to demonstrate that toxicity has been removed.

2.3 Municipal and Industrial Dischargers

The State Water Board regulates toxic pollutants in the effluents of municipal and industrial wastewater treatment facilities through the National Pollutant Discharge and Elimination System (NPDES) permit program. The Water Boards issue NPDES permits pursuant to section 402 of the Clean Water Act which requires that all point source discharges of pollutants to waters of the United States be regulated under a permit. Under the NPDES permit program, permits contain both technology-based and water quality-based effluent limits (WQBELs). WQBELs reflect applicable water quality standards including those contained in basin plans and the California Toxic Rule.

NPDES permits also reflect narrative objectives contained in basin plans. For example, Section V of the San Francisco Bay Regional Final Order 2010 – 0060 states the discharges shall not cause toxic or other deleterious substances to be present in concentrations or quantities which will cause deleterious effects on wildlife, waterfowl, or other aquatic biota, or which render any of these unfit for human consumption, either at levels created in the receiving waters or as a result of biological concentration in Central San Francisco Bay (SFRWQCB, 2010). These permittees may contribute and support the RMP in which several special studies focus on exposure and effects to fish and wildlife to assess compliance with the receiving water limits. In addition, the City of Los Angeles Terminal Island treatment plant's NPDES permit (Order R4-2010-0071) contains provisions requiring the discharger to perform a number of special studies related to the protection of fish and wildlife including local demersal fish survey and local bioaccumulation trends survey, and participate in Southern California Bight Regional Demersal Fish and Invertebrate Survey and Regional Predator Risk Survey.

Although, the proposed Plan amendments apply to bays and estuaries, municipal and industrial facilities discharging to tributaries upstream of affected waters could also be a potential source of pollutant loadings to downstream sediments. Based on the Regulated Facilities Report for California, there are 584 individually-permitted NPDES dischargers in the state discharging to inland surface waters, enclosed bays, and estuaries **(Exhibit 2-1)**.

Exhibit 2-1. Summary of Individual-Permitted NPDES Dischargers in California

Regional Water Board	Major Dischargers	Minor Dischargers	Total Dischargers
1	15	31	46
2	56	25	81
3	22	17	39
4	45	75	120
5F	7	22	29
5R	14	37	51
5S	37	51	88
6T	1	4	5
6V	2	5	7
7	9	17	26
8	22	12	34
9	40	17	57
Total	270	313	583

Source: SWRCB (2011b).

2.4 Storm Water Dischargers

Regional Water Boards regulate most storm water discharges under general permits. General permits often require compliance with standards through an iterative approach based on storm water management plans (SWMPs), rather than through the use of numeric effluent limits. In other words, permittees implement best management practices (BMPs) identified in their SWMPs. Then, if those BMPs do not result in attainment of water quality standards, Regional Water Boards require additional practices until pollutant levels are reduced to the appropriate levels. Because Regional Water Boards use this iterative approach that increases requirements until water quality objectives are met, current levels of implementation may not reflect the maximum level of control required to meet existing standards (CSU Sacramento, 2005). The State Water Board has four existing programs for controlling pollutants in storm water runoff: municipal, industrial, construction, and California Department of Transportation (Caltrans).

2.4.1 Municipal Discharges

The municipal program regulates storm water discharges from municipal separate storm sewer systems (MS4s). The MS4 permits require the discharger to develop and implement a SWMP, with the goal of reducing the discharge of pollutants to the maximum extent practicable (MEP). MEP is the performance standard specified in Section 402(p) of the Clean Water Act. The management programs specify the BMPs to be used to address public education and outreach; illicit discharge detection and elimination; construction and post-construction; and good housekeeping for municipal operations. In general, medium and large municipalities must conduct chemical monitoring, though small municipalities do not.

There are currently 22 Phase I MS4 permits in California with discharges to bay and estuaries. These permits can include actions addressing sediment quality. For example, the Contra Costa Clean Water Program (CA0029912 and CA0083313) requires the permittees to pursue a mass emission strategy to reduce pollutant discharges from point and nonpoint sources and address accumulation of pollutants in organisms and sediments (SFRWQCB, 1999). Municipalities may also be required to monitor to assess whether the discharges contribute to exceedances of narrative criteria. For example, similar to the wastewater dischargers to the San Francisco Bay, municipal stormwater agencies are provided flexibility associated with monitoring requirements under Order No. R2-2009-0074 which also requires receiving water monitoring and participation within the RMP to assess receiving water quality; specific provisions require monitoring of water column and sediment toxicity, benthic invertebrates (bioassessment) and sediment bound toxic pollutants DDT, PCBs, copper, mercury, selenium to assess effectiveness DDT. The Alameda Countywide Clean Water Program (CAS0029831) requires tracking of mercury trends in sediment (Alameda, 2003).

In addition, there are 209 small MS4s that have submitted SWMPs to Regional Water Boards or the State Water Board for approval. However, it is not clear how many of those MS4s discharge to enclosed bays and estuaries.

2.4.2 Industrial Discharges

Under the industrial program, the State Water Board issues a general NPDES permit that regulates discharges associated with ten broad categories of industrial activities. This general permit requires the implementation of management measures that will achieve the performance standard of best available technology economically achievable (BAT) and best conventional pollutant control technology (BCT). The permit also requires that dischargers develop a Storm Water Pollution Prevention Plan (SWPPP) and a monitoring plan. Through the SWPPP, dischargers are required to identify sources of pollutants, and describe the means to manage the sources to reduce storm water pollution. For the monitoring plan, facility operators may participate in group monitoring programs to reduce costs and resources.

2.4.3 Construction

The construction program requires dischargers whose projects disturb one or more acres of soil or whose projects disturb less than one acre but are part of a larger common plan of development that in total disturbs one or more acres to obtain coverage under the a general permit for discharges of storm water associated with construction activity. The construction general permit requires the development and implementation of a SWPPP that lists BMPs the discharger will use to protect storm water runoff and the placement of those BMPs. Additionally, the SWPPP must contain a visual monitoring program; a chemical monitoring program for nonvisible pollutants to be implemented if there is a failure of BMPs; and a sediment monitoring plan if the site discharges directly to a water body impaired for sediment.

2.4.4 Caltrans

In 1996, Caltrans requested that the State Water Board consider adopting a single NPDES permit for storm water discharges from all Caltrans properties, facilities, and activities that would cover both the MS4 requirements and the statewide construction general permit requirements. The State Water Board issued the Caltrans general permit in 1999, requiring Caltrans to control pollutant discharges to the MEP for the MS4s and to the standard of BAT/BCT for construction activities through BMPs. The State Water Board also requires dischargers to implement more stringent controls, if necessary, to meet water quality standards.

2.5 Nonpoint Sources

Nonpoint source pollution, unlike pollution from industrial and sewage treatment plants, comes from many diffuse sources. Some nonpoint source pollution is caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants, depositing them into lakes, rivers, wetlands, coastal waters, and groundwater. Nonpoint source pollution may originate from several sources including agricultural operations, forestry operations, urban areas, boating and marinas, active and historical mining operations, atmospheric deposition, and wetlands. Note that, in many cases, discharges from these sources can be regulated as point sources (i.e., discernible, confined, and discrete conveyances).

In 1999, California implemented its Fifteen-Year Program Strategy for the Nonpoint Source Pollution Control Program, as delineated in the Plan for California's Nonpoint Source Pollution Control Program (NPS Program Plan). The legal foundation for the NPS Program Plan is the Clean Water Act (CWA) and the Coastal Zone Act Reauthorization Amendments of 1990 (CZARA) (SWRCB, 2000). The agencies primarily responsible for the development and implementation of the NPS Program Plan are the State Water Board, the nine Regional Water Boards, and the California Coastal Commission (CCC). Various other federal, state, and local agencies have significant roles in the implementation of the NPS Program Plan.

Federal approval and funding of the NPS Program Plan required assurance the state had legal authority to implement and enforce the plan. The state's Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program (NPS Policy) provides guidance regarding the implementation and enforcement of the NPS Program Plan. As stated in the NPS Policy, the Porter-Cologne Act provides the legal authority of the State Water Board and Regional Water Boards to regulate nonpoint sources in California under waste discharge requirements (WDRs), conditional waivers of WDRs, or basin plan prohibitions or amendments (SWRCB, 2004b). However, all WDRs need not contain numeric effluent limits. The Regional Water Boards do not usually assign nonpoint sources numeric effluent limits; rather they primarily rely on implementation of BMPs to reduce pollution.

The NPS Program Plan specifies management measures (MMs) and the corresponding management practices or BMPs for each of six source categories. MMs should be implemented where needed by 2013 using a combination of nonregulatory activities and enforceable policies and mechanisms (SWRCB, 2003a). **Appendix C** describes the MMs for each source category applicable to sediment toxicity reductions.

2.5.1 Agriculture

Impacts from agricultural activities that may affect sediment quality include sedimentation and the runoff of pesticides. These impacts can be caused by:

- Farming activities that cause excessive erosion, resulting in sediment entering receiving waters
- Improper use and overapplication of pesticides
- Overapplication of irrigation water resulting in runoff of sediments and pesticides (SWRCB, 2006b).

Although wastewater discharges from irrigated land including storm water runoff, irrigation tailwater, and tile drainage are subject to regulation under WDRs, Regional Water Boards have historically regulated these discharges under waivers. These waivers are authorized by CWC Section 13269 which allows Regional Water Boards to waive WDRs if it is in the public interest.

Most historical waivers require that discharges not cause violations of water quality objectives; however, do not require water quality monitoring. In 1999, Senate Bill 390 amended CWC Section 13269 and required Regional Water Boards to review and renew their waivers, or replace them with WDRs. If Regional Water Boards did not reissue the waivers by January 1, 2003 they expired. The Central Coast, Los Angeles, Central Valley, and San Diego Regional Water Boards have established conditional waivers for agricultural discharges. The Santa Ana Regional Water Board is in the process of developing a conditional waiver for discharges from irrigated agricultural lands. While the North Coast and San Francisco Bay Regional Water Boards have no immediate plans to adopt waivers for agricultural discharges, they may do so in the future in the context of TMDLs.

In conjunction with conditional waivers, Regional Water Boards regulate agricultural discharges from cropland under nonpoint source programs that rely on BMPs to protect water quality. For example, the State Water Board and the CCC oversee agricultural control programs, with assistance from the Department of Pesticide Regulation (DPR) for pesticide pollution and the Department of Water Resources for irrigation water management (SWRCB, 2006b).

The pesticide management measure (MM 1D) is likely to have the greatest impact on sediment toxicity. This MM reduces contamination of surface water and ground water from pesticides through:

- Development and adoption of reduced risk pest management strategies (including reductions in pesticide use)
- Evaluation of pest, crop, and field factors
- Use of Integrated Pest Management (IPM)
- Consideration of environmental impacts when choosing pesticides for use
- Calibration of equipment
- Use of antibackflow devices (SWRCB, 2006b).

IPM is a key component of pest control. IPM strategies include evaluating pest problems in relation to cropping history and previous pest control measures, and applying pesticides only when an economic benefit will be achieved. Pesticides should be selected based on their effectiveness to control target pests and their potential environmental impacts such as persistence, toxicity, and leaching potential (SWRCB, 2006b).

There are many planned, on-going, and completed activities related to management of pesticides. However, as reported in the most recent NPS Program Plan progress report (SWRCB, 2004a), efforts to improve water quality impaired by agriculture activities are highly challenging because of the different perspectives that exist between the regulatory community and the agricultural community.

As of 2003, the SWRCB (2004a) reports the following progress:

- 16 watershed working groups are actively developing farm water quality plans, with 19 new groups being formed
- Of the over 90 farmers that attended a Farm Water Quality Course, half have developed comprehensive water quality plans for more than 10,700 acres of irrigated crops
- Over 750 farmers have attended 35 workshops designed to train farmers in specific conservation practices.

2.5.2 Forestry

Timber harvesting and associated activities can result in the discharge of chemical pollutants and petroleum products, in addition to other conventional pollutants. Chemical pollutants and metals can be discharged through runoff and drift. Potential sources of chemical runoff include roads that have been treated with oils or other dust suppressing materials and herbicide applications.

Forest chemical management focuses on reducing pesticides that are occasionally used for pest management to reduce mortality of desired tree species, and improve forest production. Pesticide use on state or private forestry land is regulated by DPR. However, a large proportion of California's forested lands are owned or regulated by the federal government (SWQCB, 2004a) in which pesticide use is controlled by the USDA Forest Service Region 5.

In addition to the NPS Program Plan MMs, forestry activities are also controlled through WDR and conditional waivers. Recently, Regional Water Boards have adopted waivers for timber harvesting activities, provided that the activities comply with the general conditions listed in each waiver, including compliance with applicable requirements contained in each Region's basin plans.

The DPR regulates the sale and use of pesticides and, through county agricultural commissioners (CACs), enforces laws pertaining to pesticide use. CACs inspect pesticide applications to forests and ensure that applications do not violate pesticide laws and regulations. Landowners must also submit timber harvest plans (THPs) to the California Department of Forestry (CDF) outlining what timber will be harvested, how it will be harvested, and the steps that will be taken to prevent damage to the environment. CDF will only approve those THPs that comply with all applicable federal and state laws.

The Forest Practices Act provides a conditional exemption from WDRs for timber operations (article 1. section 4514.3). The Forest Practice Rules establish responsible forest resource management practices which serve the demand for timber and other forest products, while giving consideration to the public's need for watershed protection, fisheries, and wildlife and recreational opportunities.

2.5.3 Urban Runoff

Pollutants found in runoff from urban areas include, among others, sediments, heavy metals, petroleum hydrocarbons, and plastics. As population densities increase, pollutant loadings generated from human activities also increase. Most urban runoff enters surface waters without undergoing treatment.

The control of urban nonpoint pollution requires the use of two primary strategies: preventing pollutant loadings from entering waters and reducing the impact of unavoidable loadings. The major opportunities to control nonpoint loadings occur during the following three stages of development: (1) the siting and design phase, (2) the construction phase, and (3) the post-development phase. Before development occurs, land in a watershed is available for a number of pollution prevention and treatment options, such as setbacks, buffers, or open space requirements, as well as wet ponds or constructed urban runoff wetlands that can provide treatment of the inevitable runoff and associated pollutants. In addition, siting requirements and restrictions and other land use ordinances, which can be highly effective, are more easily implemented during this period. After development occurs, these options may no longer be practicable or cost-effective.

Urban runoff is addressed primarily through the NPDES program, although the State Water Board NPS Program Plan applies where runoff is not regulated as a permitted point source. The NPDES program supersedes the State Water Board and Regional Water Board NPS Program in the areas where there is overlap. NPDES permits require implementation of BMPs, which may or may not be similar to the MMs in the NPS Program.

In 1976, the State Legislature enacted the California Coastal Act (CCA) to provide for the conservation and planned development of the State's coastline. The CCA directs each of the 73 coastal cities and counties to prepare, for review and certification by the CCC, a local coastal plan (LCP) consisting of land use plans, zoning ordinances, zoning district maps, and, other implementation actions. The CCC also works with local governments to incorporate urban MMs and MPs into their respective LCPs. Certified LCPs are important tools for implementing urban runoff MMs and MPs that prevent, reduce or treat polluted runoff from proposed developments. Storm water programs can become more effective because of local planning and permitting decisions throughout the State.

2.5.4 Marina and Recreational Boating

Poorly planned or managed boating and related activities (e.g., marinas and boat maintenance areas) may threaten the health of aquatic systems and pose other environmental hazards. There are nearly 1 million registered boats and approximately 650 marinas in California (SWRCB, 2004a). Boats repairs, fouling and corrosion control, and sanding, scraping, painting, varnishing and fiberglassing boats can result in pollutants such as metals, solvents, hydrocarbons and other contaminants entering surface waters (Hunt and Doll, 2007). For example, copper and zinc are often found in marina sediments due to the leaching of antifoulant paints.

Note that commercial and military ports are subject to storm water NPDES permits regulating industrial and construction activities. Commercial ports are also required to submit a port master plan to the CCC. The master plan must include an estimate of the effect of development on habitat areas and the marine environment, a review of existing water quality, habitat areas, and quantitative and qualitative biological inventories, and proposals to minimize and mitigate any substantial adverse impact. In addition, the state has the opportunity to ensure that appropriate pollution prevention and control measures are in place at all military ports.

There are many planned, on-going, and completed activities related to nonpoint source pollution in marinas. The primary focus of these activities is to prevent discharges of waste oil, sewage, petroleum, solid waste, and toxic pollutants from surface runoff, improper boat cleaning/maintenance activities, lack of disposal facilities, or improper maintenance of facilities at marinas (SWRCB, 2006b). For example, the compliance schedule for the Dissolved Copper in Shelter Island Yacht Basin (SIYB), San Diego Bay TMDL consists of a 17-year staged schedule period. The first stage consists of an initial 2-year orientation period. The subsequent 15-year reduction period will achieve the incremental copper load reductions by requiring all new boats entering SIYB to have nontoxic or less toxic coatings, and through replacement of copper coatings on all existing boats with a nontoxic or less toxic coating at the next time routine hull stripping is scheduled (SDRWQCB, 2005).

The state is also relying on education and outreach efforts aimed at marina owners and operators, and the boating public, to provide information on pollution problems and management practices that can be implemented to prevent or control improper disposal of pollutants into surface waters (SWRCB, 2006b). For example, the Boating Clean and Green Campaign provides statewide boater education and technical assistance program, conducted by the CCC in partnership with the California Department of Boating and Waterways, to promote environmentally sound boating practices. Issues addressed through the Campaign include vessel cleaning and maintenance, handling and disposal oil and fuel, handling and disposal of hazardous materials, and proper disposal of trash and gray water. A California Clean Marina Toolkit is available to assist marine operators in identifying clean marina practices and resources that will help to implement these practices (CCC, 2004).

The Federal Oil Pollution Act (OPA) is a comprehensive prevention, response, liability, and compensation regime for dealing with vessel- and facility-generated discharges of oil or hazardous substances. Under the OPA, any hazardous waste spill from a vessel must be reported by the owner of the vessel, and vessel owners are responsible for any costs of a resulting environmental cleanup and any damage claims that might result from the spill. Marinas are responsible for any oil contamination resulting from their facilities, including dumping or spilling of oil or oil-based paint and the use of chemically treated agents. The California Department of Fish and Game's Office of Spill Prevention and Response enforces the laws designed to prevent spills, dispatches units to respond to spills, and investigates spills.

2.5.5 Abandoned and Inactive Mines

The State Water Board and Regional Water Boards have identified approximately 40 mines that cause serious water quality problems resulting from acid mine drainage and acute mercury loading (SWRCB, 2000). Although all mines may not be significant polluters individually, cumulatively mines may contribute to chronic toxicity due to increased metals loadings. Additionally, drainage structures and sluices associated with abandoned hydraulic gold mines are a potential source of mercury to surface waters. Mercury from abandoned mines poses a serious potential threat to coastal waters because mercury transported from these sites may bioaccumulate in fish.

The NPS Program Plan does not contain management measures for abandoned mines, and there is no specific, comprehensive program at either the state or federal level for cleaning up abandoned and inactive mines other than coal. Rather, abandoned and inactive mine cleanup is carried out under a variety of state, federal, and local programs. Regional Water Boards may issue WDRs to the most serious sites. The federal Superfund Program addresses only the most extreme pollution sites, such as Iron Mountain Mine. Federal land management agencies have specific, marginally funded programs for cleaning up abandoned mines on federal land, but most projects address safety hazards rather than water quality. California's Title 27 Program regulates discharges of wastes to land, and can be used to pursue mine cleanups.

Enforcement actions, however, are costly and have not been effective because responsible parties are difficult to locate, and current property owners either do not have, or will not spend money, to cleanup their sites. The main barrier to a comprehensive program for abandoned mines is liability (SWRCB, 2003a). Under the federal CWA, a third party can sue an agency or private party that performs abatement actions at an abandoned mine if the discharge from the mine continues to violate the CWA.

In June 2000, the California Department of Conservation (DOC) inventoried the number of abandoned mine sites and features located in the state. DOC estimates that of the 47,084 historic and inactive mine sites in the state, approximately 11% (5,200) present an environmental hazard. The most common hazards include heavy metals from acid rock drainage and methylmercury from mercury contaminated sediments. DOC (2000) indicates that some bays have been or could be impacted by acid rock drainage and mercury from abandoned mines.

As a land-managing agency, the U.S. Forest Service (USFS) also has an abandoned mine reclamation program. The program includes an inventory of abandoned mines and locations, environmental and/or resource problems present, rehabilitation measures required, and potential sources of funding. The USFS has worked with various Regional Water Boards on numerous occasions in the rehabilitation of mine sites. Restoration funding comes from USFS funds, the Comprehensive Environmental Response and Compensation Liability Act, and Resource Conservation and Recovery Act sources. All lands disturbed by mineral activities must be reclaimed to a condition consistent with resource management plans, including air and water quality requirements (SWRCB, 2000; SWRCB 2003a).

All active mining projects must comply with the federal Surface Mining and Reclamation Act (SMARA). The goal of SMARA is to have mined lands reclaimed to a beneficial end use. Local Enforcement Agencies (LEAs), usually counties, implement SMARA. The DOC's Office of Mine Reclamation provides technical support to LEAs but has limited enforcement authority.

Mining projects that could impair water quality or beneficial uses may also be subject to NPDES permits or conditions under the CWA section 401 Water Quality Certification Program.

2.5.6 Atmospheric Deposition

Atmospheric deposition may be a potential nonpoint source to bays through either direct or indirect deposition. Indirect deposition reflects the process by which metals and other pollutants such as PAHs deposited on the land surface are washed off during storm events and enter surface water through storm water runoff (LARWQCB, 2005a). For example, Sabina, et al. (2005) concluded that atmospheric deposition potentially accounts for as much as 57–100% of the total trace metal loads in storm water within Los Angeles. In LARWQCB (2005a) and LARWQCB (2005b) loadings associated with indirect atmospheric deposition are included in the storm water waste load allocations. Therefore, nonpoint source pollution from atmospheric deposition is not directly addressed, but indirectly addressed through storm water management. Typically, direct deposition accounts for a very small fraction of nonpoint source pollution (for example, see LARWQCB, 2005a and LARWQCB, 2005b).

2.5.7 Wetlands

Seasonally and permanently flooded wetlands are sites for methylmercury production due to the presence of sulfate-reducing bacteria in wetland environments (CVRWQCB, 2005a). Wetlands can be significant sources of methylmercury production; for example, the Central Valley Regional Water Board (2005c) estimated that 21,000 acres of wetland in the Sacramento-San Joaquin River Delta produce about 16% of the annual methylmercury load to the watershed. A complicating issue is that wetland restoration efforts are ongoing because wetlands provide important services for ecosystems and human communities.

Management practices to reduce methylmercury discharge could include aeration, changing the stream channel, revegetation, sediment removal, and levees. Some of these practices may be applied upstream to reduce inorganic mercury in water flowing into the wetland, thus reducing methylmercury formation. Other practices may reduce the downstream transport of methylmercury formed in the wetland (CVRWQCB, 2005b).

2.6 Current Impaired Waters

Under the CWA, Section 303(d), states are required to develop a list of water quality limited segments, establish priority rankings for the segments, and develop action plans, or TMDLs, to improve water quality. The listing policy identifies the factors and information that shall by used by the State and Regional Boards to list and delist a water body. Factors applicable to pollutants that bioaccumulate from sediment into fish at concentrations that could be toxic to fish and wildlife include:

- Bioaccumulation of pollutants in muscle or whole body exceeds pollutant specific guideline using the binomial distribution
- Other evaluation guidelines that are:
    - Applicable to the beneficial use
    - Protective of the beneficial use
    - Linked to the pollutant under consideration
    - Scientifically-based and peer reviewed
    - Well described
    - Identifies a range above which impacts occur and below which no or few impacts are predicted. For non-threshold chemicals, risk levels shall be consistent with comparable water quality objectives or water quality criteria.
- Adverse Biological Response in resident organisms compared to reference conditions and associated elevated sediment chemistry. Adverse biological response may include
    - Reduction in growth
    - Reduction in reproductive capacity,
    - Abnormal development,
    - Histopathological abnormalities
    - Other adverse conditions including fish or bird kills
- Degradation of biological populations and communities compared to reference conditions and associated elevated sediment chemistry
- Situation-specific weight of evidence listing factor

For each listing, the Listing Policy directs the Water Boards to identify the pollutant causing degradation of the beneficial uses, a total maximum daily load (TMDL) completion date, and whether a total maximum daily load is required or whether existing programs can be applied to restore the beneficial use.

Exhibit 2-2 summarizes the current impairments for bays and estuaries in California. Appendix D shows the complete list of impairments by water body.

Exhibit 2-2. Summary of Current 303(d) List for Toxics for Bays and Estuaries in California

Regional Board	Number of Water Acres[1]				Number of Water Miles[1]		
	Sediment	Tissue	Water[2]	Total	Sediment	Water[2]	Total
1	-	-	16,075	16,075	-	-	-
2	757	-	392,710	393,467	-	0.6	0.6
3	155	-	29,681	29,836	-	0.03	0.03
4	163,115	155,807	16,486	335,408	1	34	35
5	-	-	43,629	43,629	-	21	21
8	2,063	623	2,063	4,749	-	11	11
9	207	-	13,240	13,447	-	0.8	0.8
Total	166,297	156,430	513,884	836,611	1	67	68

Source: SWRCB (2010).

