

ATTACHMENT A TO RESOLUTION NO. R8-2016-0059

Amendments to the Water Quality Control Plan –Santa Ana Region to incorporate the Newport Bay Copper (Cu) TMDLs, and Non-TMDL Action Plans for Zinc (Zn), Mercury (Hg), Arsenic (As) and Chromium (Cr)

[Note: Total Maximum Daily Loads established for waters in the Santa Ana Region are currently shown in Chapter 5 – Implementation. To enhance clarity and facilitate reader access to established TMDLs, a new separate chapter (Chapter 6 – Total Maximum Daily Loads), is proposed for addition to the Basin Plan.

The current Chapters 6 (Monitoring and Assessment) and 7 (Water Resources and Water Quality Management), will be re-numbered to Chapters 7 and 8, respectively. Text references to these chapters in the Plan would be modified as necessary to reflect the revised numbers, and the tables/figures in these Chapters would be renumbered appropriately. These changes would be accompanied by appropriate changes to the Table of Contents and Lists of Tables and Figures.

The Copper (Cu) TMDLs and Non-TMDL Action Plans for Zinc (Zn), Mercury (Hg), Arsenic (As) and Chromium (Cr) are proposed to be added to the new Chapter 6 with this amendment. Over time, the established TMDLs (now in Chapter 5 of the Basin Plan) will be moved to the new Chapter 6, with appropriate reformatting and renumbering of tables and figures and page numbers and headers/footers. No substantive changes to the TMDLs will be made absent a Basin Plan amendment.]

The following identifies the changes to the Basin Plan as they would appear in the Basin Plan. Attachment B shows these changes in underline/strike-out format.

Add to the Basin Plan after Chapter 5 - Implementation:

Chapter 6. Total Maximum Daily Loads (TMDLs)

6.1 Newport Bay Watershed TMDLs

6.1 Copper (Cu): Cu TMDLs for Newport Bay

6.1 Zinc (Zn), Mercury (Hg), Arsenic (As), Chromium (Cr): Zn, Hg, As and Cr Non-TMDL Action Plans (Action Plans) for Newport Bay

These TMDLs and Non-TMDL Action Plans were adopted by the Regional Water Quality Control Board, Santa Ana Region on [insert date here].

These TMDLs and Non-TMDL Action Plans were approved by:

- The State Water Resources Control Board on [insert date here].
- The Office of Administrative Law on [insert date here].
- The U.S. Environmental Protection Agency on [insert date here].

The elements of the Cu TMDLs and the Implementation Tasks and Schedule are presented in Table 6.1.Cu-1. The Non-TMDL Action Plans for Zn, Hg, As and Cr are presented in Table 6.1.Zn, Hg, As, Cr-1. The documentation prepared to support the adoption of these TMDLs and Non-TMDL Action Plans can be found at the Regional Board's

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website:http://www.waterboards.ca.gov/santaana/water_issues/programs/tmdl/tmdl_metals.shtm

Table 6.1.Cu-1: Total Maximum Daily Loads (TMDLs) for Copper (Cu) for Newport Bay