1. Acres and miles are not unique to medium (i.e., water bodies may be impaired for sediment, tissue, and water)
2. Assumed impairment is for water where sediment or tissue is not specified explicitly.

There are also a number of toxics 303(d) listings for waters upstream of affected bays and estuaries (see SWRCB, 2010). Impaired sediments can be carried downstream and settle into bays and estuaries, contributing to existing impairments or causing new impairments.

Under the existing listing policy, Regional Water Boards may remove waters from the 303(d) list, or delist, if sediment toxicity or associated sediment quality guidelines are no longer exceeded. Regional Water Boards can delist waters if, using the binomial distribution, the number of measured exceedances supports rejection of the null hypothesis. Regional Water Boards may also remove waters from the list if objectives or standards are revised and the site or water meets the revised standards.

2.7 Sediment Cleanup and Remediation Activities

There are a number of sediment cleanup and remediation programs and activities planned or currently underway in California.

2.7.1 Bay Protection and Toxic Cleanup Program

The State Water Board established the Bay Protection and Toxic Cleanup Program (BPTCP) to implement the requirements of Chapter 5.6 of the CWC. Section 13394 of Chapter 5.6 requires the State Water Board and the Regional Water Boards to develop a Consolidated Toxic Hot Spots Cleanup Plan (Consolidated Plan). The Consolidated Plan identifies and ranks known toxic hot spots based on a two-step process using three lines of evidence, and presents descriptions of toxic hot spots, actions necessary to remediate sites, the benefits of remediation, and a range of remediation costs. The plan is applicable to point and nonpoint source discharges that Regional Water Boards reasonably determine to contribute to or cause the pollution at toxic hot spots.

The Consolidation Plan requires Regional Water Boards to implement the remediation action to the extent that responsible parties can be identified, and funds are available and allocated for this purpose. When the

Regional Water Boards cannot identify a responsible party, the Consolidation Plan indicates that they are to seek funding from available sources to remediate the site. The Regional Water Boards determine the ranking of each known toxic hot spot based on the five general criteria specified in the Consolidation Plan as shown in **Exhibit 2-3**.

Exhibit 2-3. Toxic Hot Spot Ranking Criteria

Criteria Category	High	Moderate	Low
Human Health Impacts	Human health advisory for consumption of nonmigratory aquatic life from the site	Tissue residues in aquatic organisms exceed FDA/DHS action level or U.S. EPA screening levels	None
Aquatic Life Impacts[1]	Hits in any two biological measures if associated with high chemistry	Hit in one of the measures associated with high chemistry	High sediment or water chemistry
Water Quality Objectives	Objectives exceeded regularly	Objectives occasionally exceeded	Objectives infrequently exceeded
Areal Extent of Hot Spot	More than 10 acres	1 to 10 acres	Less than 1 acre
Natural Remediation Potential	Unlikely to improve without intervention	May or may not improve without intervention	Likely to improve without intervention

Source: SWRCB (2003b).

1. Rank based on analysis of sediment chemistry, sediment toxicity, biological field, water toxicity, TIEs, and bioaccumulation.

Appendix E provides additional information on the enclosed bays listed as known toxic hot spots in the Consolidated Plan, including ranking and reason for listing. **Exhibit 2-4** provides a summary of the remedial actions and estimated costs for the high priority toxic hot spots. Note that several of the remedial actions identified by the State and Regional Water Boards only characterize the problem at a hot spot. Thus, the costs identified for those actions do not include all actions necessary to fully remediate the toxic hot spot. Additional funds would be required for remediation after characterization studies are complete.

Exhibit 2-4. Summary of Actions and Costs to Address High Priority Known Toxic Hot Spots

Site	Source	Remedial Actions and Estimated Costs to Remediate Site
Delta Estuary, Cache Creek	• Exports from Placer gold mines • Mercury mining in the Coast Range • Resuspension of estuarine sediment • Effluent from municipal and industrial discharges to surface waters.	• Studies to develop mercury control strategy: • Fish eating bird & egg studies plus OEHHA coordination: $335,000 • Mercury monitoring: $1,120,000 • Mine remediation feasibility studies: $150,000 • Estuarine mercury studies: $1,500,000
Delta Estuary, Entire Delta	• Application of diazinon as a dormant orchard spray in the agricultural areas of the Central Valley	• RWB oversight: $400,000 FY 2002-2003 • Other oversight: $200,000 FY 2003-2004 • Costs to growers: $180,000-$600,000/yr • Implementation of practices: $0-$300,000/yr • Regulatory compliance: $3-$164/acre • Continued practices development: $1,000-$4,060/grower/yr • Monitoring: $100,000 to $1 million/yr.

Exhibit 2-4. Summary of Actions and Costs to Address High Priority Known Toxic Hot Spots

Site	Source	Remedial Actions and Estimated Costs to Remediate Site
Delta Estuary, Morrison Creek, Mosher, 5-Mile, Mormon Slough, and Calaveras River	• Urban runoff	• Rainfall evaluation: $50,000/ yr for 3 years • Monitoring urban dischargers: $50,000/yr • Continued practices evaluation: $50,000 to $100,000 for cities annually • Implementation of practices: No additional cost • Regulatory agency oversight: $20,000/yr • Develop TMDL: $50,000/yr until 2005 • Basin Plan amendment: $50,000/yr for 2 years.
Delta Estuary, Ulatis Creek, Paradise Cut, French Camp, and Duck Slough	• Agricultural use	• Basin Plan proposal: $100,000 FY 2002-2003 • R5 oversight: $100,000 FY 2003-2004 • Other oversight: $540,000 -$1.8 million/yr • Costs to growers: $0-$300,000/yr • Implement practices: $2,695-$27,555/grower • Regulatory compliance: $555 - $8,200/grower/yr • Continued practices development: $100,000 - $1million/ yr • Monitoring: $100,000/yr in Delta only.
Humboldt Bay, Eureka Waterfront H Street	• Scrap metal facility including disassembly, incineration, and crushing of autos • Storage of metals, batteries, radiators, metal reclamation from electrical transformers and miscellaneous refuse	• Removal of polluted soils and capping of site: $500,000 - $5,000,000, based on a $500/ton cost for hauling and tipping fees at a hazardous waste disposal site
LA Inner Harbor, Dominguez Channel/ Consolidated Slip	• Historical discharge of DDTs, PCBs, metals • Spills, vessel discharges, anti fouling paints, and storm drains • Waste streams from refineries	• Dredging and offsite disposal of polluted sediments: $1,000,000 - $5,000,000 • Treatment of polluted sediments: $5,000,000 - $50,000,000
LA Outer Harbor, Cabrillo Pier	• Historical discharge of DDTs, PCBs • Discharge of wastewater effluent from Terminal Island WWTP • Nonpoint sources including ship spills, industrial facilities, and storm water runoff	• Dredging and offsite disposal of polluted sediments: $500,000 - $5,000,000 • Capping: $500,000 - $1,000,000 • Treatment of polluted sediments: $2,500,000 - $50,000,000
Lower Newport Bay, Rhine Channel	• Boat yard operations	• Sediment removal: $231,800 • Offsite transport: $4,600,000 • Disposal in a Class I facility: $5,750,000
Moss Landing Harbor and Tributaries	• Past and present agricultural activities • River and stream maintenance activities • Ship maintenance • Urban runoff	• RWB Management: $925,000 (over 5 yrs) • Control of harbor pollutants: $348,334 • Urban runoff action plan: $1,052,750 • Agricultural BMPs: $6,790,000 • Monitoring: $678,000
Mugu Lagoon east arm, Main Lagoon, western arm Calleguas Creek Tidal Prism	• Agricultural runoff, nonpoint source runoff	• In situ treatment of polluted sediment: $72,500,000 • Dredging and removal of polluted sediments: $1,000,000 - $5,000,000
San Diego Bay, Seventh St. Channel Naval Station	• Industrial activities • Pesticides from lawns, streets and buildings • Runoff from pest control operations • Atmospheric deposition	• Dredging and upland disposal: $3,384,800 - $7,405,200 • Dredging and contained aquatic disposal: $145,520 - $275,880

Exhibit 2-4. Summary of Actions and Costs to Address High Priority Known Toxic Hot Spots

Site	Source	Remedial Actions and Estimated Costs to Remediate Site
San Francisco Bay, Castro Cove	• Refinery operations	• Site investigation and feasibility study: $2,000,000 • Dredging with upland disposal and capping: $1,000,000 - $20,000,000 • Regional Water Board staff cost: $200,000
San Francisco Bay, Entire Bay	• Mercury mining runoff and use in placer and hydraulic gold mining operations • Historic industrial use of PCBs	• Cleanup New Almaden Mine: $10,000,000 • Point Potrero cleanup: $800,000-3,000,000 • TMDLs adoption and mercury strategy: $10,000,000 - $20,000,000 • Watershed investigations to identify sources: $4,000,000/5 yrs • Regional Monitoring Plan studies: $75,000/yr; $150,000/2 yrs; then $50,000/yr • Public education on source control and product substitution: $50,000
San Francisco Bay, Islais Creek	• Storm water or urban runoff entering directly or through combined sewer overflows • Sheet runoff or past discharge from auto dismantlers and metal recycling facilities Deposition of air emissions from I-280	• Site investigation and feasibility study: $1,000,000 • Remediation including dredging with follow-up monitoring: $800,000 - $5,200,000 • Change operation or increase storage and capacity of the current system: $75,000,000 • RWB staff costs: $100,000 - $200,000
San Francisco Bay, Mission Creek	• Historic sources • Storm water entering directly or through infrequent combined sewer overflows • Deposition of air emissions from I-280	• Site investigation and feasibility study: $1,000,000 • Remediation including dredging/capping or off site disposal and monitoring: $800,000 - $1,800,000 • Increase storage and structural changes: $75,000,000 • RWB staff costs: $100,000 - $200,000
San Francisco Bay, Peyton Slough	• Historical industrial activity associated with the creation of cinder/slag piles	• Dredging and disposal of 12,000 cubic yards of sediments, and a 3 foot cap on the entire slough: $400,000 - $1,200,000 • Follow-up monitoring: $5,000 - $10,000 per yr • RWB staff costs: $10,000 - $50,000
San Francisco Bay, Point Potrero/ Richmond Harbor	• Historical ship building and scrapping operations • Metal scrap recycling operations	• Sheetpile bulkhead, capping, and institutional controls: $792,000 • Rock Dike bulkhead capping and institutional controls: $1,344,000 • Excavation and off-site disposal: $3,010,000 • Excavation reuse or disposal on site: $881,000 • Regional Water Board costs: $30,000/3yrs
San Francisco Bay, Stege Marsh	• Oxidation of pyrite cinders in presence of sulfides produced during industrial process • Urban runoff • Upland industrial facilities	• Site investigation and feasibility study and remediation option: $1,500,000 to $10,000,000 • RWB costs: $100,000-$200,000
Santa Monica Bay, Palos Verdes Shelf	• Historical wastewater discharges from manufacturing operations • Wastewater treatment plant discharges	• Capping 7.6 sq. km with 45 cm isolation cap: $44,000,000 - $67,000,000 • Capping 7.6 sq. km with 15 cm isolation cap: $18,000,000 - $30,000,000 • Capping most polluted area 4.9 sq. km with 15 cm. isolation cap: $13,000,000 - $19,000,000

Source: SWRCB (2003b). Year dollars not specified.

2.7.2 TMDLs

There are a number of TMDLs in the state that set load limits for pollutant in sediments or target protection on fish and wildlife. For example, the San Francisco Bay Regional Water Board recently adopted two TMDLs to address bay-wide exceedances of the narrative bioaccumulation objective caused by excessive levels of methylmercury and PCBs in fish tissue (SFRWQCB 2006; 2008). The Regional Water Board determined that high mercury levels in sediments are due, in large part, to legacy gold mining operations which have resulted in bay-wide fish consumption advisories. The Regional Water Board derived the mercury targets from the estimated reduction in mercury mass in tissue that would be needed to be protective of human health and wildlife (SFRWQCB, 2006). The U.S. Fish and Wildlife Service performed an ecological risk assessment on the methylmercury tissue criteria to confirm that the TMDL target concentration was protective of rare and endangered species in California. Unlike mercury, the movement of PCBs and other hydrophobic organochlorine compounds up through the food web can be predicted with food web models. The Regional Water Board developed targets for PCBs based on human health risk, however, they also determined that harbor seals and birds such as cormorants and terns would also be protected (SFRWQCB, 2007).

Other examples include the Santa Ana River Region's effort underway to develop a TMDL and site specific objective (SSO) to protect wildlife from exposure to selenium that has accumulated in fish tissue and egg shells. The technical workgroup has begun to identify relevant and appropriate endpoints and targets that protect wildlife in the waterbody.

As part of a TMDL, Regional Water Boards identify potential implementation strategies and estimate the cost of implementation. However, Porter-Cologne prohibits Regional Water Boards from prescribing the exact method of achieving compliance with the targets. Thus, there is no requirement to follow the proposed strategies as long as the allowable loadings are not exceeded.
Although sources are not required to follow the proposed strategies, the recommendations provide an idea of the types of activities that could be necessary for compliance with baseline standards.

In certain cases, implementation activities may not vary based on the pollutant. For example, storm water BMPs designed to remove a specific metal could be used to remove all metals. Implementation activities for the Calleguas Creek metals and organochlorine pesticides and PCBs TMDLs include:

- Establish group concentration-based effluent limits for NPDES dischargers
- Implement BMPs for nonpoint sources consistent with the Nonpoint Source Plan and Conditional Waiver Program.
- Develop Agricultural Water Quality Management Plans and implement agricultural BMPs based on results of BMP effectiveness studies
- Develop agricultural education program to inform growers of the recommended BMPs and the Management Plan.

Implementation plans may also include additional studies to better determine pollutant sources, causes of toxicity, or most cost-effective controls. For example, in implementing the Ballona Creek TMDL, the Regional Water Board conducted field and laboratory studies with enhanced chemistry analyses and sediment toxicity identification studies for multiple sites. The Regional Water Board found that while chemical contamination and sediment toxicity is present throughout the estuary, TMDL target exceedances showed little relationship to toxicity. Rather, tests showed that pyrethroid pesticides (which were not included as a pollutant of concern in developing the TMDL targets) are the principal cause of the observed sediment toxicity.

Appendix D summarizes the targets, load allocations, and implementation plans for sediment-related TMDLs completed for enclosed bays and estuaries in the state.

2.7.3 Cleanup and Abatement Orders

Regional Water Boards have issued a number of existing cleanup and abatement orders for bays and estuaries to improve sediment quality and reduce toxicity. Under these orders, dischargers or companies are required to cleanup contaminated sediments, soils, or groundwater to background levels, or if background levels are not technologically or economically feasible, to a level determined by the Regional Water Board. For example, the San Diego Regional Water Board is proposing a tentative cleanup order for the contaminated sediments in the San Diego Bay between Sampson Street extension and the mouth of Chollas Creek. The Regional Water Board has proposed a cleanup level that the responsible parties will be required to achieve.

2.7.4 Contaminated Sediment Task Force

In 1997, the governor signed Senate Bill 673 into law, requiring the California Coastal Commission and the Los Angeles Regional Water Board to establish a multi-agency Contaminated Sediments Task Force (CSTF) to assist in the preparation of a long-term management strategy for dredging and disposal of contaminated sediments in the Los Angeles area. The resulting long-term management strategy includes, among other recommendations, a component focused on the reduction of contaminants at their source (CSTF, 2005). The next steps involve implementing the plan. The CSTF Management Committee meets on a quarterly basis to address a number of issues, including continuing refinement of management tools (e.g., BMP toolbox, water quality monitoring, and sediment quality guidelines) (CSTF, 2005).

3. Description of the Amendments

This section describes the applicability of the amendments, and the SQOs, implementation procedures, and monitoring requirements. Also described is the extent of current attainment of the proposed SQOs.

3.1 Applicability

The amendments to the Sediment Quality Plan for Enclosed Bays and Estuaries applies to:

- Enclosed bays[1] and estuaries[2]
- Surficial sediments that have been deposited or emplaced below the intertidal zone, not to sediments characterized by less than 5% fines or substrates composed of gravels, cobbles, or consolidated rock.

The Plan is not applicable to ocean waters including Monterey Bay, Santa Monica Bay, or inland surface waters, and does not govern dredge material suitability determinations or the management of active, designated, or permitted aquatic dredged material disposal or placement sites.

3.2 Sediment Quality Objectives

The SQO to protect wildlife and resident finfish prohibits pollutants in sediment at levels that alone or in combination are toxic to wildlife and resident finfish by direct exposure or bioaccumulate in aquatic life at levels that are harmful to wildlife or resident finfish by indirect exposure. The policy defines wildlife as tetrapod vertebrates, including amphibians, reptiles, birds and mammals, inclusive of marine mammals, and defines resident finfish as any species of bony fish or cartilaginous fish (sharks, skates and rays) whose adult home range occupies all or part of the water body but does not extend into other water bodies.

3.3 Implementation Procedures

The proposed amendments specify that the Water Boards implement the narrative wildlife and resident finfish SQOs on a case-by-case basis, based on an ecological risk assessment. In conducting an ecological risk assessment, the Water Boards shall consider any applicable and relevant ecological risk information including policies and guidance from the following sources:

- California Environmental Protection Agency's (Cal/EPA) Office of Environmental Health Hazard Assessment (OEHHA)
- Cal/EPA's Department of Toxic Substances Control (DTSC)
- California Department of Fish and Game
- U.S. Environmental Protection Agency
- U.S. Army Corps of Engineers
- National Oceanographic Atmospheric Administration
- U.S. Fish and Wildlife Service

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[1] Enclosed Bays are indentations along the coast which enclose an area of oceanic water within distinct headlands or harbor works. Enclosed bays include all bays where the narrowest distance between headlands or outermost harbor works is less than 75% of the greatest dimension of the enclosed portion of the bay (SWRCB, 2006a).

[2] Estuaries and coastal lagoons are waters at the mouths of streams that serve as mixing zones for fresh and ocean waters during a major portion of the year. Mouths of streams that are temporarily separated from the ocean by sandbars are considered estuaries. Estuarine waters generally extend from a bay or the open ocean to the upstream limit of tidal action, but may extend seaward if significant mixing of fresh and salt water occurs in open coastal waters (SWRCB, 2006a).

When threatened or endangered species are present the Water Boards shall consult with these agencies to ensure that these species are adequately protected

3.4 Monitoring and Assessment

The proposed amendments do not include monitoring requirements, although the ecological risk assessment specified in the implementation procedures involves monitoring. For example, DTSC's ERA guidance (CA EPA, 1996) indicates that an ERA should include the following steps:

- Scoping assessment – includes site characterization (e.g., trophic level structure, food web transfer of contaminants), biological characterization (e.g., identification of distinct habitats, identification of species and communities present, identification of species indicative of normal functioning ecosystem, identification of common site receptors), and pathway assessment (e.g., identify potential for contact between receptors and chemicals of concern)
- Predictive assessment – involves selection of representative species and toxicity data, identification of measurement endpoints, evaluation of potential exposure pathways and contact rates, and calculation of hazard quotients and a hazard index.
- Validation study – refine and validate parameters used to estimate the risk to exposed biota through sampling and analysis, or validate conclusions of predictive assessment through site-specific laboratory and/or field testing
- Impact assessment – conduct field testing and/or more extensive laboratory testing to assess the severity and extent of population and community effects as input to the evaluation of remedial alternatives and refinement of remediation goals.

The goal of the ecological risk assessment is to predict potential adverse effects and when appropriate, to measure existing adverse effects, of chemical contaminants on the biota on or near a site or facility, and to determine levels of those chemicals in the environment that would not be expected to adversely affect the biota.

3.5 Attainment

As discussed in Section 2, there are currently 127 segments of bays and estuaries on the State's 2010 303(d) list for toxic pollutants, including 88 listings for sediment quality, and 48 sites identified as known toxic hot spots under the State Water Board's BPTCP. In addition, the State Water Board (2008) identified an additional 8 bays that may be impaired based on the direct effects benthic community SQO. The extent to which those impairments result in direct or indirect toxicity to wildlife and finfish represents the level of existing nonattainment of the proposed wildlife and finfish SQO.

The proposed Plan amendments could also result in additional efforts to assess attainment of fish and wildlife beneficial uses in bays and estuaries, which in turn could result in identification of new impairments or changes to existing impairments. **Exhibit 3-1** indicates the possible outcomes under the proposed Plan amendments.

Exhibit 3-1. Potential Incremental Impacts Associated with the Proposed Plan Amendments

Assessment of Attainment of Existing Beneficial Uses	Assessment Under Proposed SQO	
	Impairment not attributable to sediments	Impairment attributable to sediments
Impairment not attributable to sediments	• No change in sediment quality. • Potential incremental assessment costs.	• Sediment quality improvement. • Potential incremental assessment and control costs.
Impairment attributable to sediments	• Sediment quality remains the same, which may be lower than under implementation of baseline narrative objective. • Potential incremental assessment costs, but will avoid unnecessary control costs.	• Change in sediment quality if better data lead to change in control strategies. • Potential incremental assessment costs; potential incremental costs or cost-savings depending on differences in control strategies.

4. Methods of Compliance and Potential Costs

This section identifies potential means of compliance with the Plan, and the potential costs of those measures.

4.1 Monitoring and Assessment

As discussed in Section 2, there are extensive monitoring and assessment activities supporting the baseline regulatory framework. Absent the proposed Plan amendments, these activities will continue, and additional efforts will be undertaken (e.g., as Regional Boards assess compliance with existing objectives for sediment toxicity, and address sites currently impaired for sediment toxicity). That is, data is needed to determine whether sediments are in compliance with existing narrative objectives for sediment toxicity related to fish and wildlife. Similarly, in instances in which sediments exceed baseline objectives for sediment toxicity, assessment of the causes and sources will be needed in order to identify means of compliance with the objectives. These activities, which can include developing a work plan/project management, collecting additional data, conducting ERAs or toxicity identification evaluations (TIEs), surface water modeling, and other analysis, may be conducted as part of developing a TMDL (SCCWRP, 2005; Parsons, et al., 2002, as cited in WSPA, 2007).

The objective of ERA is to evaluate the potential for biological effects to occur as a result of exposure to one or more stressors in the environment. ERA is a flexible iterative process that can be used for any site segment or waterbody either prospectively to assess future conditions or retrospectively to assess risk associated with spills or releases or existing degradation (U.S. EPA, 1998). ERAs may be relatively simple or extremely complex depending upon the site conditions, number of pollutants, exposure pathways and receptors. In all cases, a variety of expertise is needed to ensure that the results of the ERA are relevant for the species exposure pathways and pollutants associated with the site segment or waterbody.

SWRCB (2008) provided unit costs for monitoring to assess the SQOs to protect the benthic community (direct effects). Monitoring efforts for ERAs to assess indirect effects to wildlife and finfish beyond the monitoring necessary to assess water quality criteria and the SQOs for direct effects could involve collecting finfish and documenting the presence of deformities, irregularities in size, or population effects, and collection and analysis of wildlife tissue or bird eggs. **Exhibit 4-1** provides unit costs for these types of analyses. Sample collection costs may vary based on factors such as water depth, abundance of fish species, sediment characteristics (may cause unsuccessful grabs that need to be repeated), and distance between stations. Although data for some parameters may not be needed at each sampling site, the total costs per sampling event could be in the range of $7,400 to $11,700.

Exhibit 4-1. Incremental Sampling Costs to Assess Finfish and Wildlife Health[1]

Parameter	Unit Cost	Number per Event	Total Cost
Fish Collection (for sampling or observation)[2]	$1,500 – $1,800 per site	1	$1,500 – $1,800
Metals suite (tissue)	$175 – $225 per sample	6*	$1,050 – $1,350
Mercury (tissue)	$30 – $80 per sample	6*	$180 – $480
Chlorinated pesticides (tissue)	$200 – $575 per sample	6*	$1,200 – $3,450
PCBs suite (tissue)	$575 – $775 per sample	6*	$3,450 – $4,650
Total cost per sampling event	NA	NA	$7,380 – $11,730

Source: SCCWRP (2011) and SWRCB (2011a).

*Three fish per species and two species per site.

1. Incremental to sampling requirements to assess attainment of SQOs for direct effects in bays and estuaries. See SWRCB (2008)

2. Includes boat, materials, and labor for observing fish communities or collecting fish for sampling.

To assess attainment of the proposed SQO, the number of stations from which data should be collected will vary based on water body-specific factors including:

- area
- tidal flow and/or direction of predominant currents
- historic and or legacy conditions in the vicinity of the water body
- nearby land and marine uses or actions
- beneficial uses
- potential receptors of concern
- changes in grain size, salinity, water depth, and organic matter
- other sources or discharges in the immediate vicinity of the water body.

Exhibit 4-2 shows the minimum number of samples for different size bays, assuming that sediment conditions are relatively homogeneous. These estimates reflect a goal of providing a spatially-based measure of fish and wildlife health with a level of precision similar to that used in regional monitoring programs throughout California. Different numbers of stations may be required for targeted or focused studies.

Exhibit 4-2. Potential Number of Samples to Assess Compliance

Bay Size (acres)	Number of Sites
<500	5
500-5000	12
>5000	30

Source: SCCWRP (2007).

The State Water Board estimates that there are approximately 7 bays and estuaries with areas greater than 5,000 acres, 10 with areas between 500 and 5,000 acres, and 84 with areas less than 500 acres for which monitoring to assess compliance with the proposed SQO could be necessary. Assuming that assessments of fish and wildlife health would be based on the number of sites per water body in Exhibit 4-2, incremental monitoring costs could range from approximately $5.5 million to $8.8 million.