Problem Statement for Cu
<p>In June 2002, USEPA promulgated TMDLs for copper (Cu), lead (Pb), zinc (Zn) and cadmium (Cd) in the Upper Bay and Cu, Pb and Zn in the Lower Bay, based on an impairment assessment conducted by USEPA (USEPA, 2002). (USEPA also promulgated Cd, Cu, Pb and Zn TMDLs for San Diego Creek (<i>ibid.</i>)). Sediment metal concentrations were also shown to exceed water quality criteria, and sediment toxicity was found in sediment samples across the Upper and Lower Bay (Bight '98, '03). Increased Cu and Zn concentrations were found in mussels in the Lower Bay. Cadmium (Cd), Cu, lead (Pb) and Zn are known to bioaccumulate in benthic organisms, but do not generally biomagnify up the food chain; however, more recent studies have shown that sublethal Cu concentrations in water can be harmful to salmonids. The concentrations of heavy metals in aquatic plants in Newport Bay have not been documented, although Allen et al (2008) tested concentrations in algae.</p> <p>In 2006, the State Board assessed individual metals in Newport Bay and listed the Upper and Lower Bay for Cu. No other individual metals were listed based on the State Board assessment, although USEPA's 2002 TMDLs remained in place. State Board also demonstrated no metals impairment in San Diego Creek.</p> <p>The latest impairment assessment by Regional Board staff, based on data collected after 2002, showed that Upper and Lower Newport Bay are still impaired for Cu in water and sediments. The Cu TMDLs address the Cu impairment, and revise and replace the Cu TMDLs promulgated by USEPA (2002). Demonstrated impairment in the Bay due to other metals (Zn, Hg, As and Cr) are addressed by Non-TMDL Action Plans (Action Plans). The Action Plan for Zn will replace the Zn TMDLs promulgated by USEPA.</p> <p>Impairment Assessment Results</p> <p>Water. Both Upper and Lower Newport Bay, including marinas, are impaired for Cu based on exceedances of the dissolved Cu saltwater criteria specified in the 2000 California Toxics Rule (CTR).</p> <p>Sediments. Sediment Cu exceeded the Cu Effects Range Median (ERM) sediment guideline in surface sediments in the Lower Bay, particularly in the Turning Basin/South Lido Channel areas. Sediment toxicity was also found in the Upper and Lower Bay in multiple studies. Since only a subset of marinas was sampled in the Cu-Metals Marina Study, a more extensive marina survey is needed to fully assess the extent of sediment Cu exceedances and sediment toxicity in marina and boatyard areas in Newport Bay.</p> <p>Fish and/or mussel tissue. Cu did not exceed fish tissue guidelines for either human health or wildlife.</p>
Numeric Targets for Cu
<p>Numeric targets have been identified below for water and sediment. The targets include 1) the CTR saltwater criteria for dissolved copper (Cu) in water, and 2) the Effects Range Low (ERL) sediment guideline for total Cu in sediments. ERLs rather</p>

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ERM guidelines are used to provide a conservative approach,.

<i>Numeric Targets for Copper (Cu) in Water and Sediment in Newport Bay</i>			
Metal	Water (µg/L) (CTR saltwater criteria)		Sediment (µg/g) (ERL sediment guidelines)
	acute	chronic	Effects Range Low
Cu	4.8	3.1	34

Source Analysis for Cu

Known sources of Cu include: 1) Cu antifouling paints on boat hulls and boatyards; 2) urban runoff from major tributaries; 3) urban runoff from storm drains that empty directly into Newport Bay; 4) Bay sediments; and, 5) air deposition. Cu antifouling paints (AFPs) are the largest sources of Cu to the Bay, and are an order of magnitude higher than the second largest source, which is runoff from the major tributaries. Cu in storm drain runoff is small compared to the two largest sources, but may have localized impacts in areas near storm drains. Bay sediments may also be a source of Cu to Bay waters, although their contribution has not yet been quantified. In addition, algae and other vegetation may contain Cu; however, these sources have not been quantified.

<i>Summary of Copper (Cu) Loads to Newport Bay*</i>			
	Dissolved Cu (lbs/yr) This TMDL	Percent (%) of Total	Cu (lbs/yr) (Toxics TMDLs)
Boats ¹	36,000	89.6	50,114
Tributary runoff ²	3005 (548)	7.5	7020
Storm drain runoff ³	303	0.75	
Air deposition ⁴	101	0.25	101
Ambient seawater ⁵	777	1.93	777
Bay Sediments ⁶	Unknown	-	Unknown
Total	40,186	100%	58,002⁷

* This table includes data from Table E-11 in Toxics TMDLs, Part E (USEPA 2002).

Numbers in italics are different from those estimated by USEPA (Toxics TMDLs, 2002).

¹Estimates of dissolved Cu loading from passive leaching and hull cleaning (USEPA Toxics TMDLs).

²Dissolved Cu load in tributary runoff (freshwater) was estimated from total Cu in storm water samples from San Diego Creek and Santa Ana Delhi for 2009-10 and 2010-11 monitoring data (County of Orange). (Dissolved Cu = Total Cu x 0.80) Number in parentheses indicates dissolved Cu load in runoff for the two driest years (2006-07, 2007-08). USEPA's estimate was from OCPFRD data for San Diego Creek and Santa Ana-Delhi (2000).

³Dissolved Cu load from storm drains (mean of 139lbs (2007), 468lbs (2008) at runoff coefficient of 0.9) was calculated from Lower Newport Bay Storm drain study data.