For bays and estuaries not currently on the 303(d) list for sediment toxicity that would exceed the SQO under the proposed Plan amendments, the next step under the Plan would be a sequential approach to manage the sediment appropriately, including developing and implementing a work plan to confirm and characterize pollutant-related impacts, identify pollutants, and identify sources and management actions (including adopting a TMDL, if appropriate). The cost of this sequential approach will vary depending on a number of factors, including the extent of baseline efforts and studies underway to address other impairment issues, and the number of potential stressors to the area. Note that in the absence of the Plan amendments, Regional Water Boards could identify these waters as exceeding the narrative objectives, and thus incremental impacts associated with TMDL development and pollution controls would be zero.

The State Water Board (2001) estimates that development of complex TMDLs (including an implementation plan) may cost over $1 million. In addition, SWRCB (2003a) indicates that TMDL development and mercury reduction strategy cost for the San Francisco Bay could range from $10 million to $20 million. These estimates provide some indication of costs that can be associated with sequential approaches to managing designated use impairments. Thus, the estimates provides an approximation of the potential magnitude of both costs (incremental listings) and cost savings (changes in listings due to additional information to accurately identify the cause of the impairment) that may be associated with changes in the identification of impairments under the baseline objectives and the proposed Plan amendments.

4.2 Potential Controls

For waters that Regional Water Boards identify as being impaired based on the wildlife and finfish SQO under the Plan, remediation actions and/or source controls will be needed to bring them into compliance. Many bays and estuaries are already listed for sediment impairments or are exceeding the benthic community or human health SQOs and, therefore, would require controls under baseline conditions. When the baseline controls are identical to the ones that would be implemented for the wildlife and finfish SQO, there is no incremental cost or cost savings associated with the Plan amendments. When the baseline controls differ, there is potential for either incremental costs or cost-savings associated with the Plan amendments.

For an increased in pollution controls cost associated with nonattainment of the wildlife and finfish SQO, the concentration of toxic pollutants in discharges would have to meet levels that are more stringent than what is needed to achieve compliance with existing objectives (e.g., since they could have to control based on the benthic community and human health SQOs, narrative sediment objectives, or the CTR). Incremental costs for controls may also result from the identification of additional chemical stressors that are not included in the CTR or Basin Plans. For example, in Ballona Creek, the Regional Water Board identified pyrethoid pesticides as the cause of sediment toxicity, and not metals and other toxic pollutants for which CTR criteria and sediment TMDL targets that already existed (City of Los Angeles WPD, 2010). Since many practices that may be employed under existing TMDLs are applicable for controlling the mobilization of pollutants in general, this situation is also difficult to estimate. For example, the TMDL for pesticides and PCBs in the Calleguas Creek watershed indicates that the BMPs needed to achieve the nutrient and toxicity TMDLs for the watershed would likely reduce pesticides and PCBs to necessary levels as well (LARWQCB, 2005c).

Thus, without being able to identify the particular pollutants causing toxicity to wildlife and finfish, and the development of discharge concentrations needed to achieve the objectives, the needed controls to achieve those concentrations are difficult to estimate. The following sections discuss these issues; Appendix F provides additional information on unit costs.

4.2.1 Municipal and Industrial Facilities

Regional Water Boards regulate municipal and industrial wastewater treatment facilities through the NPDES permit program. If these dischargers have potential to cause or contribute to an exceedance of water quality standards contained in Phase I of the Plan, Basin Plans (narrative and numeric), the CTR, or any other applicable policy, permit writers assign effluent limits. Regional Water Boards may also adopt more stringent criteria for specific pollutants where necessary (e.g., to meet a TMDL, site-specific objectives). If the Plan requires municipal and industrial dischargers to reduce pollutant concentrations to levels below those required by existing standards, it is likely that these facilities would implement source control to eliminate the pollutant from entering their treatment plant or industrial process, or pursue regulatory relief (e.g., a variance), rather than install costly end-of-pipe treatment. However, it is uncertain whether such a situation would arise as a result of the Plan amendments.

4.2.2 Agriculture

Regional Water Boards regulate farmers primarily through the conditional WDR waivers that require compliance with water quality standards. Regional Water Boards may also require farmers to meet more stringent criteria for specific pollutants where necessary (e.g., to meet a TMDL, site-specific objectives). All of the affected Regional Water Boards have narrative objectives that specifically prohibit the discharge of pesticides and/or toxic pollutants that cause detrimental effects in aquatic life or to animals and humans. Thus, even in the absence of the Plan amendments, farmers would be prohibited from causing or contributing to toxicity to wildlife and finfish.

4.2.3 Storm Water

An incremental level of control for storm water sources (e.g., need to implement new practices, increase the frequency of existing practices, or install structural controls that might not be required under existing objectives) may or may not be necessary for compliance with the Plan amendments. For any situation in which storm water sources are specifically required to control toxic pollutants to levels that are lower than what would be necessary in the absence of the Plan amendments, potential means of compliance include:

- Increased or additional nonstructural BMPs – institutional, education, or pollution prevention practices designed to limit generation of runoff or reduce the pollutants load of runoff
- Structural controls – engineered and constructed systems designed to provide water quantity or quality control.

The following sections provide general discussion of the types of activities and associated costs that may be affected by changes in control strategies attributable to the Plan.

Nonstructural BMPs

Nonstructural BMPs can be very effective in controlling pollution generation at the source, which in turn can reduce or eliminate the need for costly end-of-pipe treatment or structural controls. Most municipal SWMPs primarily implement nonstructural BMPs to meet existing permit requirements. It is possible that additional or increased efforts for certain nonstructural BMPs could be used for compliance with the Plan. Examples include expanding an existing outreach and education program to a larger or new target audience, refocusing source control efforts on pollutants and sources of concern (e.g., pesticide/herbicide use or integrated pest management program), increasing program compliance efforts, and increasing frequency, duration, or efficiency of maintenance practices such as street sweeping.

Although nonstructural practices play an invaluable role in protecting surface water, costs and effectiveness are not easily quantified, primarily because there are no design standards for these practices (SWRCB, 2006c) and because many have been education-oriented with high up-front costs to develop outreach materials. For example, the State Water Board's Erase the Waste campaign is a public education program that works to reduce storm water pollution and improve the environment of coastal and inland communities. The State Water Board launched the campaign in Los Angeles County in August 2003 as a 2-year, $5 million outreach campaign (SWRCB, 2004c). However, the materials produced are now available statewide (SWRCB, 2006c). Thus, expanding the program to other regions would not be as costly as starting a similar program from scratch.

A recent survey of California municipalities reports a mean annual cost of $26 per household for nonstructural SWMP measures including: public education and outreach, illicit discharge detection and elimination, construction site storm water runoff control, post construction storm water management in new development and redevelopment, and pollution prevention and good housekeeping for municipal operations such as street sweeping (CSU Sacramento, 2005). Incremental costs to improve the effectiveness of these measures may have a similar order of magnitude, although actual costs will vary depending on the baseline program, the incremental activities, municipality size, and degree of coordination with other municipalities. Appendix F provides additional examples of nonstructural BMP cost estimates.

Structural Controls

There are a variety of structural means to control the quantity and quality of storm water runoff including infiltration systems, detention systems, retention systems, constructed wetlands, filtration systems, and vegetated systems. The cost for any particular structure depends on the type of control, the quantity of water treated, and site-specific factors such as land cost. Incremental costs or cost-savings associated with the Plan amendments cannot be estimated without information on differences, if any, in structural control strategies between baseline and Plan conditions. Appendix F provides examples of cost estimates for individual structures.

4.2.4 Marinas and Boating Activities

Control measures that address toxic pollutants from marinas and boating activities include:

- Use of biocide-free paint on boats or more frequent boat hull cleaning to prevent leaching of toxic paints
- Performing above waterline boat maintenance activities in a lined channel to prevent debris from entering the water
- Performing below waterline boat maintenance on land in area with runoff (and dust) controls
- Developing a collection system for toxic materials at harbors.

Although water quality controls for marinas are less common than controls for urban storm water, information on TMDL and toxic hotspot cleanups indicates that they may be included in baseline strategies for impaired sites. However, there may also be incremental costs or cost savings at these sites as a result of the Plan amendments. Sites that are not exceeding current objectives, but would be exceeding the wildlife and finfish SQO could incur incremental control costs if boating activities contribute to sediment toxicity that harms fish and wildlife. Conversely, there may be cost savings for sites exceeding current standards that are not exceeding the proposed SQO.

Incremental costs or cost savings will depend on the pollutants of concern, the types of activities undertaken, and in some cases the number of boats affected. Appendix F provides examples of the types of activities that may be included in incremental costs (or cost savings if baseline activities are not necessary).

4.2.5 Wetlands

Incremental wetland controls may or may not be necessary to achieve compliance with the proposed SQO. Potential means of compliance include: aeration, channelization, revegetation, sediment removal, levees, or a combination of these practices.

For methylmercury and selenium in particular, protection of wildlife may result in the need for incremental controls in certain water bodies to reduce pollutants to levels that would be necessary in the absence of the Plan amendments (e.g., protection of human health only). However, the location and extent of controls needed and the types of controls are unknown. One example of efforts underway elsewhere is the Anderson Marsh wetland on Cache Creek. This wetland is located within a 1,000-acre park that also includes oak woodlands and riparian areas. Various management practices mentioned above may be applied upstream to reduce inorganic mercury in water flowing into the wetland, thus reducing methylmercury formation, and other practices may reduce the downstream transport of methylmercury formed in the wetland. The Central Valley Regional Water Board (2005b) provides capital cost estimates for controlling methylmercury export from Anderson March ranging from $200,000 to $1 million, and O&M costs ranging from $20,000 to $100,000 per year.

4.2.6 Cleanup and Remediation Activities

There is uncertainty as to whether incremental cleanup and remediation activities will be required as a result of the Plan amendments. In addition, based on the implementation plans for existing TMDLs, Regional Water Boards are likely to pursue source controls for ongoing sources and only require remediation activities for historical pollutants with no known, ongoing sources. However, for any situation in which cleanup or remediation would be required that would not be conducted in the absence of the Plan amendments, costs will depend on the technical feasibility of different strategies (e.g., capping, removal and disposal, removal and treatment and disposal), the proximity of source material (for capping) or to appropriate treatment and disposal facilities, whether disposal facilities exist or whether new facilities must be built, as well as other factors. Costs for any sediment remediation actions necessary as a result of the Plan could be similar to those estimated by the Regional Water Board for hot spot cleanup shown in Exhibit 2-5. Appendix F provides additional discussion regarding potential costs.

5. Analysis of Statewide Costs

This section provides a summary of the economic considerations of the Plan amendments, and discusses the key sources of uncertainty in the analysis.

5.1 Sediment Quality and Costs in the Absence of the Plan

There are currently 127 segments of bays and estuaries on the State's 2010 303(d) list for toxic pollutants, including 88 listings for sediment quality, and 48 sites identified as known toxic hot spots under the State Water Board's BPTCP. In addition, the State Water Board (2008) identified an additional 8 bays that may be impaired based on the direct effects benthic community SQO. These conditions require substantial resources to be spent over the next decades for monitoring, assessment, TMDL development, pollution controls, and sediment cleanup and remediation. These resources include an estimated $87.6 million to $1.03 billion for cleanup and remediation of toxic hot spots that are of high priority (SWRCB, 2003b).

All Regional Water Boards currently have narrative objectives for toxic substances, toxicity, pesticides, bioaccumulation, or a combination of these categories. Although these narrative objectives are subject to interpretation and are implemented according to each Regional Water Board's policy, any water body could potentially be listed because of detrimental physiological responses in animals or aquatic life, bioaccumulation in biota or fish resulting in adverse effects to aquatic life and wildlife, sediment toxicity, or high concentrations of toxic substances (especially pesticides) in sediments. There is uncertainty regarding whether the TMDLs developed or under development for listed waters would result in restoring beneficial uses. Indeed, TMDLs are often phased, such that evaluation of early actions can result in changes or redirection of future actions. Thus, additional costs could be incurred in the future in order to eliminate sediment toxicity to wildlife and finfish in bays and estuaries.

5.2 Sediment Quality and Costs under the Plan

As shown in Section 4.1, incremental costs associated with monitoring and assessment of the wildlife and finfish SQO could be as much as $5.5 million to $8.8 million. Where assessment indicates that the proposed SQO is not being attained, there could be additional costs associated with more comprehensive ERAs and TMDL development and implementation and remedial actions.

Note, however, that these actions could also occur in the absence of the Plan based on existing monitoring and assessment practices. For example, Anchor Environmental (2006) performed an ERA for the Rhine Channel sediment remediation feasibility study. The Rhine Channel is a toxic hotspot under the Water Boards Bay Protection Program and on the 303(d) list for copper, pesticides, chlordane, DDT, PCBs, and sediment toxicity in lower Newport Bay. The ERA focused on risks associated with bioaccumulation and trophic transfer from sediment into fish and wildlife (including benthic and pelagic forage fish and higher trophic level species including California halibut, harbor seal, and brown pelican) for copper, mercury, selenium, DDE and PCBs. The purpose of the ERA was to assess and characterize existing risks to aquatic life and biota associated with contaminants in sediment. Anchor Environmental (2006) used the results to evaluate potential management actions. Thus, incremental costs associated with the proposed Plan amendments are highly uncertain.

5.3 Uncertainties

Data limitations prevent estimating incremental control costs or cost savings associated with the proposed Plan amendments. In addition, there is also uncertainty regarding baseline conditions that may affect the evaluation of the incremental economic impacts of the narrative SQOs. For example, existing TMDLs and hot spot cleanup and remediation actions have yet to be implemented, and the sediment quality that would result without the Plan is unknown. Baseline control scenarios are relevant because many practices can reduce loadings for a wide variety of pollutants. For example, the TMDL for pesticides and PCBs in the Calleguas Creek watershed indicates that the BMPs needed to achieve the nutrient and toxicity TMDLs for the watershed would likely reduce pesticides and PCBs to necessary levels as well (LARWQCB, 2005c). Thus, controls to address existing impairments (for water or sediment) could alter the assessment of compliance with the objectives.

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Appendix A. Current Narrative Objectives Applicable to Sediment Quality

This Appendix lists the current narrative Regional Water Board Basin Plan objectives that relate to sediment quality.

North Coast Regional Water Board (Region 1)

- Toxicity – All waters shall be maintained free of toxic substances in concentrations that are toxic to, or that produce detrimental physiological responses in human, plant, animal, or aquatic life. Compliance with this objective will be determined by use of indicator organisms, analyses of species diversity, population density, growth anomalies, bioassays of appropriate duration, or other appropriate methods as specified by the Regional Water Board.
- Pesticides – No individual pesticide or combination of pesticides shall be present in concentrations that adversely affect beneficial uses. There shall be no bioaccumulation of pesticide concentrations found in bottom sediments or aquatic life.

San Francisco Bay Regional Water Board (Region 2)

- Bioaccumulation – Many pollutants can accumulate on particles, in sediment, or bioaccumulate in fish and other aquatic organisms. Controllable water quality factors shall not cause a detrimental increase in concentrations of toxic substances found in bottom sediments or aquatic life. Effects on aquatic organisms, wildlife, and human health will be considered.
- Toxicity – All waters shall be maintained free of toxic substances in concentrations that are lethal to or that produce other detrimental responses in aquatic organisms. Detrimental responses include, but are not limited to, decreased growth rate and decreased reproductive success of resident or indicator species. There shall be no acute toxicity in ambient waters. There shall be no chronic toxicity in ambient waters.
- The health and life history characteristics of aquatic organisms in waters affected by controllable water quality factors shall not differ significantly from those for the same waters in areas unaffected by controllable water quality factors.

Central Coast Regional Water Board (Region 3)

- Toxicity – All waters shall be maintained free of toxic substances in concentrations which are toxic to, or which produce detrimental physiological responses in, human, plant, animal, or aquatic life. Compliance with this objective will be determined by use of indicator organisms, analyses of species diversity, population density, growth anomalies, toxicity bioassays of appropriate duration, or other appropriate methods as specified by the Regional Water Board.
- Pesticides – No individual pesticide or combination of pesticides shall reach concentrations that adversely affect beneficial uses. There shall be no increase in pesticide concentrations found in bottom sediments or aquatic life.

Los Angeles Regional Water Board (Region 4)

- Pesticides – No individual pesticide or combination of pesticides shall be present in concentrations that adversely affect beneficial uses. There shall be no increase in pesticide concentrations found in bottom sediments or aquatic life.
- Bioaccumulation – Toxic pollutants shall not be present at levels that will bioaccumulate in aquatic life to levels which are harmful to aquatic life or human health.

- Toxicity – All waters shall be maintained free of toxic substances in concentrations that are toxic to, or that produce detrimental physiological responses in human, plant, animal, or aquatic life. Compliance with this objective will be determined by use of indicator organisms, analyses of species diversity, population density, growth anomalies, bioassays of appropriate duration, or other appropriate methods as specified by the Regional Water Board.

Central Valley Regional Water Board (Region 5)

- No individual pesticide or combination of pesticides shall be present in concentrations that adversely affect beneficial uses; discharges shall not result in pesticide concentrations in bottom sediments or aquatic life that adversely affect beneficial uses; total identifiable persistent chlorinated hydrocarbon pesticides shall not be present in the water column at concentrations detectable within the accuracy of analytical methods approved by EPA or the Executive Officer; and pesticide concentrations shall not exceed the lowest levels technically and economically achievable.
- All waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life. This objective applies regardless of whether the toxicity is caused by a single substance or the interactive effect of multiple substances. Compliance with this objective will be determined by analyses of indicator organisms, species diversity, population density, growth anomalies, and biotoxicity tests of appropriate duration or other methods as specified by the Regional Water Board.

Santa Ana Regional Water Board (Region 8)

- Toxic Substances – Toxic substances shall not be discharged at levels that will bioaccumulate in aquatic resources to levels which are harmful to human health. The concentrations of toxic substances in the water column, sediments or biota shall not adversely affect beneficial uses.

San Diego Regional Water Board (Region 9)

- Pesticides – No individual pesticide or combination of pesticides shall be present in the water column, sediments or biota at concentrations that adversely affect beneficial uses. Pesticides shall not be present at levels which will bioaccumulate in aquatic organisms to levels which are harmful to human health, wildlife, or aquatic organisms.
- Toxicity – All waters shall be maintained free of toxic substances in concentrations that are toxic to, or that produce detrimental physiological responses in human, plant, animal, or aquatic life. Compliance with this objective will be determined by use of indicator organisms, analyses of species diversity, population density, growth anomalies, bioassays of appropriate duration, or other appropriate methods as specified by the Regional Water Board.

Appendix B. Current Water Quality Objectives

This Appendix lists the current water quality objectives for toxic pollutants under the California Toxics Rule (CTR).

Exhibit B-1. CTR Priority Toxic Pollutant Criteria (concentrations in µg/L)

Pollutant	Freshwater		Saltwater		Human Health For consumption of:	
	Acute	Chronic	Acute	Chronic	Water & Organisms	Organisms Only
Antimony					14	4300
Arsenic	340	150	69	36		
Beryllium						
Cadmium 2	4.3	2.2	42	9.3		
Chromium (III)	550	180				
Chromium (VI)	16	11	1100	50		
Copper	13	139.0	4.8	3.1	1300	
Lead	65	652.5	210	8.1		
Mercury					0.05	0.051
Nickel	470	47052	74	8.2	610	4600
Selenium		5.0	290	71		
Silver	3.4	3.4	1.9			
Thallium					1.7	6.3
Zinc 2	120	120	90	81		
Cyanide	22	5.2	1	1	700	220,000
Asbestos					7,000,000 fibers/L	
2,3,7,8-TCDD (dioxin)					0.000000013	0.000000014
Acrolein					320	780
Acrylonitrile					0.059	0.66
Benzene					1.2	71
Bromoform					4.3	360
Carbon Tetrachloride					0.25	4.4
Chlorobenzene					680	21,000
Chlorodibromomethane					0.401	34
Chloroethane						
2-Chloroethylvinyl Ether						
Chloroform						
Dichlorobromomethane					0.56	46
1,1-Dichloroethane						
1,2-Dichloroethane					0.38	99
1,1-Dichloroethylene					0.057	3.2
1,2-Dichloropropane					0.52	39
1,3-Dichloropropylene					10	1,700
Ethylbenzene					3,100	29,000
Methyl Bromide					48	4,000
Methyl Chloride						
Methylene Chloride					4.7	1,600
1,1,2,2-Tetrachlorethane					0.17	11
Tetrachloroethylene					0.8	8.85
Toluene					6,800	200,000

Exhibit B-1. CTR Priority Toxic Pollutant Criteria (concentrations in µg/L)

Pollutant	Freshwater		Saltwater		Human Health For consumption of:	
	Acute	Chronic	Acute	Chronic	Water & Organisms	Organisms Only
1,2-Trans-Dichloroethylene					700	140,000
1,1,1-Trichloroethane						
1,1,2-Trichloroethane					0.60	42
Trichloroethylene					2.7	81
Vinyl Chloride					2	525
2-Chlorophenol					120	400
2,4-Dichlorophenol					93	790
2,4-Dimehtylphenol					540	2,300
2-Methyl-4,6-Dinitrophenol					13.4	765
2,4-Dinitrophenol					70	14,000
2-Nitrophenol						
4-Nirtophenol						
3-Methyl-4-Chlorophenol						
Pentachlorophenol					0.28	8.2
Phenol					21,000	4,600,000
2,4,6-Trichlorophenol					2.1	6.5
Acenaphthene					1,200	2,700
Acenaphthylene						
Anthracene					9,600	110,000
Benzidine					0.00012	0.00054
Benzo(a)Anthracene					0.0044	0.049
Benzo(a)Pyrene					0.0044	0.049
Benzo(b)Fluoranthene					0.0044	0.049
Benzo(ghi)Perylene						
Benzo(k)Fluoranthene					0.0044	0.049
Bis(2-Chloroethoxy)Methane						
Bis(2-Chloroethyl)Ether					0.031	1.4
Bis(2-Chloroisopropyl)Ether					1,400	170,000
Bis(2-Ethylhexyl)Phthalate.					1.8	5.9
4-Bromophenyl Phenyl Ether						
Butylbenzyl Phthalate					3,000	5,200
2-Chloronaphthalene					1,700	4,300
4-Chlorophenyl Phenyl Ether						
Chrysene					0.0044	0.049
Dibenzo(a,h)Anthracene					0.0044	0.049
1,2 Dichlorobenzene					2,700	17,000
1,3 Dichlorobenzene					400	2,600
1,4 Dichlorobenzene					400	2,600
3,3'-Dichlorobenzidine					0.04	0.077
Diethyl Phthalate					23,000	120,000
Dimethyl Phthalate					313,000	2,900,000
Di-n-Butyl Phthalate					2,700	12,000
2,4-Dinitrotoluene					0.11	9.1
2,6- Dinitrotoluene						
Di-n-Octyl Phthalate						
1,2-Diphenylhydrazine					0.040	0.54

Exhibit B-1. CTR Priority Toxic Pollutant Criteria (concentrations in µg/L)

Pollutant	Freshwater		Saltwater		Human Health For consumption of:	
	Acute	Chronic	Acute	Chronic	Water & Organisms	Organisms Only
Fluoroanthene					300	370
Fluorene					1,300	14,000
Hexachlorobenzene					0.00075	0.00077
Hexachlorobutadiene					0.44	50
Hexachlorocyclopentadiene					240	17,000
Hexachloroethane					1.9	8.9
Indeno(1,2,3-cd) Pyrene					0.0044	0.049
Isophorone					8.4	600
Naphthalene						
Nitrobenzene					17	1,900
N-Nitrosodimethylamine					0.00069	8.1
N-Nitrosodi-n-Propylamine					0.005	1.4
N-Nitrosodiphenylamine					5.0	16
Phenanthrene						
Pyrene					960	11,000
1,2,4-Trichlorobenzene						
Aldrin	3		1.3		0.00013	0.00014
Alpha-BHC					0.0039	0.013
Beta-BHC					0.014	0.046
Gamma-BHC	0.95		0.16		0.019	0.063
Delta-BHC	2.4					
Chlordane [1]	1.1	0.0043	0.09	0.004	0.00057	0.00059
4,4'-DDT		0.001	0.13	0.001	0.00059	0.00059
4,4'-DDE					0.00059	0.00059
4,4'-DDD	0.24				0.00083	0.00084
Dieldrin	0.22	0.056	0.71	0.0019	0.00014	0.00014
Alpha-Endosulfan	0.22	0.056	0.034	0.0087	110	240
Beta-Endosulfan		0.056	0.034	0.0087	110	240
Endosulfan Sulfate					110	240
Endrin	0.086	0.036	0.037	0.0023	0.76	0.81
Endrin Aldehyde	0.52				0.76	0.81
Heptachlor	0.52	0.0038	0.053	0.0036	0.00021	0.00021
Heptachlor Epoxide		0.0038	0.053	0.0036	0.00010	0.00011
Polychlorinated biphenyls (PCBs)	0.73	0.014		0.03	0.00017	0.00017
Toxaphene		0.0002	0.21	0.0002	0.00073	0.00075

1. Regions 1, 4, and 9 have municipal water supply use maximum contaminant level criterion for chlordane = 0.1 µg/L.
2. The maximum dissolved cadmium criterion for the Sacramento River and its tributaries above State Hwy 32 Bridge at Hamilton City in Region 5 is 0.22 µg/L; the maximum dissolved zinc criterion for Sacramento River from Keswick Dam to the I Street Bridge at City of Sacramento; American River from Folsom Dam to the Sacramento River; Folsom Lake (50); and the Sacramento-San Joaquin Delta is 0.1 mg/L.
3. Region 2 has aquatic life criteria for mercury: saltwater 4-day average = 0.025 µg/L; saltwater 1-hr average = 2.1 µg/L; freshwater 4-day average = 0.025 µg/L; freshwater 1-hr average = 2.4 µg/L. Region 3 has aquatic life criteria for mercury: freshwater average = 0.05 µg/L; freshwater maximum = 0.2 µg/L; marine habitats average = 0.05 µg/L; marine habitats maximum = 0.1 µg/L.

Appendix C. Nonpoint Source Plan Management Measures

This appendix provides a description of the management measures (MMs) applicable to sediment toxicity control from California's Nonpoint Source Management Program Plan.

There are five MMs in the NPS Program Plan relevant to sediment toxicity control for agriculture (**Exhibit C-1**).

Exhibit C-1. Agricultural Management Measures

MM Code	Agriculture MM Title	Description
1A	Erosion and Sediment Control	Where erosion and sedimentation from agricultural lands affects coastal waters and/or water bodies listed as impaired by sediment, landowners must design and install or apply a combination of practices to reduce solids and associated pollutants in runoff during all but the larger storms. Alternatively, landowners may apply the erosion component of a Resource Management System as defined in the U.S. Department of Agriculture Natural Resources Conservation Service Field Office Technical Guide.
1D	Pesticide Management	Implementation will occur through cooperation with the Department of Pesticide Regulation by development and adoption of reduced risk management strategies (including reductions in pesticide use); evaluation of pest, crop, and field factors; use of Integrated Pest Management (IPM); consideration of environmental impacts in choice of pesticides; calibration of equipment; and use of anti-backflow devices. IPM strategies are key and include evaluating pest problems in relation to cropping history and previous pest control measures, and applying pesticides only when an economic benefit will be achieved. Pesticides should be selected based on their effectiveness to control target pests and environmental impacts such as their persistence, toxicity, and leaching potential.
1F	Irrigation Water Management	Irrigation water would be applied uniformly based on an accurate measurement of crop water needs and the volume of irrigation water applied, considering limitations raised by such issues as water rights, pollutant concentrations, water delivery restrictions, salt control, wetland, water supply, and frost/freeze temperature management. Additional precautions would apply when chemicals are applied through irrigation.
1G	Education/Outreach	Implement pollution prevention and education programs such as: activities that cause erosion and loss of sediment on agricultural land; activities that cause discharge from confined animal facilities (excluding Concentrated Animal Feeding Operations) to surface water; activities that cause excess delivery of nutrients and/or leaching of nutrients; activities that cause contamination of surface water and ground water from pesticides; grazing activities that cause physical disturbance to sensitive areas and the discharge of sediment, animal waste, nutrients, and chemicals to surface and ground waters; irrigation activities that cause nonpoint source pollution of surface waters.

Source: SWRCB (2000).

There are 11 MMs that address the various forestry operations and practices (**Exhibit C-2**). The Forest Practice Rules (FPRs) also closely reflect these silvicultural MMs.

Exhibit C-2. Forestry Management Measures

MM Code	Code Forestry MM Title	Description
2A	Pre-Harvest Planning	Silvicultural activities should be planned to reduce potential delivery of pollutants to surface waters by addressing the timing, location, and design of harvesting and road construction; site preparation; identification of sensitive or high-erosion risk areas; and the potential for cumulative water quality impacts.
2B	Streamside Management Areas (SMAs)	Protect against soil disturbance and reduce sediment and nutrient delivery to waters from upland activities. Intended to safeguard vegetated buffer areas along surface waters to protect the water quality of adjacent streams.
2C	Road construction/Reconstruction	Road construction/reconstruction should be conducted so as to reduce sediment generation and delivery by following preharvest plan layouts and designs for road systems, incorporating adequate drainage structures, properly installing stream crossings, avoiding road construction in SMAs, removing debris from streams, and stabilizing areas of disturbed soil such as road fills.
2D	Road Management	Management of roads to prevent sedimentation, minimize erosion, maintain stability, and reduce the risk that drainage structures and stream crossings will fail or become less effective. Implementation includes inspections and maintenance actions to prevent erosion of road surfaces and to ensure the effectiveness of stream-crossing structures. Also address appropriate methods for closing roads that are no longer in use.
2E	Timber Harvesting	Addresses skid trail location and drainage, management of debris and petroleum, and proper harvesting in SMAs. Timber harvesting practices that protect water quality and soil productivity also have economic benefits by reducing the length of roads and skid trails, reducing equipment and road maintenance costs, and providing better road protection.
2F	Site Preparation and Forest Regeneration	Impacts of mechanical site preparation and regeneration operations—particularly in areas that have steep slopes or highly erodible soils, or where the site is located in close proximity to a water body—can be reduced by confining runoff onsite. This measure addresses keeping slash material out of drainage ways, operating machinery on contours, timing of activities, and protecting ground cover in ephemeral drainage areas and SMAs. Careful regeneration of harvested forestlands is important in protecting water quality from disturbed soils.
2H	Revegetation of Disturbed Areas	Addresses the rapid revegetation of areas disturbed during timber harvesting and road construction—particularly areas within harvest units or road systems where mineral soil is exposed or agitated (e.g., road cuts, fill slopes, landing surfaces, cable corridors, or skid trails) with special priority for SMAs and steep slopes near drainage ways.
2I	Forest Chemical Management	Application of pesticides, fertilizers, and other chemicals used in forest management should not lead to surface water contamination. Pesticides must be properly mixed, transported, loaded, and applied, and their containers disposed of properly. Fertilizers must also be properly handled and applied since they also may be toxic depending on concentration and exposure. Includes applications by skilled workers according to label instructions, careful prescription of the type and amount of chemical to be applied, use of buffer areas for surface waters to prevent direct application or deposition, and spill contingency planning.
2J	Wetlands Forest Management	Forested wetlands provide many beneficial water quality functions and provide habitat for aquatic life. Activities in wetland forests should be conducted to protect the aquatic functions of forested wetlands.

Exhibit C-2. Forestry Management Measures

MM Code	Code Forestry MM Title	Description
2K	Postharvest Evaluation	Incorporate postharvest monitoring, including (a) implementation monitoring to determine whether the operation was conducted according to specifications, and (b) effectiveness monitoring after at least one winter period to determine whether the specified operation prevented or minimized discharges.
2L	Education/Outreach	Implement pollution prevention and education programs to reduce NPS pollutants generated by applicable silvicultural activities.

Source: SWRCB (2000).

California's 15 urban MMs (**Exhibit C-3**) are organized to parallel the land use development process to address the prevention and treatment of pollution during all phases of urbanization; this strategy relies primarily on pollution prevention or source reduction practices.

Exhibit C-3. Urban Management Measures

MM Code	Urban MM Title	Description
3.1A	Developing Areas – Watershed Protection	Encourage land use and development planning on a watershed scale that takes into consideration sensitive areas that, by being protected, will maintain or improve water quality.
3.1B	Developing Areas – Site Development	Aims to protect areas that provide important water quality benefits and limit land disturbance.
3.1C	Developing Areas – New Development	Addresses increased pollutant loads associated with developed lands, and the hydrologic alterations resulting from development that affects runoff volume and timing. Developers can use innovative site planning techniques or incorporate runoff management practices to reduce the hydrologic impact of development on receiving waters.
3.2A	Construction Sites – Construction Site Erosion and Sediment Control	Aims to reduce erosion through implementation of erosion and sediment control practices.
3.2B	Construction Sites – Chemical Control	Implement a chemical control plan to: limit application, generation, and migration of toxic substances; ensure proper storage and disposal of toxic materials; and apply nutrients to establish and maintain vegetation.
3.3A	Existing Development	Includes the implementation of nonstructural controls to reduce pollutant loads and volume of storm water runoff.
3.4A	On-site Disposal Systems (OSDS) – New OSDSs	Includes comprehensive planning by the regulatory authority, including measures to protect sensitive areas, such as nutrient-limited waters and shellfish harvest areas. Measures might include prohibitions, setbacks, or requirements for the use of innovative treatment systems to effect greater treatment of sewage. Also includes performance-based requirements for the siting, design, and installation of systems, and inspection of newly installed systems.
3.4B	On-site Disposal Systems (OSDS) – Operating OSDSs	Addresses the programmatic aspects of OWTS management to ensure that systems that are installed as designed are inspected and maintained regularly to prevent failures. Public education about proper sewage treatment system use and maintenance is an important part of this measure, as is development and enforcement of policies to prevent or minimize the impacts of OWTS failures.
3.5A	Transportation Development – Planning, Siting, and	Aims to protect areas that provide important water quality benefits and limit land disturbance.

Exhibit C-3. Urban Management Measures

MM Code	Urban MM Title	Description
	Developing Roads and Highways	
3.5B	Transportation Development – Bridges	Aims to design bridges to minimize damage to riparian or wetland habitats and treating runoff from bridge decks before it is allowed to enter watercourses. Bridge maintenance activities should be conducted using containment practices to prevent pollutants from entering the water or riparian habitat below. Restoration of damaged riparian or instream habitats should be done after bridge construction, maintenance, and demolition.
3.5C	Transportation Development – Construction Projects	Implement a chemical control plan to: limit application, generation, and migration of toxic substances; ensure proper storage and disposal of toxic materials; and apply nutrients to establish and maintain vegetation.
3.5D	Transportation Development – Chemical Control	Implement a chemical control plan to: limit application, generation, and migration of toxic substances; ensure proper storage and disposal of toxic materials; and apply nutrients to establish and maintain vegetation.
3.5E	Transportation Development – Operation and Maintenance	Incorporate pollution prevention procedures into the operation and maintenance of roads, highways, and bridges to reduce pollutant loadings to surface waters.
3.5F	Transportation Development – Road, Highway, and Bridge Runoff Systems	Acknowledges the fact that roads built in the past may not have the same level of runoff control and treatment that is expected today, and these older roads may be contributing to pollution problems in receiving waters. Municipalities responsible for road and bridge rights-of-way should undertake an assessment of the roads' and bridges' contribution to surface waters and identify opportunities for installing new treatment practices. Based on water quality priorities and the availability of staff and funding resources, a schedule should be devised to implement these practices.
3.6A	Education/Outreach – Pollution Prevention: General Sources	Used to reduce the amount of pollutants generated or allowed to be exposed to runoff.

Source: SWRCB (2000).

There are 16 MMs to address marina and boating sources of nonpoint pollution (**Exhibit C-4**). Effective implementation of these MMs can ensure appropriate operation and maintenance practices and encourage the development and use of effective pollution control and education efforts. The MMs cover the following operations and facilities:

- Any facility that contains 10 or more slips, piers where 10 or more boats may tie up, or any facility where a boat for hire is docked
- Any residential or planned community marina with 10 or more slips
- Any mooring field where 10 or more boats are moored
- Public or commercial boat ramps
- Boat maintenance or repair yards on or adjacent to the water (typically, boat yards are separate entities from marinas and are regulated under NPDES storm water permits).

Exhibit C-4. Marinas and Boating Management Measures

MM Code	Marinas MM Title	Description
4.1A	Assessment, Siting and Design – Marina Flushing	Provides for maximum flushing and circulation of surface waters through marina siting and designs. These practices can reduce the potential for water stagnation, maintain biological productivity, and reduce the potential for toxic accumulation in bottom sediment.
4.1D	Assessment, Siting and Design – Shoreline Stabilization	Use of vegetative stabilization methods is preferred over the use of structural stabilization methods where shoreline erosion is a pollution problem.
4.1E	Assessment, Siting and Design – Storm Water runoff	Involves implementing runoff control strategies to remove at least 80 percent of suspended solids from storm water runoff coming from boat maintenance areas (some boat yards may conform to this provision through NPDES permits).
4.1F	Assessment, Siting and Design – Fueling Station Design	Requires that fueling stations be located and designed to contain accidental fuel spills in a limited area, and that fuel containment equipment and spill contingency plans be provided to ensure quick spill response.
4.1H	Assessment, Siting and Design – Waste Management Facilities	Requires that facilities be installed at new and expanding marinas where needed for the proper recycling or disposal of solid wastes (e.g., oil filters, lead acid batteries, used absorbent pads, spent zinc anodes, and fish waste as applicable) and liquid materials (e.g., fuel, oil, solvents, antifreeze, and paints).
4.2A	Operation and Maintenance – Solid Waste Control	Involves properly disposing of solid wastes produced by the operation, cleaning, maintenance, and repair of boats to limit entry of these wastes to surface waters.
4.2C	Operation and Maintenance – Liquid Material Control	Promotes sound fish waste management through a combination of fish cleaning restrictions, education, and proper disposal.
4.2D	Operation and Maintenance – Petroleum Control	Requires provision and maintenance of the appropriate storage, transfer, containment, and disposal facilities for liquid materials commonly used in boat maintenance, as well as encouraging the recycling of these materials.
4.2E	Operation and Maintenance – Boat Cleaning and Maintenance	Aimed at reducing the amount of fuel and oil that leaks from fuel tanks and tank air vents during the refueling and operation of boats.
4.2G	Operation and Maintenance – Boat Operation	Involves prevention of turbidity and physical destruction of shallow-water habitat resulting from boat wakes and prop wash.
4.3A	Education and Outreach – Public Education	Requires that public education, outreach, and training programs be instituted to prevent and control improper disposal of pollutants into State waters.

Source: SWRCB (2000).

State Water Resources Control Board (SWRCB). 2000. Nonpoint Source Program Strategy and Implementation Plan, 1998-2013. January.

Appendix D. Current Toxics 303(d) Listings and TMDLs

This appendix shows the 303(d) list impairments for toxic pollutants in bays and estuaries in California and provides a summary of the targets, sources, and potential implementation activities for TMDLs addressing toxic pollutants.

Exhibit D-1. Toxic Pollutant 303(d) List Impairments for Bays and Estuaries in California

Water Body Name	Sediment	Tissue	Water
Region 1			
Eureka Plain HU, Humboldt Bay			Dioxin Toxic Equivalents; PCBs
Region 2			
Carquinez Strait			Chlordane; DDT; Dieldrin; Dioxin compounds; Furan Compounds; Mercury; PCBs; PCBs (dioxin-like); Selenium
Castro Cove, Richmond (San Pablo Basin)	Dieldrin; Mercury; PAHs; Selenium		
Central Basin, San Francisco (part of SF Bay, Lower)	Mercury; PAHs		Chlordane; DDT; Dieldrin; Dioxin compounds; Furan Compounds; Mercury; PCBs; PCBs (dioxin-like); Selenium
Islais Creek	Chlordane; Dieldrin; PAHs; Sediment Toxicity		Hydrogen Sulfide
Mission Creek	Chlordane; Dieldrin; Lead; Mercury; PCBs; Silver; Zinc		Hydrogen Sulfide; PAHs
Oakland Inner Harbor (Fruitvale Site, part of SF Bay, Lower)	Chlordane; PCBs; Sediment Toxicity		Chlordane; DDT; Dieldrin; Dioxin compounds; Furan Compounds; Mercury; PCBs; PCBs (dioxin-like); Selenium
Oakland Inner Harbor (Pacific Dry-dock Yard 1 Site, part of SF Bay, Lower)	Chlordane; Copper; Dieldrin; Lead; Mercury; PAHs; PCBs; Zinc		Chlordane; DDT; Dieldrin; Dioxin compounds; Furan Compounds; Mercury; PCBs; PCBs (dioxin-like); Selenium
Pacific Ocean at Pillar Point			Mercury
Richardson Bay			Chlordane; DDT; Dieldrin; Dioxin compounds; Furan Compounds; Mercury; PCBs; PCBs (dioxin-like)
Sacramento San Joaquin Delta			Chlordane; DDT; Dieldrin; Dioxin compounds; Furan Compounds; Mercury; PCBs; PCBs (dioxin-like); Selenium
San Francisco Bay, Central			Chlordane; DDT; Dieldrin; Dioxin compounds; Furan Compounds; Mercury; PCBs; PCBs (dioxin-like); Selenium

Exhibit D-1. Toxic Pollutant 303(d) List Impairments for Bays and Estuaries in California

Water Body Name	Sediment	Tissue	Water
San Francisco Bay, Lower			Chlordane; DDT; Dieldrin; Dioxin compounds; Furan Compounds; Mercury; PCBs; PCBs (dioxin-like)
San Francisco Bay, South			Chlordane; DDT; Dieldrin; Dioxin compounds; Furan Compounds; Mercury; PCBs; PCBs (dioxin-like); Selenium
San Leandro Bay (part of SF Bay, Lower)	Lead; Mercury; PAHs; Pesticides; Zinc		Chlordane; Dieldrin; Dioxin compounds; Furan Compounds; Mercury
San Pablo Bay			Chlordane; DDT; Dieldrin; Dioxin compounds; Furan Compounds; Mercury; PCBs; PCBs (dioxin-like); Selenium
Stege Marsh			Chlordane; Copper; Dacthal; Dieldrin; Mercury; PCBs; Zinc
Suisun Bay			Chlordane; DDT; Dieldrin; Dioxin compounds; Furan Compounds; Mercury; PCBs; PCBs (dioxin-like); Selenium
Suisun Marsh Wetlands			Mercury
Suisun Slough			Diazinon
Tomales Bay			Mercury
Region 3			
Carpinteria Marsh (El Estero Marsh)			Priority Organics
Elkhorn Slough			Pesticides
Goleta Slough/Estuary			Priority Organics
Monterey Harbor	Sediment Toxicity		Metals
Moro Cojo Slough			Pesticides
Moss Landing Harbor	Sediment Toxicity		Chlorpyrifos; Diazinon; Nickel; Pesticides
Old Salinas River Estuary			Pesticides
Pacific Ocean (Point Ano Nuevo to Soquel Point)			Dieldrin
Pacific Ocean at Avila Beach (Avila Pier)			PCBs
Salinas River Lagoon (North)			Pesticides
Region 4			
Abalone Cove Beach	DDT		PCBs
Amarillo Beach			DDT; PCBs
Big Rock Beach			DDT; PCBs
Bluff Cove Beach			DDT; PCBs
Cabrillo Beach (Outer)			DDT; PCBs
Calleguas Creek Reach 1 (was Mugu Lagoon on 1998 303(d) list)	DDT; Sediment Toxicity	Chlordane; DDT; Endosulfan; PCBs	Copper; Dieldrin; Mercury; Nickel; Toxaphene; Zinc
Carbon Beach			DDT; PCBs
Castlerock Beach			DDT; PCBs

Exhibit D-1. Toxic Pollutant 303(d) List Impairments for Bays and Estuaries in California

Water Body Name	Sediment	Tissue	Water
Colorado Lagoon	Chlordane; Lead; PAHs; Sediment Toxicity; Zinc	Chlordane; DDT; Dieldrin; PCBs	
Dominguez Channel Estuary (unlined portion below Vermont Ave)	DDT; Sediment Toxicity; Zinc	Chlordane; DDT; Dieldrin; Lead	Benthic Community Effects; Benzo(a)pyrene; Benzo[a]anthracene; Chrysene (C1-C4); PCBs; Phenanthrene; Pyrene
Escondido Beach			DDT; PCBs
Flat Rock Point Beach Area			DDT; PCBs
Inspiration Point Beach			DDT; PCBs
La Costa Beach			DDT; PCBs
Las Flores Beach			DDT; PCBs
Las Tunas Beach			DDT; PCBs
Long Point Beach			DDT; PCBs
Los Angeles Harbor - Cabrillo Marina			Benzo(a)pyrene; DDT; PCBs
Los Angeles Harbor - Consolidated Slip	Cadmium; Chlordane; Chromium; Copper; DDT; Lead; Mercury; PCBs; Sediment Toxicity; Zinc	Chlordane; DDT; PCBs; Toxaphene	2-Methylnaphthalene; Benthic Community Effects; Benzo(a)pyrene; Benzo[a]anthracene; Chrysene (C1-C4); Dieldrin; Phenanthrene; Pyrene
Los Angeles Harbor - Fish Harbor	Sediment Toxicity		Benzo(a)pyrene; Benzo[a]anthracene; Chlordane; Chrysene (C1-C4); Copper; DDT; Dibenz[a,h]anthracene; Lead; Mercury; PAHs; PCBs; Phenanthrene; Pyrene; Zinc
Los Angeles Harbor - Inner Cabrillo Beach Area			DDT; PCBs
Los Angeles River Estuary (Queensway Bay)	Chlordane; DDT; PCBs; Sediment Toxicity		
Los Angeles/Long Beach Inner Harbor	Sediment Toxicity		Benthic Community Effects; Benzo(a)pyrene; Chrysene (C1-C4); Copper; DDT; PCBs; Zinc
Los Angeles/Long Beach Outer Harbor (inside breakwater)	Sediment Toxicity		DDT; PCBs
Los Cerritos Channel	Chlordane		Bis(2ethylhexyl)phthalate ; Copper; Lead; Zinc
Malaga Cove Beach			DDT; PCBs
Malibu Beach			DDT
Malibu Lagoon			Benthic Community Effects
Malibu Lagoon Beach (Surfrider)			DDT; PCBs

Exhibit D-1. Toxic Pollutant 303(d) List Impairments for Bays and Estuaries in California

Water Body Name	Sediment	Tissue	Water
Marina del Rey Harbor - Back Basins	Chlordane; Copper; Lead; PCBs; Sediment Toxicity; Zinc	Chlordane; DDT; Dieldrin; Fish Consumption Advisory; PCBs	
Nicholas Canyon Beach			DDT; PCBs
Palo Verde Shoreline Park Beach			Pesticides
Paradise Cove Beach			DDT; PCBs
Point Dume Beach			DDT; PCBs
Point Fermin Park Beach			DDT; PCBs
Port Hueneme Harbor (Back Basins)		DDT; PCBs	
Port Hueneme Pier			PCBs
Portuguese Bend Beach			DDT; PCBs
Puerco Beach			DDT; PCBs
Redondo Beach			DDT; PCBs
Robert H. Meyer Memorial Beach			DDT; PCBs
Royal Palms Beach			DDT; PCBs
San Pedro Bay Near/Off Shore Zones	DDT; Sediment Toxicity	DDT	Chlordane; PCBs
Santa Clara River Estuary			ChemA; Toxaphene; Toxicity
Santa Monica Bay Offshore/Nearshore	DDT; PCBs; Sediment Toxicity	DDT; Fish Consumption Advisory; PCBs	
Sea Level Beach			DDT; PCBs
Topanga Beach			DDT; PCBs
Trancas Beach (Broad Beach)			DDT; PCBs
Ventura Marina Jetties			DDT; PCBs
Whites Point Beach			DDT; PCBs
Zuma Beach (Westward Beach)			DDT; PCBs
Region 5			
Calaveras River, Lower (from Bellota Weir to Stockton Diverting Canal)			Unknown Toxicity
Delta Waterways (Stockton Ship Channel)			Chlorpyrifos; DDT; Diazinon; Dioxin; Furan Compounds; Group A Pesticides; Mercury PCBs; Unknown Toxicity
Delta Waterways (central portion)			Chlorpyrifos; DDT; Diazinon; Group A Pesticides; Mercury; Unknown Toxicity
Delta Waterways (eastern portion)			Chlorpyrifos; DDT; Diazinon; Group A Pesticides; Mercury; Unknown Toxicity
Delta Waterways (export area)			Chlorpyrifos; DDT; Diazinon; Group A Pesticides; Mercury; Unknown Toxicity
Delta Waterways (northern portion)			Chlordane; Chlorpyrifos; DDT; Diazinon; Group A Pesticides; Mercury; PCBs; Unknown Toxicity
Delta Waterways (northwestern portion)			Chlorpyrifos; DDT; Diazinon; Group A Pesticides; Mercury; Unknown Toxicity

Exhibit D-1. Toxic Pollutant 303(d) List Impairments for Bays and Estuaries in California

Water Body Name	Sediment	Tissue	Water
Delta Waterways (southern portion)			Chlorpyrifos; DDT; Diazinon; Group A Pesticides; Mercury; Unknown Toxicity
Delta Waterways (western portion)			Chlorpyrifos; DDT; Diazinon; Group A Pesticides; Mercury; Unknown Toxicity
Fresno Slough (from Graham Road to James Bypass, Fresno County)			Chlorpyrifos; Unknown Toxicity
Region 8			
Anaheim Bay	Sediment Toxicity	Dieldrin; PCBs	Nickel
Balboa Beach			DDT; Dieldrin; PCBs
Bolsa Chica State Beach			Copper; Nickel
Huntington Beach State Park			PCBs
Huntington Harbour	Sediment Toxicity	PCBs	Chlordane; Copper; Lead; Nickel
Newport Bay, Lower (entire lower bay, including Rhine Channel, Turning Basin and South Lido Channel to east end of H-J Moorings)	Sediment Toxicity		Chlordane; Copper; DDT; PCBs; Pesticides
Newport Bay, Upper (Ecological Reserve)	Sediment Toxicity		Chlordane; Copper; DDT; Metals; PCBs; Pesticides
Rhine Channel	Sediment Toxicity		Copper; Lead; Mercury; PCBs; Zinc
Seal Beach			PCBs
Region 9			
Dana Point Harbor			Copper; Toxicity; Zinc
Mission Bay (area at mouth of Rose Creek only)			Lead
Mission Bay (area at mouth of Tecolote Creek only)			Lead
Mission Bay at Quivira Basin			Copper
Oceanside Harbor			Copper
Pacific Ocean Shoreline, Imperial Beach Pier			PCBs
San Diego Bay			PCBs
San Diego Bay Shoreline, 32nd St San Diego Naval Station	Sediment Toxicity		Benthic Community Effects
San Diego Bay Shoreline, Chula Vista Marina			Copper
San Diego Bay Shoreline, Downtown Anchorage	Sediment Toxicity		Benthic Community Effects
San Diego Bay Shoreline, North of 24th Street Marine Terminal	Sediment Toxicity		Benthic Community Effects
San Diego Bay Shoreline, Seventh Street Channel	Sediment Toxicity		Benthic Community Effects
San Diego Bay Shoreline, Vicinity of B St and Broadway Piers	Sediment Toxicity		Benthic Community Effects
San Diego Bay Shoreline, at Americas Cup Harbor			Copper

Exhibit D-1. Toxic Pollutant 303(d) List Impairments for Bays and Estuaries in California

Water Body Name	Sediment	Tissue	Water
San Diego Bay Shoreline, at Coronado Cays			Copper
San Diego Bay Shoreline, at Glorietta Bay			Copper
San Diego Bay Shoreline, at Harbor Island (East Basin)			Copper
San Diego Bay Shoreline, at Harbor Island (West Basin)			Copper
San Diego Bay Shoreline, at Marriott Marina			Copper
San Diego Bay Shoreline, between Sampson and 28th Streets			Copper
San Diego Bay Shoreline, between Sampson and 28th Streets			Mercury; PAHs; PCBs; Zinc
San Diego Bay Shoreline, near Chollas Creek	Sediment Toxicity		Benthic Community Effects
San Diego Bay Shoreline, near Coronado Bridge	Sediment Toxicity		Benthic Community Effects
San Diego Bay Shoreline, near Switzer Creek			Chlordane PAHs
San Diego Bay Shoreline, near sub base	Sediment Toxicity		Benthic Community Effects; Toxicity
San Diego Bay, Shelter Island Yacht Basin			Copper, Dissolved
Tijuana River Estuary			Lead; Nickel; Pesticides; Thallium

Source: SWRCB (2010).

Exhibit D-2. Summary of Toxic Pollutant TMDLs for Bays and Estuaries

Numeric Targets	Load Allocations	Implementation
Ballona Creek Estuary Toxics TMDL (LARWQCB, 2005a)		
<u>Sediment:</u> Chlordane = 0.5 μg/kg; DDT = 1.58 μg/kg; PCBs = 22.7 μg/kg; PAHs = 4,022 μg/kg; Cadmium = 1.2 mg/kg; Copper = 34 mg/kg; Lead = 46.7 mg/kg; Silver = 1.0 mg/kg; Zinc = 15 mg/kg	<u>Direct Air:</u> Chlordane = 0.02 g/yr; DDT = 0.1 g/yr; PCBs = 1.0 g/yr; PAHs = 170 g/yr; Cadmium = 0.05 kg/yr; Copper = 1.4 kg/yr; Lead = 2 kg/yr; Silver = 0.04 kg/yr; Zinc = 6 kg/yr <u>Open Space:</u> Chlordane = 0.02 g/yr; DDT = 0.1 g/yr; PCBs = 1.0 g/yr; PAHs = 160 g/yr; Cadmium = 0.05 kg/yr; Copper = 1.4 kg/yr; Lead = 2 kg/yr; Silver = 0.04 kg/yr; Zinc = 6 kg/yr <u>General Construction SW:</u> Chlordane = 0.1 g/yr; DDT = 0.31 g/yr; PCBs = 4 g/yr; PAHs = 800 g/yr; Cadmium = 0.23 kg/yr; Copper = 6.6 kg/yr; Lead = 9.1 kg/yr; Silver = 0.2 kg/yr; Zinc = 29 kg/yr	Potential implementation strategies: • Implement nonstructural BMPs such as better sediment control at construction sites and improved street cleaning by upgrading to vacuum type sweepers for 30% of urbanized watershed • Install structural BMPs at critical points in the storm water conveyance system for 40% of urbanized watershed: 50% infiltration trenches and 50% sand filters. • The Regional Water Board assumed that the remaining 30% of urbanized land will be controlled through Los Angeles County's Integrated Resources Plan that aims to increase the amount of wet-weather urban runoff that can be captured and beneficially used. The Regional Water Board estimated that implementation of an adaptive management approach could costs from about $245 million to $335 million.

Exhibit D-2. Summary of Toxic Pollutant TMDLs for Bays and Estuaries

Numeric Targets	Load Allocations	Implementation
	General Industrial SW: Chlordane = 0.02 g/yr; DDT = 0.08 g/yr; PCBs = 1.0 g/yr; PAHs = 200 g/yr; Cadmium = 0.06 kg/yr; Copper = 1.7 kg/yr; Lead = 2.3 kg/yr; Silver = 0.05 kg/yr; Zinc = 7 kg/yr Caltrans: Chlordane = 0.05 g/yr; DDT = 0.15 g/yr; PCBs = 2 g/yr; PAHs = 400 g/yr; Cadmium = 0.11 kg/yr; Copper = 3.2 kg/yr; Lead = 4.4 kg/yr; Silver = 0.09 kg/yr; Zinc = 14 kg/yr MS4s: Chlordane = 3.34 g/yr; DDT = 10.56 g/yr; PCBs = 152 g/yr; PAHs = 26,900 g/yr; Cadmium = 8.0 kg/yr; Copper = 227.3 kg/yr; Lead = 312.3 kg/yr; Silver = 6.69 kg/yr; Zinc = 1,003 kg/yr	
Cache Creek Mercury TMDL (part of Delta watershed) (CVRWQCB, 2004a; 2004b; 2005b)		
Fish Tissue: Methylmercury trophic level 3 fish = 0.12 mg/kg Methylmercury trophic level 4 fish = 0.23 mg/kg	Mercury Allocations: Bear Creek mines = 5% of existing Hg loads (Rathburn, Petray North and South, and Rathburn-Petray); Harley Gulch mines = 5% of existing Hg loads (Abbott and Turkey Run); Sulphur Creek = 30% of existing Hg loads (geothermal springs, erosion of undisturbed soil, mines, contaminated streambeds, and atmospheric deposition) Methylmercury Allocations: Cache Creek at Yolo = 66 g MeHg/yr; Settling Basin = 34.7 g MeHg/yr; Bear Creek at gauge = 3.2 g MeHg/yr	Implementation options include: • Public outreach regarding the levels of safe fish consumption and monitoring • Remediation of inactive mines • Control of erosion in mercury-enriched upland areas and in floodplains downstream of the mines and in the lower watershed, • Conducting feasibility studies and evaluating possible remediation at the Harley Gulch delta • Identifying sites and projects to remediate or remove floodplain sediments containing mercury and implement feasible projects • Addressing methylmercury reductions through studies of sources and possible controls in Bear Creek and Anderson Marsh, controlling inputs from new impoundments, wetlands restoration projects, or geothermal spring development. The Regional Water Board estimated capital costs of $14 million and O&M of $700,000 per year.
Calleguas Creek Watershed Metals and Selenium TMDL[a] (LARWQCB, 2006)		
Dry Weather Water: Dissolved Copper = 3.1 × WER**; Dissolved Nickel = 8.2 μg/L; Total Mercury = 0.051 μg/L Wet Weather Water: Dissolved Copper = 4.8 × WER**; Dissolved Nickel = 74 μg/L; Total Mercury = 0.051 μg/L Sediment: Copper = 34,000 μg/kg; Nickel = 20,900 μg/kg	Suspended Sediments: Mercury = 80% reduction below background concentrations Average Dry Weather (<86th Percentile Flow): Agriculture: Copper = 0.12 × WER** - 0.02 lbs/day; Nickel = 0.26 lbs/day Open Space: Copper = 0.08 lbs/day; Nickel = 0.42 lbs/day NPDES Dischargers: Copper	Implementation options include: • Establish group concentration-based effluent limits for NPDES dischargers • Implement BMPs for nonpoint sources consistent with the Nonpoint Source Plan and Conditional Waiver Program.

Exhibit D-2. Summary of Toxic Pollutant TMDLs for Bays and Estuaries

Numeric Targets	Load Allocations	Implementation
Fish Tissue: Methylmercury = 0.3 mg/kg (human health); Methylmercury Trophic Level 3 <50 mm = 0.03 mg/kg; Methylmercury Trophic Level 3 50-150 mm = 0.05 mg/kg; Methylmercury Trophic Level 3 150-350 mm = 0.1 mg/kg Bird Egg: Mercury = 0.5 mg/kg	Monthly Average = 3.7 × WER** µg/L; Nickel Monthly Average = 8.2 µg/L; Mercury = 0.051 µg/L Wet Weather: Agriculture: Copper = (0.00017 × $flow^2$ × 0.01 × flow – 0.05) × WER** - 0.02 lbs/day; Nickel = 0.014 × flow + 0.42 × flow lbs/day Open Space: Copper = 0.0000537 × $flow^2$ + 0.00321 × flow lbs/day; Nickel = 0.014 × flow + 0.42 × flow lbs/day NPDES Dischargers: Copper Daily Maximum = 5.8 × WER** µg/L; Nickel Daily Maximum = 74 µg/L; Mercury = 0.051 µg/L	
Calleguas Creek Watershed OC Pesticides and PCBs TMDL[a] (LARWQCB, 2005e)		
Sediment: Chlordane = 0.5 µg/kg; DDT = 1 µg/kg; Dieldrin = 20 ng/kg; PCBs = 23 µg/kg Water: Chlordane = 4 ng/L; DDT = 1 ng/L; Dieldrin = 1.9 ng/L; PCBs = 30 ng/L; Toxaphene = 0.2 ng/L Fish Tissue: Chlordane = 0.83 µg/kg; DDT = 32 µg/kg; Dieldrin = 0.65 µg/kg; PCBs = 5.3 µg/kg; Toxaphene = 9.8 µg/kg	Storm Water Permits: Chlordane = 3.3 ng/g; DDT = 0.3 ng/g; Dieldrin = 4.3 ng/g; PCBs = 180 ng/g; Toxaphene = 360 ng/g Minor Point Sources Daily Maximum: Chlordane = 1.2 ng/L; DDT = 1.2 ng/L; Dieldrin = 0.28 ng/L; PCBs = 0.33 ng/L; Toxaphene = 0.34 ng/L Minor Point Sources Average Monthly: Chlordane = 0.59 ng/L; DDT = 0.59 ng/L; Dieldrin = 0.14 ng/L; PCBs = 0.17 ng/L; Toxaphene = 0.16 ng/L	Implementation options include: • Establish group concentration-based effluent limits for NPDES dischargers • Implement BMPs for nonpoint sources consistent with the Nonpoint Source Plan and Conditional Waiver Program. • Develop Agricultural Water Quality Management Plans and implement agricultural BMPs based on results of BMP effectiveness studies • Develop agricultural education program to inform growers of the recommended BMPs and the Management Plan.
Delta Waterways Methylmercury TMDL (CVRWQCB, 2005a)		
Fish Tissue: Methylmercury for largemouth bass = 0.28 mg/kg	Methylmercury Allocations: Central Delta = current load; Marsh Creek = 1.8 g MeHg/yr; Mokelumne-Cosumnes Rivers = 44 g MeHg/yr; Sacramento River = 1,341 g MeHg/yr; San Joaquin = 178 g MeHg/yr; West Delta = current load; Yolo Bypass = 234 g MeHg/yr Total Mercury Allocations: All mercury sources to delta = 174,000 g Hg/yr	Draft implementation options include: • Improve trapping efficiency in Cache Creek Settling Basin • Require that dredged spoil with average concentrations greater than 0.2 mg/kg be placed on or above the 100-year flood plain • Require mercury concentration of fine grain material in top 6-cm of newly exposed sediment to have an average concentration less than the surface material before dredging or be less than 0.2 mg/kg dry weight • Cap NPDES discharger loads at 2005 levels • Implement P2 at facilities with increasing loads • Allow facilities that show maintaining cap is technically impractical or excessively expensive to participate in offsets program • Implement studies to enable reduction of methylmercury in Delta waters.
Marina del Rey Toxics TMDL (LARWQCB, 2005b)		
Sediment: Chlordane = 0.5	Atmospheric Deposition:	Potential implementation strategies:

Exhibit D-2. Summary of Toxic Pollutant TMDLs for Bays and Estuaries

Numeric Targets	Load Allocations	Implementation
µg/kg; PCBs = 22.7 µg/kg; Copper = 34 mg/kg; Lead = 46.7 mg/kg; Zinc = 150 mg/kg Water Quality: PCBs = 0.17 ng/L (interim); PCBs = 30 ng/L (final) Fish Tissue: PCBs = 5.3 µg/kg	Chlordane = 0.002 g/yr; PCBs = 0.079 g/yr; Copper = 0.12 kg/yr; Lead = 0.16 kg/yr Zinc = 0.52 kg/yr General Construction SW: Chlordane = 0.0005 g/yr; PCBs = 0.0219 g/yr; Copper = 0.033 kg/yr; Lead = 0.045 kg/yr; Zinc = 0.144 kg/yr General Industrial SW: Chlordane = 0.0001 g/yr; PCBs = 0.029 g/yr; Copper = 0.004 kg/yr; Lead = 0.006 kg/yr; Zinc = 0.018 kg/yr Caltrans: Chlordane = 0.0003 g/yr; PCBs = 0.015 g/yr; Copper = 0.022 kg/yr; Lead = 0.030 kg/yr; Zinc = 0.096 kg/yr MS4s: Chlordane = 0.03 g/yr; PCBs = 1.34 g/yr; Copper = 2.01 kg/yr; Lead = 2.75 kg/yr; Zinc = 8.85 kg/yr	• Implement nonstructural BMPs such as better sediment control at construction sites and improved street cleaning by upgrading to vacuum type sweepers for 30% of urbanized watershed • Install structural BMPs at critical points in the storm water conveyance system for 70% of urbanized watershed: 50% infiltration trenches and 50% sand filters. The Regional Water Board estimated structural storm water BMP implementation costs to range from about $5.5 million to $7.6 million.
Upper and Lower Newport Bay (including Rhine Channel) Metals TMDL (U.S. EPA Region 9, 2002; Anchor Environmental, 2006)		
Sediment Quality: Cadmium: 0.67 mg/kg; Copper: 18.7 mg/kg; Lead: 30.2 mg/kg; Zinc: 124 mg/kg; Mercury = 0.13 mg/kg; Chromium = 52 mg/kg Acute Water Quality: Cadmium: 42 µg/L; Copper: 4.8 µg/L; Lead: 210 µg/L; Zinc: 90 µg/L Chronic Water Quality: Cadmium: 9.3 µg/L; Copper: 3.1 µg/L; Lead: 8.1 µg/L; Zinc: 81 µg/L Fish Tissue: Mercury = 0.3 mg/kg; Chromium = 0.2 mg/kg	Urban runoff: Cadmium = 9,589 lb/yr; Copper = 3,043 lb/yr; Lead = 17,638 lb/yr; Zinc = 174,057 lb/yr; Mercury = 17.1 g/yr; Chromium = 5.66 kg/yr Caltrans: Cadmium = 1,185 lb/yr; Copper = 423 lb/yr; Lead = 2,171 lb/yr; Zinc = 22,866 lb/yr; Mercury = 2.7 g/yr; Chromium = 0.89 kg/yr Other NPDES Permittees: Cadmium = 596 lb/yr; Copper = 190 lb/yr; Lead = 1,154 lb/yr; Zinc = 17,160 lb/yr; Mercury = 2.7 g/yr; Chromium = 0.89 kg/yr Agriculture: Copper = 215 lb/yr; Zinc = 114 lb/yr; Mercury = 0 g/yr; Chromium = 0.89 kg/yr Boats: Copper = 4,542 lb/yr; Zinc = 1,056 lb/yr Air Deposition: Cadmium = 4 lb/yr; Copper = 101 lb/yr; Lead = 68 lb/yr; Zinc = 606 lb/yr Open Space and Existing Sediments: Cadmium = 428 lb/yr; Copper = 803 lb/yr; Lead = 678 lb/yr; Zinc = 11,414 lb/yr; Mercury = 67.5 g/yr; Chromium = 22.3 kg/yr	RWQCB is considering the following options for the Rhine Channel (in Lower Newport Bay): • Dredge sediment and dewater prior to transporting to an approved off-site upland disposal facility ($11 million to $17 million) • Dredge sediment and place within an off-site nearshore confined disposal facility ($7.5 million) • Dredge sediment and dispose of within a confined aquatic disposal area excavated near channel mouth ($12.6 million). First option shown is preferred option.
Upper and Lower Newport Bay Organochlorine Compounds TMDL (SARWQCB, 2006)		

Exhibit D-2. Summary of Toxic Pollutant TMDLs for Bays and Estuaries

Numeric Targets	Load Allocations	Implementation
Sediment Quality: Chlordane = 2.26 µg/kg; DDT = 3.89 µg/kg; PCBs = 21.5 µg/kg Fish Tissue: Chlordane = 30 µg/kg; DDT = 50 µg/kg; PCBs = 20 µg/kg Water Quality: Chlordane = 0.59 ng/L; DDT = 0.59 ng/L; PCBs = 0.17 ng/L	Urban runoff*: Chlordane = 41.1 g/yr; DDT = 70.9 g/yr; PCBs = 107.9 g/yr Caltrans*: Chlordane = 12.6 g/yr; DDT = 21.6 g/yr; PCBs = 33 g/yr Construction*: Chlordane = 32 g/yr; DDT = 55.2 g/yr; PCBs = 83.9 g/yr Commercial Nurseries: Chlordane = 4.5 g/yr; DDT = 7.9 g/yr; PCBs = 12 g/yr Agriculture*: Chlordane = 9.5 g/yr; DDT = 9.9 g/yr; PCBs = 17.8 g/yr Open Space: Chlordane = 10.4 g/yr; DDT = 17.8 g/yr; PCBs = 27 g/yr Channels and Streams: Chlordane = 2.3 g/yr; DDT = 4.0 g/yr; PCBs = 6.0 g/yr Existing Sediments and Air Deposition*: Chlordane = 5.7 g/yr; DDT = 9.9 g/yr; PCBs = 15 g/yr	The Regional Water Board recommends the following implementation actions: • Review and revise existing NPDES permits to incorporate wasteload allocations (WLAs), compliance schedules, and monitoring program requirements. • Require agricultural operators to identify and implement monitoring program to assess pollutant discharges from their facilities, and to identify and implement a BMP program. • Identify parties responsible for open space areas, and implement a monitoring program to assess the discharges. • Implement appropriate BMPs and sampling plans for construction activities. • MS4s shall implement additional/enhanced BMPs to ensure pollutant reductions. • Evaluate feasibility and mechanisms to fund future dredging operations. • Develop a work plan to meet TMDL implementation requirements. • Revise regional monitoring program to evaluate effectiveness of actions and programs. • Conduct special studies to review and revise TMDLs.
San Diego Bay, Shelter Island Yacht Club Dissolved Copper TMDL (SDRWQCB, 2005)		
Acute Water Quality: 4.8 µg/L Chronic Water Quality: 3.1 µg/L	Passive Leaching: 375 kg Cu/yr Hull Cleaning: 72 kg Cu/yr Urban Runoff: 30 kg Cu/yr Background: 30 kg Cu/yr Direct Atmospheric Deposition: 3 kg Cu/yr Existing Sediment: 0 kg Cu/yr	The Regional Water Board recommends the following implementation actions: • Coordinate with governmental agencies over the use of copper-based antifouling paints to protect water quality from the adverse effects of copper-based antifouling paints • Regulate discharges of copper through WDRs, waivers of WDRs, or adoption of waste discharge prohibitions • Amend MS4 permit to include 30 mg/kg copper limit.
San Francisco Bay Mercury TMDL (SFBRWQCB, 2004a)		
Sediment Quality: 0.2 mg Hg/kg Fish Tissue: 0.2 mg Hg/kg Wildlife, Birds Egg: 0.5 mg Hg/kg	Bed erosion: 220 kg Hg/yr (53% reduction) Central Valley watershed: 330 kg Hg/yr (24% reduction) Urban storm water runoff: 82 kg Hg/yr (48% reduction) Guadalupe River watershed: 2 kg Hg/yr (98% reduction) Atmospheric deposition: 27 kg Hg/yr (current load) Nonurban storm water runoff: 25 kg Hg/yr (current load) Wastewater: 20 kg Hg/yr (current load; 17 kg Hg/yr municipal; 3 kg Hg/yr industrial)	The proposed implementation plan identified actions for each source except bed erosion and nonurban storm water runoff because more information is needed. • Central Valley watershed: developing TMDL to meet allocation; actions likely to include mine remediation and sediment capture • Urban storm water runoff: comply with NPDES permits and implement pollution prevention (P2) • Guadalupe R. watershed: developing TMDL to meet allocation; actions likely to include mining waste removal and slope stabilization • Atmospheric deposition: no mandated action • Wastewater: capped at current loads.

Exhibit D-2. Summary of Toxic Pollutant TMDLs for Bays and Estuaries

Numeric Targets	Load Allocations	Implementation
San Francisco Bay PCBs TMDL (SFBRWQCB, 2004b)		
<u>Sediment Quality:</u> 2.5 µg PCBs/kg <u>Fish Tissue:</u> 22 ng PCBs/g	<u>Atmospheric Deposition:</u> -7 kg PCBs/yr <u>Central Valley Delta:</u> 32 kg/yr <u>Wastewater Discharges:</u> 2.3 kg/yr <u>Urban Runoff:</u> 2 kg/yr <u>Dredged Material:</u> 1.4 kg/yr <u>In-Bay PCBs Hot Spots:</u> Not quantified	The Regional Water Board recommends the following implementation actions: • Develop a watershed-wide NPDES permit for all point source dischargers that caps current loads • Implement source control programs for point source dischargers • Require petroleum refineries to evaluate the significance of PCB air emissions to load to bay • Cleanup of hotspots on land, storm drains, and vicinity of storm drain outfalls • Capture, detention, and treatment of highly contaminated runoff (where cleanup is not effective) • Implementation of urban runoff management practices and controls that remove PCBs • Implementation and attainment of the Long Term Management Strategy in-Bay disposal goals • Remediate PCBs contaminated sediments according to site-specific clean-up plans.

*Includes Upper and Lower Newport Bay allocations.

** The WER has a default value of 1.0 unless the Regional Water Board approves a site-specific WER. The Regional Water Board is reviewing a WER study for Mugu Lagoon (Reach 1), and if approved, the Regional Water Board will modify the TMDL targets in accordance with all legal and regulatory requirements.

a. Only includes pollutants from Exhibit 2-1 and allocations for Mugu Lagoon/Calleguas Creek Reach 1.

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Appendix E. Toxic Hot Spots for Bays and Estuaries

This appendix provides additional information on the enclosed bays listed as known toxic hot spots in the Consolidated Plan. **Exhibit E-1** summarizes the information in the Consolidation Plan for bays.

Exhibit E-1. Enclosed Bays Listed as Known Toxic Hot Spots

Rank	Site Identification	Reason for Listing	
		Definition trigger	Pollutants
High	Delta Estuary, Cache Creek watershed including Clear lake	Human health impacts	Mercury
High	Delta Estuary	Aquatic life impacts	Diazinon
High	Delta Estuary - Morrison Creek, Mosher Slough, 5 Mile Slough, Mormon Slough & Calaveras River	Aquatic life impacts	Diazinon & Chlorpyrifos
High	Delta Estuary - Ulatis Creek, Paradise Cut, French Camp & Duck Slough	Aquatic life impacts	Chlorpyrifos
High	Humboldt Bay Eureka Waterfront H Street	Bioassay toxicity	Lead, Silver, Antimony, Zinc, Methoxychlor, PAHs
High	Los Angeles Inner Harbor Dominguez Channel, Consolidated Slip	Human health, aquatic life impacts	DDT, PCBs, PAH, Cadmium, Copper, Lead, Mercury, Zinc, Dieldrin, Chlordane
High	Los Angeles Outer Harbor Cabrillo Pier	Human health, aquatic life impacts	DDT, PCBs, Copper
High	Lower Newport Bay Rhine Channel	Sediment toxicity, exceeds objectives	Arsenic, Copper, Lead, Mercury, Zinc, DDE, PCB, TBT
High	Moss Landing Harbor and Tributaries	Sediment chemistry, toxicity, bioaccumulation, and exceedances of NAS and FDA guidelines	Pesticides, PCBs, Nickel, Chromium, TBT
High	Mugu Lagoon/ Calleguas Creek tidal prism, Eastern Arm, Main Lagoon, Western Arm	Aquatic life impacts	DDT, PCBs, metals, Chlordane, Chlorpyrifos
High	San Diego Bay Seventh St. Channel Paleta Creek, Naval Station	Sediment toxicity and benthic community impacts	Chlordane, DDT, PAHs and Total Chemistry[2]
High	San Francisco Bay Castro Cove	Aquatic life impacts	Mercury, Selenium, PAHs, Dieldrin
High	San Francisco Bay Entire Bay	Human health impacts	Mercury, PCBs, Dieldrin, Chlordane, DDT, Dioxin Site listing was based on Mercury and PCB health advisory
High	San Francisco Bay, Islais Creek	Aquatic life impacts	PCBs, chlordane, dieldrin, endosulfan sulfate, PAHs, anthropogenically enriched H_2S and NH_3
High	San Francisco Bay Mission Creek	Aquatic life impacts	Silver, Chromium, Copper Mercury, Lead, Zinc, Chlordane, Chlorpyrifos, Dieldrin, Mirex, PCBs, PAHs, anthropogenically enriched H_2S and NH_3
High	San Francisco Bay, Peyton Slough	Aquatic life impacts	Silver, Cadmium, Copper, Selenium, Zinc, PCBs, Chlordane, ppDDE, Pyrene

Exhibit E-1. Enclosed Bays Listed as Known Toxic Hot Spots

Rank	Site Identification	Reason for Listing	
		Definition trigger	Pollutants
High	San Francisco Bay Point Potrero/ Richmond Harbor	Human health	Mercury, PCBs, Copper, Lead, Zinc
High	San Francisco Bay Stege Marsh	Aquatic life impacts	Arsenic, Copper, Mercury, Selenium, Zinc, chlordane, dieldrin, ppDDE, dacthal, endosulfan, endosulfan sulfate, dichlorobenzophenone, heptachlor epoxide, hexachlorobenzene, mirex, oxidiazon, toxaphene and PCBs
Moderate	Anaheim Bay, Naval Reserve	Sediment toxicity	Chlordane, DDE
Moderate	Ballona Creek Entrance Channel	Sediment toxicity	DDT, zinc, lead, Chlordane, dieldrin, chlorpyrifos
Moderate	Bodega Bay-10006 Mason's Marina	Bioassay toxicity	Cadmium, Copper, TBT, PAH
Moderate	Bodega Bay-10028 Porto Bodega Marina	Bioassay toxicity	Copper, lead, Mercury, Zinc, TBT, DDT, PCB, PAH
Moderate	Delta Estuary	Aquatic life impacts	Chlordane, Dieldrin, Lindane, Heptachlor, Total PCBs, PAH & DDT
Moderate	Delta Estuary	Human health impacts	Chlordane, Dieldrin, Total DDT, PCBs, Endosulfan, Toxaphene
Moderate	Los Angeles River Estuary	Sediment toxicity	DDT, PAH, Chlordane
Moderate	Upper Newport Bay Narrows	Sediment toxicity, exceeds water quality objectives	Chlordane, Zinc, DDE
Moderate	Lower Newport Bay Newport Island	Exceeds water quality objectives	Copper, Lead, Mercury, Zinc, Chlordane, DDE, PCB, TBT
Moderate	Marina del Rey	Sediment toxicity	DDT, PCB, Copper, Mercury, Nickel, Lead, Zinc, Chlordane
Moderate	Monterey Harbor	Aquatic life impacts, sediment toxicity	PAHs, Cu, Zn, Toxaphene, PCBs, Tributyltin
Moderate	San Diego Bay Between "B" Street & Broadway Piers	Benthic community impacts	PAHs, Total Chemistry
Moderate	San Diego Bay, Central Bay Switzer Creek	Sediment toxicity	Chlordane, Lindane, DDT, Total Chemistry
Moderate	San Diego Bay, Chollas Creek	Benthic community impacts	Chlordane, Total Chemistry
Moderate	San Diego Bay, Foot of Evans & Sampson Streets	Benthic Community Impacts	PCBs, Antimony, Copper, Total Chemistry
Moderate	San Francisco Bay Central Basin	Aquatic life impacts	Mercury, PAHs
Moderate	San Francisco Bay, Fruitvale (in front of storm drain)	Aquatic life impacts	Chlordane, PCBs
Moderate	San Francisco Bay Oakland Estuary. Pacific Drydock #1 (in front of storm drain)	Aquatic life impacts	Copper, Lead, Mercury, Zinc, TBT, ppDDE, PCBs, PAHs, Chlorpyrifos, Chlordane, Dieldrin, Mirex
Moderate	San Francisco Bay, San Leandro Bay	Aquatic life impacts	Mercury, Lead, Selenium, Zinc, PCBs, PAHs, DDT, pesticides
Low	Huntington Harbor Upper Reach	Sediment toxicity	Chlordane, DDE, Chlorpyrifos

Source: SWRCB (2003).

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Appendix F. Control Costs

This appendix provides a description of the types of the control costs that might be incurred as incremental costs of the Plan amendments should entities need to implement controls that would not be necessary in the absence of the Plan.

F.1 Storm Water Nonstructural BMPs

Street sweeping programs are often among the more costly nonstructural BMPs, accounting for approximately 11% to 64% of SWMP costs incurred by municipalities responding to a recent survey (CSU Sacramento, 2005). More intensive sweeping could include incremental costs for equipment purchase and operation. The effectiveness of street sweeping depends on the type and operation of the equipment, sweeping frequency and number of passes, and climate (FHWA, 2002). Thus, increasing the frequency of sweeping or changing the type of sweeper used may result in decreases in pollutant loads.

California State University (CSU) Sacramento conducted a storm water cost survey for the State Water Board to document costs incurred by select municipalities in implementing SWMPs as part of their MS4 NPDES permits. **Exhibit F-1** shows street sweeping costs for several California municipalities, with costs ranging from $12 to $61 per curb mile. Incremental costs for more extensive sweeping would depend on a municipality's current sweeping practices and the extent of the increase needed to reduce toxic loadings (e.g., the incremental curb miles and whether new sweepers need to be purchased).

Exhibit F-1. Examples of Street Sweeping Costs

Municipality	Street Sweeping Costs ($)	Annual Curb Miles Swept	Cost Per Curb Mile Swept ($/curb mile)	Estimated Annual Frequency
Fremont	$1,915,000	31,405	$61	12
Sacramento	$1,322,748	26,450	$50	12
Encinitas	$117,962	5,832	$20	12
Corona	$414,215	20,877	$20	26
Fresno-Clovis	$2,193,296	142,411	$15	12
Santa Clarita	$557,443	46,800	$12	50

Source: CSU Sacramento (2005).
1. Costs are in 2002/2003 fiscal year dollars.

Most municipalities use mechanical/brush model sweepers (Minton, 2007). These models are generally only half as effective as vacuum sweepers with respect to pollutant loading reduction. Vacuum sweepers are much more effective at removing fine sediments, silts and clays where much of the pollution resides. There are two types of vacuum sweepers: wet and dry. The dry vacuum sweepers remove a greater percentage of small particulates and sediments than the wet vacuum sweepers. Thus, depending on the load reductions needed, switching to either a wet or dry vacuum sweeper could increase pollutant load reductions to surface waters.

Conventional mechanical sweepers cost approximately $69,000 (1995 dollars), whereas wet vacuum sweepers cost around $127,000 (1995 dollars) (FHWA, 2002). The useful life span of these sweepers is between 4 and 7 years, and the operating cost associated with these sweepers is about $70 per hour (1996 dollars) (FHWA, 2002). The capital cost of vacuum-assisted dry sweepers is on the order of $170,000 (1996 dollars) with a projected useful life span of about 8 years, and operating costs of approximately $35 per hour (1996 dollars) (FHWA, 2002).

F.2 Storm Water Structural Controls

There are a variety of structural means to control the quantity and quality of storm water runoff including infiltration systems, detention systems, retention systems, constructed wetlands, filtration systems, and vegetated systems. The cost of constructing storm water controls depends on site conditions and drainage area. Furthermore, there are often economics of scale, making it difficult to develop a unit construction cost.

Caltrans conducted a storm water control retrofit pilot program to acquire experience in the installation and operation of a wide range of structural controls and to evaluate the performance and costs of these devices (Caltrans, 2004). As part of this program, Caltrans compared the construction costs incurred during the program to costs collected from several other transportation departments and jurisdictions (Caltrans, 2001). Caltrans obtained cost data from the following entities: Maryland State Highway Administration, Texas Department of Transportation, City of Austin (Texas), King County (Washington), Florida Department of Environmental Quality, Maryland and Virginia BMP data collected by the Center for Watershed Protection, and City of Santa Monica (California). **Exhibit F-2** presents Caltrans' unit cost estimates for these municipalities.

Exhibit F-2. Storm Water Control Cost Summary (2007$)[1]

Control Type	Number of Projects	Approximate Unit Cost ($/acre)			
		Median	Average	Max	Min
Detention Basin	23	$4,901	$6,983	$32,336	$470
Retention Basin (Wet Pond)	23	$8,287	$13,122	$55,883	$1,625
Wetland	25	$4,807	$7,859	$37,641	$271
Infiltration Trench	8	$15,395	$24,626	$65,737	$7,127
Austin Sand Filter	15	$24,307	$40,737	$171,438	$1,828
Delaware Sand Filter	4	$118,933	$117,938	$193,484	$40,404
Bioretention	2	$60,498	$60,498	$95,582	$25,414

Source: Caltrans (2001); escalated to 2007 dollars (from 1999 dollars) using the CCI.

1. Does not include Caltrans pilot program costs. Caltrans adjusted all costs for difference in regional economics and date of construction using RS Means Heavy Construction Cost Data and the CCI, respectively.

However, the costs incurred by Caltrans for BMPs constructed during their retrofit program are, in general, substantially higher than costs reported by the other entities Caltrans used for comparison. Caltrans (2001) indicated several reasons for these higher costs:

- Experience and efficiency in planning and design can contribute significantly to savings; Caltrans had relatively little experience and a relatively short planning horizon.
- BMP retrofit work was not combined with any ongoing construction projects.
- Pilot program did not reflect lowest cost technology for a given site.

Caltrans estimated that the retrofit program costs could be lowered by between 41% and 76%. Therefore, although the retrofit program provides valuable information related to storm water controls, the costs are likely to overstate those that would be incurred by other entities for the same practices.

The Westside Water Quality Improvement (WWQI) Project is an example of a structural storm water control project designed and constructed in California. The WWQI Project is a system designed to treat, to the maximum extent possible, dry weather and storm water runoff from eastern parts of Santa Monica and parts of west Los Angeles. The system is capable of treating dry weather runoff up to 3 cubic feet per second (cfs) and storm water runoff up to 33 cfs in a 24-hour period. The runoff comes from approximately 220 acres within Santa Monica's Centinela Sub-Watershed area and 2,280 acres from parts of west Los Angeles (CSM, No Date).

The facility utilizes three separate processes to treat and improve the quality of runoff: screening, sedimentation, and direct filtration. Direct filtration takes place in the Contech Stormwater Management StormFilter® unit which removes oil and grease, dissolved heavy metals, herbicides and pesticides. Removal of trash and other floatables, and suspended particulates by sedimentation occurs in the StormFilter, Bio Clean Nutrient Separating Baffle Box™, and at the transverse diversion weir (CSM, No Date). The facility operates totally on a gravity follow basis. Isolation gate valves may be closed for maintenance or to protect the system from being overloaded during heavy storm events (typically once or twice in a season) (CSM, No Date). The estimated cost of this project was approximately $2 million (ACC, 2007).

F.3 Controls for Marinas

Coastal Boatworks in Morro Bay, California completed a pollution prevention project in 1999 to reduce the amount of heavy metals and toxic pollutants that reached the bay from the marina. In addition to distributing 500 pamphlets to various agencies and organizations promoting pollution prevention along the waterfront, the facility also purchased new cleaning equipment including dustless sanders and a Vacu-boom system (used to prevent runoff from washing operations) for boaters to use during maintenance operations (MBNEP, 2000). The marina spent approximately $14,500 on the program (includes $5,400 in funding from the MBNEP) (MBNEP, 2000).

The Vacu-boom system is a hollow, flexible tube placed directly on a hard surface to form a downslope side dam or to completely encircle the wash or containment area. During use, the boom is connected by a portable wet vacuum recovery unit (Pressure Power Systems, 2007). When the wet vacuum system is turned on, the Vacu-Boom tightly seals itself to the surface to form an impervious liquid barrier and water is extracted into the boom into the vacuum unit (Pressure Power Systems, 2007). The water is discharged from the vacuum unit through a discharge hose into a holding tank, filter unit, or sanitary sewer (Pressure Power Systems, 2007). **Exhibit F-3** shows costs for various size units.

Exhibit F-3. Capital Costs for Vacu-Boom System (2007 dollars)

Tube Size	Capital Cost[1]
20 feet	$3,200
25 feet	$3,350
30 feet	$3,600
40 feet	$4,100
50 feet	$4,500

Source: Pressure Power Systems (2007).
1. Includes cost of shipping.

The Los Angeles Regional Water Board, among others, has identified copper-based antifouling paints as a source of copper pollution in marinas and bays (LARWQCB, 2005a; 2005b). Reduction or elimination of this pollution may require the transition to alternatives. Few, if any, areas in California have begun the transition to less toxic alternatives. The San Diego Regional Water Board (2005) provides information on the potential costs associated with the use of nontoxic paints on boats, based on findings in Carson, et al. (2002). **Exhibit F-4** provides a comparison between copper-based antifouling paints and nontoxic epoxy coatings. Boat owners may save small amounts of money on nontoxic hull coatings and maintenance over the life of the boat. In some situations, individual boat owners could spend slightly more money on nontoxic coating maintenance but the amount will be small compared to hull maintenance cost over the life of the boat (SDRWQCB, 2005).

Exhibit F-4. Comparison of Copper-Based Antifouling Paints to Nontoxic Epoxy Coatings[1]

Copper-Based Antifouling Paints	Nontoxic Epoxy Coatings
Initially less expensive to apply ($30 per foot)	Initially more expensive to apply ($30 - $50 per foot)
Do not need to be cleaned as often (14 times per year)	Need to be cleaned more often (22 times per year)
Need to be reapplied more often (every 2.5 years)	Do not need to be re-applied very often (every 5 years to 10 years)
Need to be stripped about every 6th application (every 15 years if paint reapplied every 2.5 years)	Do not need to be stripped (in first 30 – 60 years)

Source: SDRWQCB (2005).

1. Based on a typical stylized 40-foot long boat with 11-foot beam width and 375 square feet of wetted hull surface.

Variability in costs from this transition depends primarily on whether stripping for a boat is required prior to application of the nontoxic alternative. Stripping is not needed for new, unpainted boats. For older boats (approximately 15 years old), stripping is required for both application of nontoxic epoxy coatings, and continued application of copper-based paints. Thus, only boats less than 15 years old would have the option of stripping prior to applying the new paint. Stripping costs are approximated at $120/foot (Carson, et al., 2002). Long term cost estimates for transitioning from copper-based antifouling paints to nontoxic coatings also vary depending on assumptions regarding the performance of the nontoxic coatings and their price (SDRWQCB, 2005).

For example, Carson, et al. (2002) estimated the cost of remaining life hull maintenance for 40 foot length, 11 foot width boats to range from a savings of $1,354 (new boat with nontoxic coating, good performance, and lower prices) to a cost of $6,251 (2.5 year old boat requiring stripping, fair performance, and higher prices). Carson, et al. (2002) estimated that the least costly alternative for the transition to nontoxic paint (i.e., allowing boat owners to convert when the epoxy-copper cost differential is most favorable) would cost the boating community (about 7,000 boats) in San Diego Bay approximately $1.5 million over 15 years (2002 year dollars). If all boat owners were required to convert to nontoxic paints immediately, costs to boaters would be approximately $33.8 million (Carson, et al., 2002).

F.4 Sediment Remediation and Cleanup

There are a number of limitations associated with estimates of unit costs for sediment remediation and cleanup. Unit costs are generally only applicable to the conditions and constraints of the site remediated (Myers, 2005). Factors such as project scale, beneficial use opportunities, and the need for land are highly site-specific and greatly influence project costs (Myers, 2005). Myers (2005) also points out that unit costs for a one time remediation job will generally be greater than unit costs of a long term project in which a specific amount of sediment is treated each year over many years, due to economies of scale.

The types of remedial or cleanup activities implemented and their effectiveness are also highly site-specific. For example, sediment capping may be feasible in a deep water area but not feasible in a shallower area through which large ships have to pass. Also, dredging may be cost-effective where only the top layer of sediment is contaminated. However, where contamination exists beneath the top layer of sediment, dredging may not be feasible or cost-effective. Thus, information on the extent of contamination and water body uses is important in determining feasible cleanup options.

Another limitation to most unit cost estimates is a lack of detail on how the costs were derived. Tetra Tech and Averett (1994) (as cited in Myers, 2005) estimate that unit costs for a thermal gas phase reduction process range from $426/cy to $506/cy. This estimate reflects the build up of costs in a number of categories, including site preparation, permitting, capital equipment, pretreatment, labor, consumables, supplies, and utilities, effluent treatment and disposal, monitoring, maintenance, site demobilization and cleanup, dredging, construction of and transportation to temporary storage facility, land leases, and disposal of residual material. However, due to site-specific conditions in another area (e.g., lack of available space to construct a temporary storage facility), these particular estimates may not be applicable. If documentation regarding the buildup of costs for each category is available, the estimates could potentially be modified to take site-specific conditions into account.

In 1997, the National Academy of Sciences (NAS) published comparison unit cost and cost-effectiveness information for a number of remediation strategies (**Exhibit F-5**). NAS (1997) ranked the alternatives based on feasibility, effectiveness, practicality, and cost (<$1/cy to $1,000/cy). The lowest cost option (natural recovery) does not rank high in feasibility or practicality. In comparison, the highest cost option (thermal ex situ treatment) ranks high in feasibility, effectiveness, and practicality.

Exhibit F-5. Cost-Effectiveness of Sediment Remediation Approaches

Approach	Feasibility	Effective	Practicality	Cost
Interim Control				
Administrative	0	4	2	4
Technological	1	3	1	3
In Situ Treatment				
Natural Recovery	0	4	1	4
Capping	2	3	3	3
Treatment	1	1	2	2
Sediment Removal and Transport	2	4	3	2
Ex Situ Treatment				
Physical	1	4	4	1
Chemical	1	2	4	1
Thermal	4	4	3	0
Biological	0	1	4	1
Ex Situ Containment	2	4	2	2

Scoring	Feasibility	Effective	Practicality	Cost
0	<90%	Concept	Not acceptable, very uncertain	$1,000/cy
1	90%	Bench		$100/cy
2	99%	Pilot		$10/cy
3	99.9%	Field		$1/cy
4	99.99%	Commercial	Acceptable, certain	<$1/cy

Source: SWRCB (1998), as adapted from and reprinted with permission from Contaminated Sediments in Ports and Waterways Cleanup Strategies and Technologies. Copyright 1997 by the National Academy of Sciences. Courtesy of the National Academy Press, Washington, D.C.

Comparable to the NAS estimates from 1997, USACE (2001) indicates that sediment treatment costs can range from around $50/cubic meter ($65/cy) for a process such as stabilization to over $1,000/cubic meter ($1,300/cy) for high temperature thermal processes. These estimates are based on project costs throughout the United States. However, preliminary estimates from USACE (1999) for capping sediments in the Palos Verdes Shelf in California range from $1.79/cy to $5.06/cy, which is greater than the $1/cy estimate in the exhibit.

As part of a cleanup and abatement order, the San Diego Regional Water Board developed unit cost estimates for dredging contaminated sediments in the San Diego Bay based on preliminary cost estimates from Exponent (2003). **Exhibit F-6** shows these unit costs. All of the estimates are for dredging with a mechanical dredge and do not include the sediment volume from areas beneath piers or within 10 feet of structures because of stability concerns.

Exhibit F-6. Dredging Unit Cost Estimates

Cleanup Alternative	Approximate Dredge Volume (cubic yards)	Approximate Total Cost	Approximate Cost per Cubic Yard
LAET	75,000	$15,000,000	$200
5x Background	754,000	$88,000,000	$117
Background	1,200,000	$120,000,000	$102

Sources: SDRQWCB (2007)
LAET = lowest apparent effects threshold

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1239

California Regional Water Quality Control Board
San Diego Region

Staff Report on the
Establishment of Shipyard Sediment Cleanup Levels
for
National Steel and Shipbuilding Company
and Southwest Marine, Inc.
February 17, 1999

Issue

There are elevated levels of pollutants in the bay bottom sediment adjacent to several shipyards in San Diego Bay. The concentration of these pollutants causes or threatens to cause a condition of pollution in San Diego Bay by impairing the benthic organisms which are protected by the Marine Habitat Beneficial Use. National Steel and Shipbuilding Company (NASSCO) and Southwest Marine, Inc. (Southwest Marine) are engaged in a process of assessment and removal of sediments which have high concentrations of pollutants adjacent to their facilities. The Regional Board must establish cleanup levels for NASSCO and Southwest Marine which protect the beneficial uses and abate the threat of pollution in San Diego Bay.

Conclusion

The Regional Board should adopt tentative Resolution No. 99-12, *A Resolution Establishing Shipyard Sediment Cleanup Levels for Southwest Marine, Inc., San Diego County* and tentative Resolution No. 99-20, *A Resolution Establishing Shipyard Sediment Cleanup Levels for National Steel and Shipbuilding Company, San Diego County.* These resolutions designate the following cleanup levels and indicator chemicals for cleanup of bay bottom sediments at NASSCO and Southwest Marine as indicated below:

CONSTITUENT	CLEANUP LEVEL FOR BAY SEDIMENT (mg/kg) Dry Weight	NASSCO CLEANUP INDICATOR CHEMICALS	SOUTHWEST MARINE CLEANUP INDICATOR CHEMICALS
Copper	810	X	X
Zinc	820	X	X

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CONSTITUENT	CLEANUP LEVEL FOR BAY SEDIMENT (mg/kg) Dry Weight	NASSCO CLEANUP INDICATOR CHEMICALS	SOUTHWEST MARINE CLEANUP INDICATOR CHEMICALS
Lead	231		X
Mercury	4.2	X	X
PCBs	0.95		X

These cleanup levels for NASSCO and Southwest Marine are based on cleanup levels for Campbell Industries Marine Construction and Design Company (Campbell Industries) and the mercury cleanup level for Shelter Island Boatyard. These cleanup levels are appropriate for NASSCO and Southwest Marine because the wastes at NASSCO and Southwest Marine are similar to the wastes at Campbell Industries and Shelter Island Boatyard and the cleanup levels will protect the beneficial uses and abate the threat of pollution in San Diego Bay.

Background

The Regional Board has been working, since October, 1994, on a project for assessing the chemical quality of sediments in San Diego Bay immediately off-shore of two shipyards -- Southwest Marine, and National Steel and Shipbuilding Company (NASSCO). This project was initiated because of data dating to the late 1980's indicating elevated levels of contaminants in sediments immediately offshore of the shipyards. These contaminants are consistent with those produced as a result of shipyard operations. Since 1994 NASSCO and Southwest Marine began actively working on a voluntary, cooperative basis with the Regional Board to expedite the assessment and cleanup of the polluted sediments. The shipyards have worked cooperatively to perform a sediment study and a remedial action alternatives analysis report in accordance with Regional Board guidelines. It has not been necessary to issue cleanup and abatement orders to the shipyards because of the good faith shown by the shipyards and the excellent progress that has been made to date.

By letter dated February 14, 1997, the Regional Board issued sediment investigation requirements to NASSCO for elevated concentrations of copper and zinc in the San Diego Bay sediment. At a meeting on March 11, 1998, the Regional Board directed NASSCO to also investigate mercury at a small area of NASSCOs leasehold just east of the floating drydock near shore. A similar sediment investigation letter was issued to Southwest Marine on October 22, 1997 for elevated concentrations of copper, zinc, lead, and mercury. By letter dated April 27, 1998, the Regional Board directed Southwest Marine to also investigate PCBs in the sediment. For both shipyards, sediment investigations were required to determine the areal extent and location of sediments containing chemical concentrations in excess of the Campbell Industries shipyard cleanup levels or the Shelter Island Boatyard mercury apparent effects threshold level.

NASSCO submitted a Site Characterization and Remedial Action Plan in November, 1997 as required. This report contains the results of NASSCO's site characterization sampling. Four remediation areas are identified which contain elevated sediment metal concentrations. Based on Regional Board comments, additional sampling for copper and zinc was conducted in one area outside NASSCO's leasehold which could be influenced by NASSCO's work. Mercury samples were also be collected from an area identified from recent NPDES sediment sampling results. The results of the supplemental sampling, dated September 14, 1998, confirmed that the original four remediation areas are satisfactory.

Southwest Marine submitted a Preliminary Report Sediment Characterization Study and Remediation Plan on July 30, 1997 as required. This report contains the results of Southwest Marine's site characterization sampling and also recommends some additional characterization work. Additional samples were collected and analyzed as necessary to fully delineate the pollution. Some archived samples were also reanalyzed. Southwest Marine submitted a Report of Waste Discharge for dredging dated November 19, 1998 and the Final Report Sediment Characterization Study and Remediation Plan dated December 1998. Five remediation areas are identified in the reports for Southwest Marine.

NASSCO and Southwest Marine have concluded their sediment characterization studies and are now proposing removal of polluted sediment.

Basis for NASSCO and Southwest Marine Shipyard Cleanup Levels

The proposed cleanup levels for NASSCO and Southwest Marine are based on the previously established cleanup levels for Campbell Industries and the mercury cleanup level for Shelter Island Boatyard.

Campbell Cleanup Levels

On June 8, 1995, the Regional Board issued Cleanup and Abatement Order No. 95-21 to Campbell Industries Marine Construction and Design Company (Campbell). Order No. 95-21 established sediment cleanup levels for Campbell Industries as specified below:

CONSTITUENT	BAY SEDIMENT (mg/kg) Dry Weight
Copper	810
Zinc	820
Lead	231
PCB's	0.95

These cleanup levels were developed in a report by PTI Environmental Services titled "Campbell Shipyards Remedial Action Alternatives Analysis Report" (Campbell RAAAR) dated October 1993. These Campbell cleanup levels were derived as site-specific sediment quality objectives using the Apparent Effects Threshold (AET) approach. An AET is defined as the sediment concentration of a given chemical above which statistically significant biological effects (e.g., depressions in the abundance of local benthic infuana) are always observed in the data used to generate AET values. If any chemical exceeds its AET for a particular biological indicator, a measurable (although potentially minor) adverse biological effect is predicted for that indicator. The AET approach uses observed relationships between biological data and chemical data. Biological data for 15 stations were evaluated using the following tests: amphipod mortality, polychaete growth, total benthic infauna abundance (in situ), and amphipod abundance (in situ). The 10-day amphipod survival, avoidance, and reburial test used the species Rhepoxynius abronius following the test procedures described in Swartz et al. (1985), ASTM (1990), and PSEP (1991). The 20-day juvenile polychaete test use the species Neanthes arenaceodentata following the test procedures described in PSEP (1991).

It is appropriate to apply cleanup levels developed for the Campbell site to the NASSCO and Southwest Marine sites. This is based on similarities between physical, biological, and chemical conditions at the Campbell, NASSCO, and Southwest Marine shipyards and the fact that Campbell shipyard is physically located in San Diego Bay just north of the NASSCO and Southwest Marine facilities. Particularly important similarities include the following:

- Campbell, NASSCO, and Southwest Marine are comparable in terms of site activities, waste materials, and matrices (i.e. paint)
- Campbell, NASSCO, and Southwest Marine are in the same hydrodynamic and biogeographic zones
- Campbell, NASSCO, and Southwest Marine are influenced by a similar suite of pollutants from off-site.

Shelter Island Boatyard Mercury Cleanup Level

Because there is no cleanup level for mercury at Campbell, the mercury level from Shelter Island Boatyard is proposed for NASSCO and Southwest Marine. Shelter Island Boatyard is located in America's Cup Harbor in San Diego Bay. Shelter Island Boatyard submitted a Remedial Action Alternatives Analysis Report (RAAAR) by PTI Environmental Services dated June 30, 1989 and a supplement dated January 1990. PTI performed a sediment biological effects study similar to the biological effects study performed for Campbell Industries. PTI's study included eleven sample stations. A benthic infaunal count, and an amphipod sediment toxicity test were performed for each station. The 10-day survival, avoidance, and reburial test used the species Rhepoxynius abronius following the test procedures described in Swartz et al. (1985) as amended by Chapman and Becker (1986). PTI reported that high amphipod survival and no depression in infaunal assemblage were found in the sediment from the area adjacent to Shelter Island Boatyard with the sediment mercury concentration of 4.2 mg/kg (dry weight). This established a 4.2 mg/kg (dry weight) AET mercury level for Shelter Island Boatyard. This Shelter Island Boatyard mercury level was not adopted as a cleanup level in the Shelter Island Boatyard cleanup and abatement order. However, the Regional Board decided that no cleanup was necessary for Shelter Island Boatyard's sediment which contained mercury at this 4.2 mg/kg level in Order No. 91-91, "Rescinding Cleanup and Abatement Order No. 88-70 for Shelter Island Boatyard, San Diego County," which was adopted on October 28, 1991. It is appropriate to apply the Shelter Island Boatyard mercury cleanup level of 4.2 mg/kg to the NASSCO and Southwest Marine shipyards because:

- The boatyards are similar to the shipyards in terms of site activities, waste materials, and matrices (i.e. paint).
- The boatyards and shipyards are both in San Diego Bay.
- Data from eleven stations was used to derive the Shelter Island Boatyard mercury level which is comparable to the fifteen stations used to derive the Campbell cleanup levels.

Background Sediment Levels in San Diego Bay

The NPDES permits for the shipyards in San Diego Bay require semiannual sediment monitoring. As part of this NPDES sediment monitoring program, three reference stations in San Diego Bay are monitored. Reference Station REF-01 is located at the west side of San Diego Bay off the Naval Ocean Systems Center pier. Reference Station REF-02 is located at the north side of San Diego Bay at the Marina Cortez Marina in Harbor Island's west basin. Reference Station REF-03 is located at the north east side of San Diego Bay at the end of the Broadway Pier. The results of eleven rounds of sediment sampling at these reference stations were used to calculate the average background sediment levels shown in the table below. The proposed cleanup levels for NASSCO and Southwest Marine allow residual concentrations of pollutants to remain in the sediment which are above the background levels shown in the table below. Requiring cleanup to background levels would be overly protective of bay beneficial uses. The proposed cleanup levels while allowing pollutants to remain in bay sediments above background levels are sufficient to protect beneficial uses in San Diego Bay.

Average Background Sediment Levels (mg/kg Dry Weight)

	REF-01	REF-02	REF-03
Copper	36	196	91
Zinc	78	225	148
Lead	15	46	42
PCBs	0.041	0.049	0.041
Mercury	0.18	0.53	0.61

Other Cleanup Levels Considered

Cleanup levels from several other sources were considered before selecting the proposed cleanup levels.

Boatyard Cleanup Levels

Bay City Marine, Eichenlaub Marine, Kettenburg Marine, and Mauricio & Sons are boatyards in the America's Cup Harbor in San Diego Bay. The sediment in San Diego Bay adjacent to these boatyards contained elevated levels of copper, mercury, and tributyl tin. Woodward-Clyde Consultants submitted a RAAAR dated October 12, 1990 for these four boatyards. The Woodward-Clyde RAAAR contained a sediment biological effects study prepared by Kinnetic Laboratories, Inc. One sediment station at each client boatyard (Bay City Marine, Kettenburg Marine, Eichenlaub Marine, and Mauricio and Sons Marine) and one reference station in the center of the basin for a total of five sampling stations were used in this study. Benthic infaunal counts, an amphipod sediment toxicity test, and a bivalve larvae sediment elutriate test were performed for each station. The amphipod 10-day survival and reburial test used the species Grandidierella japonica following the test procedures described in Swartz et al. (1985). The 48-hour bivalve larvae survival and shell abnormality test used a 1:4 sediment to water elutriate mixture as described in ASTM Test Method E-724-80. Woodward-Clyde concluded that there were no significant adverse biological effects associated with sediment containing 530 mg/kg (dry weight) of copper and 4.8 mg/kg (dry weight) of mercury. This established a 530 mg/kg (dry weight) copper AET and 4.8 mg/kg (dry weight) mercury AET.

These boatyard cleanup levels were not used for the shipyards mainly because data from only five stations were used to derive the boatyard cleanup levels instead of the fifteen stations used to derive the Campbell cleanup levels and the eleven stations used to derive the Shelter Island Boatyard mercury cleanup level. The greater number of sample stations used at the Shelter Island Boatyard and Campbell Industries sites provide a more sound technical basis for more precisely defining the "cleanup" sediment concentrations needed to protect San Diego Bay beneficial uses (i.e the "no effects" sediment concentration level above which statistically significant biological effects could be expected to occur).

Paco Terminals Copper Cleanup Level

Cleanup and Abatement Order No. 85-91 was issued to Paco Terminals for elevated copper levels in the sediment in San Diego Bay adjacent to the facility. Paco Terminals was found to have discharged copper ore from their facility to San Diego Bay. Paco Terminals submitted a report prepared by Westec Services, Inc. entitled "Evaluation of Copper in Interstitial Water from Sediments at Paco Terminals, San Diego Bay, Phase II" on March 24, 1987. Interstitial water samples were collected and analyzed for copper from 36 sediment core samples. Linear regression was performed on the results to determine if there was a statistically significant relationship between copper concentrations in the interstitial water and sediment. Based on this linear regression, Westec Services, Inc. concluded that a sediment concentration of 7,050 mg/kg would result in an interstitial water concentration of 50 ug/l. The "Water Quality Control Plan, Ocean Waters of California, 1983" (1983 Ocean Plan) contains a 5 ug/l six-month median copper water quality objective. Although the available data did not provide a clearly defined relationship between the six-month median copper concentration of 5 ug/l and a particular sediment copper concentration, the Regional Board found in Addendum No. 1 to Cleanup and Abatement Order No. 85-91 that the data indicates that the sediment copper concentration of less than 1,000 mg/kg would likely result in water quality which meets the 1983 Ocean Plan six-month median water quality objective. Cleanup and Abatement Order No. 85-91, as amended, established a copper cleanup level of 1,000 mg/kg for Paco Terminals, Inc.

On August 1, 1991, a report entitled "Remedial Action Alternatives for National City Marine Terminal" prepared by Woodward-Clyde Consultants on behalf of the San Diego Unified Port District was submitted to the Regional Board. This report contained the results of toxicity tests conducted on the sediment adjacent to Paco Terminal. Nine different standard organism types were used including shrimp, flat fish, sea urchin eggs and embryos, clams, worms, two different amphipods, fish larvae, and oyster larvae. Eight of the nine organism types tested exhibited no toxicity under standardized toxicity test conditions. The organism Rhepoxynius abronius exhibited a toxic response which was found to be unrelated to the copper concentration.

Toxicity tests indicate that the copper in the shipyards sediment is more bioavailable than the copper in Paco Terminals sediment. The Paco Terminals copper cleanup level was not used for the shipyards mainly because the relatively insoluble chalcopyrite copper ore discharged by Paco Terminals is not similar to the wastes generated by the shipyards.

Teledyne Ryan Aeronautical PCB Cleanup Level

Cleanup and Abatement Order No. 86-92 was issued to Teledyne Ryan Aeronautical (Teledyne Ryan) for elevated PCB levels in the Convair Lagoon portion of San Diego Bay. Teledyne Ryan submitted a report entitled, "Recommendations for PCB Action Levels in Sediments: Convair Lagoon, San Diego Bay, March 1990. Many factors were evaluated in this report including protection of benthic species, historic regulatory precedent, engineering/ economic feasibility, and background concentrations. Based on this report, a PCB cleanup level of 4.6 mg/kg will protect against chronic effects to the typical benthic species and other species in Convair Lagoon. The cleanup level is also expected to reduce the mussel tissue PCB concentrations to below the US Food and Drug Administration tolerance level of 2.0 mg/kg. Cleanup and Abatement Order No. 86-92, as amended, established a PCB cleanup level of 4.6 mg/kg.

On January 22, 1997, Teledyne Ryan Aeronautical submitted a report titled, "Baseline Sediment Toxicity Testing, Convair Lagoon Capping Project." This report presents the results of baseline sediment toxicity tests conducted for the Convair Lagoon Capping Project. Six sediment samples were collected; three in Convair Lagoon and three at reference stations outside of Convair Lagoon. Amphipod 10-day survival and reburial toxicity tests were conducted on each sediment sample using the amphipod Grandidierella japonica. Sediment samples from Convair Lagoon contained 39, 42, and 46 mg/kg PCBs (dry weight). Reference sediment samples contained 0.17, 0.18, and 3.8 mg/kg PCBs (dry weight). The average survival rate of 85 percent for the three Convair Lagoon sites is only slightly lower than the average survival rate of 86.3 percent for the three reference sites. The results of the toxicity tests do not indicate a significant relative toxicity of the Convair Lagoon sediment in comparison with the reference site sediment.

The results of sediment toxicity tests in Convair Lagoon and at Campbell Industries show that amphipod toxicity occurs at a lower PCB level (above 0.95 mg/kg) at shipyards compared to the elevated PCB level (above 46 mg/kg) in Convair Lagoon. These toxicity tests indicate that the PCBs in the sediment at Campbell Industries are more bioavailable than the PCBs at Convair Lagoon. The Teledyne Ryan PCB cleanup level was not used for the shipyards because the wastes in Convair Lagoon are not similar to the wastes adjacent to the shipyards.

Bay Protection and Toxic Cleanup Program Screening Values

Sediment samples were collected from approximately 160 stations in San Diego Bay as part of the Bay Protection and Toxic Cleanup Program (BPTCP) between October, 1992 and May, 1994. These BPTCP samples were analyzed for chemicals, toxicity, and/or benthic community structure. The results of the BPTCP samples were published in a report titled "Chemistry, Toxicity, and Benthic Community Conditions in Sediments of the San Diego Bay Region. Final Report. September 1996." (1996 BPTCP Report). Additional BPTCP data were published in a report titled "Chemistry, Toxicity, and Benthic Community Conditions in Sediments of the San Diego Bay Region. Addendum Report. 1998."

This 1996 BPTCP Report used two types of screening values to provide guidance for evaluating the degree to which sediment chemical pollutant levels are responsible for effects observed in a toxicity test. These screening values are the Probable Effects Level (PEL) developed by the State of Florida and the Effects Range - Median (ERM) developed by the National Oceanic and Atmospheric Administration (NOAA). The ERM was developed using a large national database of biological effects. The PEL was developed using a large database which is dominated by data collected in the southeast part of the nation. The report containing the PEL documentation states that the PEL numbers are broadly applicable in the southeast, and that care should be exercised in applying the PEL elsewhere in North America.

In order to better relate the original PEL and ERM numbers to San Diego Bay, the 1996 BPTCP Report uses adjustment factors of four times (4x) the ERM and 5.9 times (5.9x) the PEL. These San Diego Bay adjustment factors were derived using a qualitative examination of the BPTCP data set which indicated that only in the top 10th percentile of chemical measurements do the values exceed 4x the ERM or 5.9x the PEL. The table below shows the original and adjusted PEL and ERM for selected chemicals.

	Units (Dry Weight)	**PEL**	**5.9 x PEL**	**ERM**	**4 x ERM**
Copper	mg/kg	108	638	270	1080
Lead	mg/kg	112	662	218	872
Mercury	mg/kg	0.7	4.1	0.7	2.8
Zinc	mg/kg	271	1599	410	1640
PCBs	mg/kg	0.189	1.114	0.180	0.720

The original and adjusted PEL and ERM values were not used for shipyard cleanup levels because the PEL and ERM are more appropriately used as a screening tool rather than site specific cleanup levels. The site specific Campbell cleanup levels more accurately represent the relationship between shipyard chemical concentrations in the sediment and potential adverse biological effects

Regional Toxic Hot Spot Cleanup Plan

The Regional Toxic Hot Spot Cleanup Plan (Cleanup Plan) was adopted by the San Diego Regional Board on December 16, 1998. This Cleanup Plan, a result of the BPTCP, identifies and ranks candidate toxic hot spots. The Cleanup Plan includes a characterization of high priority toxic hot spots and a description of preliminary assessment of actions to address the problems. The Cleanup Plan also identifies one high priority and four medium priority candidate toxic hot spots in San Diego Bay. The high priority site is at Seventh Street Channel/ Paleta Creek near the Naval Station. The moderate priority sites are 1) between "B" Street and Broadway piers, 2) Switzer Creek, 3) Foot of Evans and Sampson Streets, and 4) Chollas Creek. The Chollas Creek site, at the south boundary of NASSCO, is the only candidate toxic hot spot which is near NASSCO and Southwest Marine. Three BPTCP stations, located in the mouth of Chollas Creek, had degraded benthic communities and elevated pollutant levels which qualified the site for a medium priority ranking. The impairment at Chollas Creek could be caused by sources other than shipyards such as urban runoff. Investigation of this Chollas Creek site is expected to be addressed during the Total Maximum Daily Load (TMDL) process for the Chollas Creek watershed.

Indicator Chemicals

Indicator chemicals are used to predict the most likely location of elevated levels of pollutants in the sediment. Indicator chemicals are chosen by identifying chemicals which are commonly elevated and which co-occur with other elevated chemicals. The goal is for cleanup of sediment containing elevated levels of the indicator chemicals to also result in cleanup of areas with elevated levels of any other pollutants. Sediment data from several sources was evaluated in determining indicator chemicals for NASSCO and Southwest Marine.

The NPDES permits for NASSCO (Order No. 85-05) and Southwest Marine (Order No. 83-11) required biannual sediment sampling at seventeen and fifteen stations respectively. Sediment samples from each NPDES station were analyzed for metals or metals plus organics. The results from nine rounds of biannual sampling from 1992 through 1996 were evaluated in determining the indicator chemicals.

As part of the BPTCP, sediment samples were collected from approximately 160 stations in San Diego Bay between October, 1992 and May, 1994. These BPTCP samples were analyzed for chemicals, toxicity, and/or benthic community structure. The results from the chemical analysis of BPTCP samples were evaluated in determining indicator chemicals.

Sediment quality data from the NPDES biannual monitoring program and from the BPTCP were evaluated for each shipyard to determine appropriate indicator chemicals for each shipyard. Copper and zinc were identified as indicator chemicals for NASSCO. Mercury was also added later for a small area of NASSCO. Copper, zinc, lead, mercury, and PCBs were identified as indicator chemicals for Southwest Marine. Although only the indicator chemicals will be analyzed for, it is expected that any other pollutants at elevated concentrations will be removed with the indicator chemicals.

Cleanup Levels for NASSCO and Southwest Marine

In setting cleanup levels at any site, the Regional Board must consider the terms and conditions of State Board Resolution No. 92-49 (Policies and Procedures for Investigation and Cleanup and Abatement of Discharges). These conditions include 1) site-specific characteristics, 2) applicable state and federal statutes and regulations, 3) the Basin Plan, and 4) State Board Resolution 68-16 (Statement of Policy with Respect to Maintaining High Quality Waters in California). Section II.A.9 of Resolution 92-49 directs Regional Boards to "prescribe cleanup levels which are consistent with appropriate levels set by the Regional Board for analogous discharges that involve similar wastes, site characteristics, and water quality considerations." The proposed shipyard cleanup levels for NASSCO and Southwest Marine are in conformance with Resolution No. 92-49.

Site-specific characteristics were considered by selecting cleanup levels which were established for San Diego Bay at similar facilities that involve similar wastes, site characteristics, and water quality conditions. The BPTCP, as discussed above, is an applicable state statute which was considered in establishing these cleanup levels.

The *Water Quality Control Plan, San Diego Basin (9)* (Basin Plan) was adopted by this Regional Board on September 8, 1994 and subsequently approved by the State Water Resources Control Board (State Board) on December 13, 1994. Subsequent revisions to the Basin Plan have also been adopted by the Regional Board and approved by the State Board. The Basin Plan designates beneficial uses and narrative and numerical water quality objective, and prohibitions which are applicable to the discharges regulated under this Order. The Basin Plan identifies the following beneficial uses of the waters of San Diego Bay: industrial service supply; navigation; water contact recreation; non-contact water recreation; ocean commercial and sport fishing; estuarine habitat; preservation of biological habitats of special significance; wildlife habitat; preservation of rare and endangered species; marine habitat; fish migration; and shellfish harvesting.

Beneficial uses established in the Basin Plan will be protected by these cleanup levels. The sediment adjacent to NASSCO and Southwest Marine contains pollutant concentrations which have been shown to be harmful to the benthic organisms in San Diego Bay. The Marine Habitat Beneficial Use (MAR) which has been designated for San Diego Bay includes uses of water that support marine ecosystems. These benthic organisms are part of the marine ecosystem which is protected by the MAR use. The proposed cleanup levels will be protective of the benthic organisms and the MAR use because the cleanup levels were derived using biological studies involving benthic organisms.

State Board Resolution 68-16 provides that existing high water quality be maintained when it is reasonable to do so. This policy further provides that any adverse change in water quality 1) be consistent with the maximum public benefit, 2) will not unreasonably affect beneficial uses, and 3) will not result in water quality less than that prescribed in the policies. The proposed cleanup levels are consistent with the maximum public benefit and will not unreasonably affect beneficial uses because the cleanup levels were derived to protect beneficial uses for the public benefit. Water quality is not expected to be less than that prescribed in the policies as a result of these cleanup levels.

Based on all of the information discussed above, the proposed cleanup levels shown below are appropriate for NASSCO and Southwest Marine.

CONSTITUENT	CLEANUP LEVEL FOR BAY SEDIMENT (mg/kg) Dry Weight	NASSCO CLEANUP INDICATOR CHEMICALS	SOUTHWEST MARINE CLEANUP INDICATOR CHEMICALS
Copper	810	X	X
Zinc	820	X	X
Lead	231		X
Mercury	4.2	X	X
PCBs	0.95		X

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TAB	DATE	BATES NO.	DOC_TYPE	SUBJECT	FROM	FM_ORG	TO	TO_ORG
1	0	SAR063064	Other	Remediation Costs at Various Cleanup Levels	Halvax, Sandor	Southwest Marine, Inc.	Rodriguez, Vincent	San Diego RWQCB
2	0	SAR063065	Other	Remediation Costs at Various Cleanup Levels	Halvax, Sandor	Southwest Marine, Inc.	Rodriguez, Vincent	San Diego RWQCB
3	0	SAR063067	Other	Remediation Costs at Various Cleanup Levels	Halvax, Sandor	Southwest Marine, Inc.	Rodriguez, Vincent	San Diego RWQCB
4	0	SAR063068	E-mail	Remediation Costs at Various Cleanup Levels	Halvax, Sandor	Southwest Marine, Inc.	Rodriguez, Vincent	San Diego RWQCB
5	0	SAR063069	Other	Remediation Costs at Various Cleanup Levels	Halvax, Sandor	Southwest Marine, Inc.	Rodriguez, Vincent	San Diego RWQCB
6	19960410	SAR001337	Letter	Receipt of Monitoring Reports for Order No. 87-065; NPDES No. CA0108332	Pease, Susan	San Diego RWQCB	Halvax, Sandor	NASSCO
7	19961229	SAR012021	Letter	Third Annual Statistical Analyses Report, 12/96	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
8	19961229	SAR012023	Report or Study	Third Annual Statistical Analyses Report, 12/96	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
9	19970101	SAR011786	Letter	12/96 Compliance Certification Report	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
10	19970127	SAR011804	Letter	Receipt of Monitoring Reports for Order No. 83-011; NPDES No. CA0107697, Facility: Southwest Marine, Inc., WDID No.: 9 000000137	Robertus, John H.	San Diego RWQCB	Halvax, Sandor	Southwest Marine, Inc.
11	19970201	SAR014622	Letter	Compliance Certification Report, 01/97	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
12	19970301	SAR014621	Letter	Compliance Certification Report, 02/97	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
13	19970401	SAR014619	Letter	Compliance Certification Report, 03/97	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
14	19970422	SAR014992	Other	Request for Removal of Marine Fouling Organisms from Drydock AFDL-48	Halvax, Sandor	Southwest Marine, Inc.	Pease, Susan	San Diego RWQCB

EXHIBIT NO. 1240
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TAB	DATE	BATES NO.	DOC_TYPE	SUBJECT	FROM	FM_ORG	TO	TO_ORG
15	19970501	SAR014620	Letter	Compliance Certification Report, 04/97	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
16	19970601	SAR013843	Letter	12/96 - 05/97 Compliance Certification Reports and Waste Hauling Log, 1996 Annual Chemical Utilization Audit, and Tenth Semi-Annual Marine Sediment Monitoring Report, 06/97	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
17	19970630	SAR013842	Letter	12/96 - 05/97 Compliance Certification Reports and Waste Hauling Log, 1996 Annual Chemical Utilization Audit, and Tenth Semi-Annual Marine Sediment Monitoring Report, 06/97	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
18	19970630	SAR013844	Other	12/96 - 05/97 Compliance Certification Reports and Waste Hauling Log, 1996 Annual Chemical Utilization Audit, and Tenth Semi-Annual Marine Sediment Monitoring Report, 06/97	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
19	19970630	SAR013870	Report or Study	12/96 - 05/97 Compliance Certification Reports and Waste Hauling Log, 1996 Annual Chemical Utilization Audit, and Tenth Semi-Annual Marine Sediment Monitoring Report, 06/97	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
20	19970630	SAR014107	Disc	12/96 - 05/97 Compliance Certification Reports and Waste Hauling Log, 1996 Annual Chemical Utilization Audit, and Tenth Semi-Annual Marine Sediment Monitoring Report, 06/97	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB

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TAB	DATE	BATES NO.	DOC_TYPE	SUBJECT	FROM	FM_ORG	TO	TO_ORG
21	19970630	SAR270299	Letter	1996 - 1997 Storm Water Annual Report	Halvax, Sandor	Southwest Marine, Inc.	Fulton, Gloria R. (GRF)	San Diego RWQCB
22	19970630	SAR270301	Report or Study	1996 - 1997 Storm Water Annual Report	Halvax, Sandor	Southwest Marine, Inc.	Fulton, Gloria R. (GRF)	San Diego RWQCB
23	19970630	SAR014108	Other	REF1997A.WB1; 12/96 - 05/97 Compliance Certification Reports and Waste Hauling Log, 1996 Annual Chemical Utilization Audit, and Tenth Semi-Annual Marine Sediment Monitoring Report, 06/97	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
24	19970630	SAR014109	Other	SWM1997A.REP; 12/96 - 05/97 Compliance Certification Reports and Waste Hauling Log, 1996 Annual Chemical Utilization Audit, and Tenth Semi-Annual Marine Sediment Monitoring Report, 06/97	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
25	19970630	SAR014122	Other	SWM1997A.WB1; 12/96 - 05/97 Compliance Certification Reports and Waste Hauling Log, 1996 Annual Chemical Utilization Audit, and Tenth Semi-Annual Marine Sediment Monitoring Report, 06/97	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John. H.	San Diego RWQCB
26	19970731	SAR014758	Letter	Receipt of Monitoring Reports for Order No. 83-011; NPDES No. CAG107697, Facility: Southwest Marine, Inc., WDID No.: 9 000000137	Robertus, John H.	San Diego RWQCB	Halvax, Sandor	Southwest Marine, Inc.
27	19970814	SAR061569	Letter	Preliminary Sediment Characterization	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John	San Diego RWQCB
28	19970820	SAR050270	Letter	Comments on Tentative Order No. 97-36	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John	San Diego RWQCB
29	19970908	SAR014993	Other	Request for Removal of Marine Fouling Organisms from Drydock AFDL-48	Halvax, Sandor	San Diego RWQCB	Pease, Susan	Southwest Marine, Inc.

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TAB	DATE	BATES NO.	DOC_TYPE	SUBJECT	FROM	FM_ORG	TO	TO_ORG
30	19970910	SAR015003	Letter	Removal of Marine Fouling Organisms from Drydock AFDL-48	Robertus, John H.	San Diego RWQCB	Halvax, Sandor	
31	19970910	SAR015116	Letter	Request for Removal of Marine Fouling Organisms from Drydock AFDL-48	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
32	19970914	SAR061570	Report or Study	Preliminary Sediment Characterization	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John	San Diego RWQCB
33	19970930	SAR014760	Letter	Receipt of Monitoring Reports for Order No. 83-011; NPDES No. CAG107697, Facility: Southwest Marine, Inc., WDID No.: 9 000000137	Robertus, John H.	San Diego RWQCB	Halvax, Sandor	Southwest Marine, Inc.
34	19971016	SAR061392	Letter	Comments on San Diego Bay Sediment Investigation Requirements	Halvax, Sandor	Southwest Marine, Inc.	Rodriguez, Vincent	San Diego RWQCB
35	19971021	SAR050289	Letter	Adoption of Order No. 97-36	Robertus, John	San Diego RWQCB	Halvax, Sandor	Southwest Marine, Inc.
36	19971021	SAR050291	Other	Adoption of Order No. 97-36	Robertus, John	San Diego RWQCB	Halvax, Sandor	Southwest Marine, Inc.
37	19971021	SAR050294	Order	Adoption of Order No. 97-36	Robertus, John	San Diego RWQCB	Halvax, Sandor	Southwest Marine, Inc.
38	19971021	SAR050438	Order	Adoption of Order No. 97-36	Robertus, John	San Diego RWQCB	Halvax, Sandor	Southwest Marine, Inc.
39	19971021	SAR050447	Order	Adoption of Order No. 97-36	Robertus, John	San Diego RWQCB	Halvax, Sandor	Southwest Marine, Inc.
40	19971021	SAR050451	Order	Adoption of Order No. 97-36	Robertus, John	San Diego RWQCB	Halvax, Sandor	Southwest Marine, Inc.
41	19971021	SAR050461	Order	Adoption of Order No. 97-36	Robertus, John	San Diego RWQCB	Halvax, Sandor	Southwest Marine, Inc.
42	19971028	SAR065393	Letter	Request for Rescision of Order No. 92-68	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John	San Diego RWQCB

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43	19971229	SAR014725	Letter	Receipt of Monitoring Reports for Order No. 97-36; NPDES No. CAG039001, Facility: Southwest Marine, Inc., WDID No.: 9 000000137	Pease, Susan	San Diego RWQCB	Halvax, Sandor	Southwest Marine, Inc.
44	19971231	SAR014726	Letter	Sample Collection Plan	Robertus, John H.	San Diego RWQCB	Halvax, Sandor	Southwest Marine, Inc.
45	19971231	SAR015104	Letter	Sample Collection Plan	Robertus, John H.	San Diego RWQCB	Halvax, Sandor	Southwest Marine, Inc.
46	19980126	SAR065358	Letter	Tentative Order No. 98-13, An Order Rescinding Order No. 92-68	Morris, Robert	San Diego RWQCB	Halvax, Sandor	Southwest Marine, Inc.
47	19980126	SAR065365	Report or Study	Tentative Order No. 98-13, An Order Rescinding Order No. 92-68	Morris, Robert	San Diego RWQCB	Halvax, Sandor	Southwest Marine, Inc.
48	19980129	SAR013667	Other	10/97 - 12/97 Quarterly Effluent Water Monitoring Report, Spill / Illicit Discharge Log, Floating Drydock Submergence / Emergence Water, 12/97 Compliance Certification Report, and 10/97 - 12/97 Waste Hauling Log	Halvax, Sandor	Southwest Marine, Inc.	Pease, Susan	San Diego RWQCB
49	19980129	SAR014751	Other	Southwest Marine Waste Hauling Log, 10/97 - 12/97	Halvax, Sandor	Southwest Marine, Inc.	Pease, Susan	San Diego RWQCB
50	19980130	SAR013664	Letter	10/97 - 12/97 Quarterly Effluent Water Monitoring Report, Spill / Illicit Discharge Log, Floating Drydock Submergence / Emergence Water, 12/97 Compliance Certification Report, and 10/97 - 12/97 Waste Hauling Log	Halvax, Sandor	Southwest Marine, Inc.	Pease, Susan	San Diego RWQCB

TAB	DATE	BATES NO.	DOC_TYPE	SUBJECT	FROM	FM_ORG	TO	TO_ORG
51	19980130	SAR013666	Other	10/97 - 12/97 Quarterly Effluent Water Monitoring Report, Spill / Illicit Discharge Log, Floating Drydock Submergence / Emergence Water, 12/97 Compliance Certification Report, and 10/97 - 12/97 Waste Hauling Log	Halvax, Sandor	Southwest Marine, Inc.	Pease, Susan	San Diego RWQCB
52	19980130	SAR014145	Other	12/97 - 05/98 Waste Hauling Log and Compliance Certification Reports, 1997 Annual Chemical Utilization Audit and Twelfth Semi-Annual Marine Sediment Monitoring Report, 06/98	Halvax, Sandor	Southwest Marine, Inc.	Pease, Susan	San Diego RWQCB
53	19980225	SAR013672	Letter	Certification Statement for Transmittal Letter dated 01/30/98	Halvax, Sandor	Southwest Marine, Inc.	Pease, Susan	San Diego RWQCB
54	19980226	SAR065366	Letter	Adoption of Order No. 98-13, An Order Rescinding Order No. 92-68	Robertus, John	San Diego RWQCB	Halvax, Sandor	Southwest Marine, Inc.
55	19980227	SAR014146	Other	12/97 - 05/98 Waste Hauling Log and Compliance Certification Reports, 1997 Annual Chemical Utilization Audit and Twelfth Semi-Annual Marine Sediment Monitoring Report, 06/98	Halvax, Sandor	Southwest Marine, Inc.	Pease, Susan	San Diego RWQCB
56	19980309	SAR014728	Letter	Southwest Marine's BMP Program	Robertus, John H.	San Diego RWQCB	Halvax, Sandor	Southwest Marine, Inc.
57	19980309	SAR014732	Letter	Southwest Marine's BMP Program	Robertus, John H.	San Diego RWQCB	Halvax, Sandor	Southwest Marine, Inc.
58	19980311	SAR014737	Letter	Receipt of Monitoring Reports for Order No. 97-36; NPDES No. CAG039001, Facility: Southwest Marine, Inc., WDID No.: 9 000000137	Robertus, John H.	San Diego RWQCB	Halvax, Sandor	Southwest Marine, Inc.
59	19980312	SAR015102	Letter	Notice of Violation No. 98-36	Robertus, John H.	San Diego RWQCB	Halvax, Sandor	Southwest Marine, Inc.

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TAB	DATE	BATES NO.	DOC_TYPE	SUBJECT	FROM	FM_ORG	TO	TO_ORG
60	19980323	SAR015112	Letter	Response to Notice of Violation Order No. R9-1998-0036	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
61	19980327	SAR014147	Other	12/97 - 05/98 Waste Hauling Log and Compliance Certification Reports, 1997 Annual Chemical Utilization Audit and Twelfth Semi-Annual Marine Sediment Monitoring Report, 06/98	Halvax, Sandor	Southwest Marine, Inc.	Pease, Susan	San Diego RWQCB
62	19980428	SAR014148	Other	12/97 - 05/98 Waste Hauling Log and Compliance Certification Reports, 1997 Annual Chemical Utilization Audit and Twelfth Semi-Annual Marine Sediment Monitoring Report, 06/98	Halvax, Sandor	Southwest Marine, Inc.	Pease, Susan	San Diego RWQCB
63	19980430	SAR061500	Letter	San Diego Bay Sediment Investigation, Quarterly Progress Report January - March 1998	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John	San Diego RWQCB
64	19980519	SAR014149	Other	12/97 - 05/98 Waste Hauling Log and Compliance Certification Reports, 1997 Annual Chemical Utilization Audit and Twelfth Semi-Annual Marine Sediment Monitoring Report, 06/98	Halvax, Sandor	Southwest Marine, Inc.	Pease, Susan	San Diego RWQCB
65	19980529	SAR050976	Letter	Compliance with Order No. 83-11 During Stay	Robertus, John	San Diego RWQCB	Halvax, Sandor	Southwest Marine, Inc.
66	19980612	SAR014764	Letter	[Submits copy of Best Management Practices required by Order No. 83-11.]	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
67	19980629	SAR014741	Letter	[Encloses disposal and waste hauling logs.]	Halvax, Sandor	Southwest Marine, Inc.	Pease, Susan	San Diego RWQCB

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68	19980629	SAR014123	Letter	12/97 - 05/98 Waste Hauling Log and Compliance Certification Reports, 1997 Annual Chemical Utilization Audit and Twelfth Semi-Annual Marine Sediment Monitoring Report, 06/98	Halvax, Sandor	Southwest Marine, Inc.	Pease, Susan	San Diego RWQCB
69	19980629	SAR270369	Letter	1997 - 1998 Storm Water Annual Report	Halvax, Sandor	Southwest Marine, Inc.	Pease, Susan	San Diego RWQCB
70	19980629	SAR270370	Report or Study	1997 - 1998 Storm Water Annual Report	Halvax, Sandor	Southwest Marine, Inc.	Pease, Susan	San Diego RWQCB
71	19980629	SAR014742	Other	Hazardous Industrial Waste Disposal Log, 10/97 - 12/97	Halvax, Sandor	Southwest Marine, Inc.	Pease, Susan	San Diego RWQCB
72	19980630	SAR014124	Other	12/97 - 05/98 Waste Hauling Log and Compliance Certification Reports, 1997 Annual Chemical Utilization Audit and Twelfth Semi-Annual Marine Sediment Monitoring Report, 06/98	Halvax, Sandor	Southwest Marine, Inc.	Pease, Susan	San Diego RWQCB
73	19980630	SAR014150	Other	12/97 - 05/98 Waste Hauling Log and Compliance Certification Reports, 1997 Annual Chemical Utilization Audit and Twelfth Semi-Annual Marine Sediment Monitoring Report, 06/98	Halvax, Sandor	Southwest Marine, Inc.	Pease, Susan	San Diego RWQCB
74	19980630	SAR014151	Report or Study	12/97 - 05/98 Waste Hauling Log and Compliance Certification Reports, 1997 Annual Chemical Utilization Audit and Twelfth Semi-Annual Marine Sediment Monitoring Report, 06/98	Halvax, Sandor	Southwest Marine, Inc.	Pease, Susan	San Diego RWQCB

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75	19980630	SAR014375	Report or Study	12/97 - 05/98 Waste Hauling Log and Compliance Certification Reports, 1997 Annual Chemical Utilization Audit and Twelfth Semi-Annual Marine Sediment Monitoring Report, 06/98	Halvax, Sandor	Southwest Marine, Inc.	Pease, Susan	San Diego RWQCB
76	19980720	SAR014739	Letter	Receipt of Monitoring Reports for Order No. 97-36; NPDES No. CAG039001, Facility: Southwest Marine, Inc., WDID No.: 9 000000137	Robertus, John H.	San Diego RWQCB	Halvax, Sandor	Southwest Marine, Inc.
77	19980720	SAR014761	Letter	Receipt of Monitoring Reports for Order No. 83-11; NPDES No. CAG107697, Facility: Southwest Marine, Inc., WDID No.: 9 000000137	Robertus, John H.	San Diego RWQCB	Halvax, Sandor	Southwest Marine, Inc.
78	19980720	SAR061566	Map or Plot Plan	PCB Sample Location Map	Halvax, Sandor	Southwest Marine, Inc.	Schwall, Kristin	San Diego RWQCB
79	19980825	SAR014753	Letter	[Submits revisions per request of RWQCB in correspondence dated 06/20/98.]	Halvax, Sandor	Southwest Marine, Inc.	Pease, Susan	San Diego RWQCB
80	19980825	SAR050978	Letter	Revised Pages for December 1997 through 1998 Semiannual Reporting	Halvax, Sandor	Southwest Marine, Inc.	Pease, Susan	San Diego RWQCB
81	19981027	SAR013618	Letter	[Submits discharge log and compliance certification for 07/98 - 09/98.]	Halvax, Sandor	Southwest Marine, Inc.	Pease, Susan	San Diego RWQCB
82	19981117	SAR014971	Report or Study	Technical Report	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
83	19981120	SAR014970	Letter	Technical Report	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
84	19981123	SAR035059	Letter	Section E, Provision 7.A. Status Report	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
85	19981210	SAR014757	Letter	USEPA, NPDES Quarterly Non-Compliance Report	Robertus, John H.	San Diego RWQCB	Halvax, Sandor	Southwest Marine, Inc.

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86	19981210	SAR050995	Letter	NPDES Quarterly Non-Compliance Report	Robertus, John	San Diego RWQCB	Halvax, Sandor	Southwest Marine, Inc.
87	19981223	SAR035242	Letter	Discharge Monitoring Report Form	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
88	19990105	SAR199752	Letter	Rescission of Order No. 98-38, Marine Railway Removal Project	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John	San Diego RWQCB
89	19990128	SAR013625	Letter	[Submits quarterly and semi-annual reports for 07/98 - 12/98.]	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
90	19990217	SAR061447	Letter	Tentative Shipyard Sediment Cleanup Levels and Dredging WDRs	Barker, David (DTB)	San Diego RWQCB	Halvax, Sandor	Southwest Marine, Inc.
91	19990217	SAR061454	Other	Tentative Shipyard Sediment Cleanup Levels and Dredging WDRs	Barker, David (DTB)	San Diego RWQCB	Halvax, Sandor	Southwest Marine, Inc.
92	19990217	SAR199699	Letter	Transmittal of Tentative Order No. 99-14, Sediment Remediation Project	Barker, David (DTB)	San Diego RWQCB	Halvax, Sandor	Southwest Marine, Inc.
93	19990217	SAR199700	Order	Transmittal of Tentative Order No. 99-14, Sediment Remediation Project	Barker, David (DTB)	San Diego RWQCB	Halvax, Sandor	Southwest Marine, Inc.
94	19990224	SAR061457	Report or Study	Tentative Shipyard Sediment Cleanup Levels and Dredging WDRs	Barker, David (DTB)	San Diego RWQCB	Halvax, Sandor	Southwest Marine, Inc.
95	19990308	SAR199947	Other	National Resources Defense Council, et al. v. Southwest Marine, Decision	Halvax, Shaun	Southwest Marine, Inc.	Schwall, Kristin	San Diego RWQCB
96	19990310	SAR061469	Order	Tentative Shipyard Sediment Cleanup Levels and Dredging WDRs	Barker, David (DTB)	San Diego RWQCB	Halvax, Sandor	Southwest Marine, Inc.
97	19990325	SAR062112	Letter	Adoption of Resolution Nos. 99-12 and 99-20, and Order No. 99-14	Robertus, John	San Diego RWQCB	Halvax, Sandor	Southwest Marine, Inc.
98	19990325	SAR062122	Meeting Minutes	Adoption of Resolution Nos. 99-12 and 99-20, and Order No. 99-14	Robertus, John H.	San Diego RWQCB	Halvax, Sandor	Southwest Marine, Inc.
99	19990325	SAR062128	Order	Adoption of Resolution Nos. 99-12 and 99-20, and Order No. 99-14	Robertus, John	San Diego RWQCB	Halvax, Sandor	Southwest Marine, Inc.

TAB	DATE	BATES NO.	DOC_TYPE	SUBJECT	FROM	FM_ORG	TO	TO_ORG
100	19990419	SAR013617	Letter	Quarterly / Semiannual Effluent Monitoring Reports (Reporting Period): 01/99 - 03/99	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
101	19990429	SAR013609	Letter	[Submits log, VHS tape, certification, and letter for 01/99 - 03/99.]	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
102	19990701	SAR270508	Letter	1998 - 1999 Storm Water Annual Report	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John	San Diego RWQCB
103	19990701	SAR270509	Report or Study	1998 - 1999 Storm Water Annual Report	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John	San Diego RWQCB
104	19990708	SAR035244	Report or Study	Inspection Report	Richter, Paul J.	San Diego RWQCB	Halvax, Sandor	Southwest Marine, Inc.
105	19990712	SAR269999	Letter	Notice of Termination	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John	San Diego RWQCB
106	19990712	SAR270000	Other	Notice of Termination	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John	San Diego RWQCB
107	19990716	SAR013569	Letter	[Submits quarterly and semi-annual reports for 01/99 - 06/99.]	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
108	19990830	SAR035811	Report or Study	[Consists of various monthly, quarterly, and annual reports in accordance with Order No. 97-36.]	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
109	19990830	SAR035789	Letter	[Submits various monthly, quarterly, and annual reports in accordance with Order No. 97-36.]	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
110	19990830	SAR036512	Report or Study	Marine Sediment Monitoring and Reporting Annual Report, 08/99	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
111	19990830	SAR035790	Report or Study	Southwest Marine, Inc. Technical Report Section F.1(a-c)	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
112	19990831	SAR036800	Report or Study	ref1999 for swm.XLS, Southwest Marine, NPDES Permit Marine Sediment Monitoring & Reporting, 08/31/99	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB

TAB	DATE	BATES NO.	DOC_TYPE	SUBJECT	FROM	FM_ORG	TO	TO_ORG
113	19990831	SAR036799	Disc	Southwest Marine, NPDES Permit Marine Sediment Monitoring & Reporting, 08/31/99	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
114	19990831	SAR036848	Report or Study	swm Table B.doc, Southwest Marine, NPDES Permit Marine Sediment Monitoring & Reporting, 08/31/99	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
115	19990831	SAR036806	Report or Study	swm1999 report MSW.doc, Southwest Marine, NPDES Permit Marine Sediment Monitoring & Reporting, 08/31/99	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
116	19990831	SAR036821	Report or Study	SWM1999.XLS, Southwest Marine, NPDES Permit Marine Sediment Monitoring & Reporting, 08/31/99	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
117	19991005	SAR034660	Report or Study	Quarterly Report 07/99 - 09/99	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
118	19991030	SAR029429	Report or Study	ALTA SDG#20841.pdf, Quarterly Report 07/99 - 09/99	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
119	19991030	SAR030871	Report or Study	ALTA SDG#20842.pdf, Quarterly Report 07/99 - 09/99	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
120	19991030	SAR032424	Report or Study	ALTA SDG#20856.pdf, Quarterly Report 07/99 - 09/99	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
121	19991030	SAR015243	Report or Study	CAS SDG#K2105657.pdf, Quarterly Report 07/99 - 09/99	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
122	19991030	SAR019736	Report or Study	CAS SDG#K2105657.pdf, Quarterly Report 07/99 - 09/99	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
123	19991030	SAR032605	Report or Study	CAS SDG#K2105657.pdf, Quarterly Report 07/99 - 09/99	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
124	19991030	SAR015663	Report or Study	CAS SDG#K2105719.pdf, Quarterly Report 07/99 - 09/99	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
125	19991030	SAR020475	Report or Study	CAS SDG#K2105719.pdf, Quarterly Report 07/99 - 09/99	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB

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TAB	DATE	BATES NO.	DOC_TYPE	SUBJECT	FROM	FM_ORG	TO	TO_ORG
126	19991030	SAR024837	Report or Study	CAS SDG#K2105719.pdf, Quarterly Report 07/99 - 09/99	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
127	19991030	SAR032941	Report or Study	CAS SDG#K2105719.pdf, Quarterly Report 07/99 - 09/99	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
128	19991030	SAR016005	Report or Study	CAS SDG#K2105764.pdf, Quarterly Report 07/99 - 09/99	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
129	19991030	SAR021147	Report or Study	CAS SDG#K2105764.pdf, Quarterly Report 07/99 - 09/99	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
130	19991030	SAR025239	Report or Study	CAS SDG#K2105764.pdf, Quarterly Report 07/99 - 09/99	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
131	19991030	SAR033184	Report or Study	CAS SDG#K2105764.pdf, Quarterly Report 07/99 - 09/99	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
132	19991030	SAR016534	Report or Study	CAS SDG#K2105797.pdf, Quarterly Report 07/99 - 09/99	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
133	19991030	SAR021926	Report or Study	CAS SDG#K2105797.pdf, Quarterly Report 07/99 - 09/99	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
134	19991030	SAR025764	Report or Study	CAS SDG#K2105797.pdf, Quarterly Report 07/99 - 09/99	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
135	19991030	SAR033516	Report or Study	CAS SDG#K2105797.pdf, Quarterly Report 07/99 - 09/99	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
136	19991030	SAR017081	Report or Study	CAS SDG#K2105847.pdf, Quarterly Report 07/99 - 09/99	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
137	19991030	SAR022748	Report or Study	CAS SDG#K2105847.pdf, Quarterly Report 07/99 - 09/99	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
138	19991030	SAR026237	Report or Study	CAS SDG#K2105847.pdf, Quarterly Report 07/99 - 09/99	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
139	19991030	SAR033732	Report or Study	CAS SDG#K2105847.pdf, Quarterly Report 07/99 - 09/99	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
140	19991030	SAR017618	Report or Study	CAS SDG#K2105847A.pdf, Quarterly Report 07/99 - 09/99	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
141	19991030	SAR018235	Report or Study	CAS SDG#K2105900.pdf, Quarterly Report 07/99 - 09/99	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB

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TAB	DATE	BATES NO.	DOC_TYPE	SUBJECT	FROM	FM_ORG	TO	TO_ORG
142	19991030	SAR023981	Report or Study	CAS SDG#K2105900.pdf, Quarterly Report 07/99 - 09/99	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
143	19991030	SAR034004	Report or Study	CAS SDG#K2105900.pdf, Quarterly Report 07/99 - 09/99	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
144	19991030	SAR018250	Report or Study	CAS SDG#K2105935.pdf, Quarterly Report 07/99 - 09/99	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
145	19991030	SAR034225	Report or Study	CAS SDG#K2105935.pdf, Quarterly Report 07/99 - 09/99	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
146	19991030	SAR018717	Report or Study	CAS SDG#K2105935A.pdf, Quarterly Report 07/99 - 09/99	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
147	19991030	SAR026933	Report or Study	PADs CAS SDG#K2105657.pdf, Quarterly Report 07/99 - 09/99	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
148	19991030	SAR027497	Report or Study	PAHs CAS SDG#K2105900.pdf, Quarterly Report 07/99 - 09/99	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
149	19991030	SAR028072	Report or Study	PAHs CAS SDG#K2105935.pdf, Quarterly Report 07/99 - 09/99	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
150	19991030	SAR015241	Disc	Quarterly Report 07/99 - 09/99	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
151	19991030	SAR034653	Video	Quarterly Report 07/99 - 09/99	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
152	19991030	SAR034655	Video	Quarterly Report 07/99 - 09/99	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
153	19991030	SAR034656	Video	Quarterly Report 07/99 - 09/99	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
154	19991030	SAR034657	Video	Quarterly Report 07/99 - 09/99	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
155	19991030	SAR034658	Video	Quarterly Report 07/99 - 09/99	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
156	19991030	SAR034659	Letter	Quarterly Report 07/99 - 09/99	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
157	19991030	SAR034652	Report or Study	San Diego RWQCB File, ShipData.mdb, Quarterly Report 07/99 - 09/99	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB

TAB	DATE	BATES NO.	DOC_TYPE	SUBJECT	FROM	FM_ORG	TO	TO_ORG
158	19991210	SAR050982	Letter	Response Regarding Disposal of Sediments	Robertus, John	San Diego RWQCB	Halvax, Sandor	Southwest Marine, Inc.
159	20000106	SAR035042	Letter	Receipt of Monitoring Reports Required by Order No. 97-36; General NPDES Permit No. CAG039001, Waste Discharge Requirements for Discharges from Ship Construction, Modification, Repair, and Maintenance Facilities and Activities Located in the San Diego Region (TTWQ/CPLX 1/A); WDID No. 9 000000137	Robertus, John H.	San Diego RWQCB	Halvax, Sandor	Southwest Marine, Inc.
160	20000106	SAR035049	Letter	Receipt of Monitoring Reports Required by Order No. 97-36; General NPDES Permit No. CAG039001, Waste Discharge Requirements for Discharges from Ship Construction, Modification, Repair, and Maintenance Facilities and Activities Located in the San Diego Region (TTWQ/CPLX 1/A); WDID No. 9 000000137	Robertus, John H.	San Diego RWQCB	Halvax, Sandor	Southwest Marine, Inc.
161	20000128	SAR034729	Letter	Quarterly Report 10/99 - 12/99	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
162	20000128	SAR034730	Report or Study	Quarterly Report 10/99 - 12/99	Halvax, Sandor	Southwest Marine, Inc.	Robertus, John H.	San Diego RWQCB
163	20000208	SAR035274	Report or Study	Inspection Report	Richter, Paul J.	San Diego RWQCB	Halvax, Sandor	Southwest Marine, Inc.