⁴Estimate for direct deposition of Cu to surface waters of Newport Bay (Toxics TMDLs, TSD sect. IV).

⁵Estimate of dissolved Cu loads from ocean based on local data (R. Gossett) x approximate ocean volume

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into Newport Bay (USEPA 2002).

⁶Cu load to waters from bay sediments is unknown at this time and should be investigated, but it is likely lower than contributions from recreational boats and major tributaries.

⁷Cu Total corrected from Table E-11, Toxics TMDLs (USEPA 2002).

Loading Capacity and Linkage Analysis for Cu

In the 2002 Newport Bay Toxics TMDLs, USEPA outlined both concentration and mass loading approaches to define the metal loading capacity and the total maximum daily load (TMDL). Mass based load allocations were used to set an upper limit on the amount of metals that are discharged into Newport Bay to prevent an accumulation of metals in the sediment, which may then cause sediment or pore water toxicity. The mass based allocations will assist in protecting benthic communities. Concentration based load allocations were defined to prevent discharges of high pulses of metals, in the short term, so that water quality criteria are met on a regular basis.

This Cu TMDL used the same methodology as USEPA used in the Toxics TMDLs to calculate loads, and the equations used in this TMDL to calculate the mass based loading capacity were based on USEPA's bathtub model approach (below).

The total allowable dissolved Cu by mass was calculated by multiplying the saltwater numeric target (chronic CTR criterion) by the volume of water in the Bay. The *mass loading capacity* of dissolved Cu was calculated as the mass of Cu that leaves the Bay minus the mass of Cu remaining in the Bay. The *concentration loading* of dissolved Cu is equivalent to the saltwater acute and chronic targets for dissolved Cu.

$$\begin{aligned} \text{Total allowable Dissolved Cu by mass} &= \text{Bay volume} \times \text{Criteria } (C_c) \\ &= 19,000,000 \text{m}^3 (1000 \text{L/m}^3) \times 3.1 \mu\text{g/L } (g/1000\mu\text{g}) \\ &= 58,900,000 \text{g} \times \text{lb}/453.6 \text{g} \\ &= 129850.09 \text{lbs} \end{aligned}$$

$$\begin{aligned} \text{Dissolved Cu Mass Loading Capacity} &= \text{Mass}_{\text{out}} - \text{Mass}_{\text{in}} \\ &= (\text{Criteria} \times \text{Volume}_{\text{out}}) - \text{Mass}_{\text{in}} \\ L_f + L_i &= C_c \times (Q_b + 1.25 A v_s F_p) - Q_o C_o \\ &= (3.1 \mu\text{g/L} \times (g/1000\mu\text{g})) \times (4980399.79 \text{ m}^3/\text{d} \times (1000 \text{ L/m}^3)) \\ &\quad - (4830917.9 \text{ m}^3/\text{d} \times (1000 \text{ L/m}^3) \times 0.0002 \text{mg/L} \times (1000 \text{mg/g})) \\ &= 14473.056 \text{ g/d} \times (\text{lb}/453.6 \text{g}) \times (365 \text{d/yr}) \\ &= 11646.09 \text{ lbs/yr} \end{aligned}$$

Where :

- L_f =Dissolved Cu in Freshwater Inflow (lbs/yr)
- L_i =Dissolved Cu Loading from Boats (lbs/yr)
- C_c =Chronic CTR Saltwater Criteria for Dissolved Cu =3.1 $\mu\text{g/L}$
- Q_b =Volume Mixed Water Leaving the Bay = 4870039.8 m^3/day
- A =Newport Bay Surface Area =5518000 m^2
- v_s =Net Settling [as a velocity] =0.08000 m/day =0.00093 mm/s
- F_p =Particulate Fraction – *Estimated* =0.20000 (20% of total metal)
- Q_o =Volume Ocean Water Entering the Bay =4830917.9 m^3/day
- C_o =Dissolved Cu in the Ocean =0.00020 mg/L

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Mass based loading capacity for Dissolved Copper (Cu) in Newport Bay	
Dissolved Cu Loading Capacity (lbs/yr)	11,646

Concentration based loading capacity for Dissolved Copper (Cu) in Newport Bay		
Metal	Saltwater acute loading capacity (µg/L)	Saltwater chronic loading capacity (µg/L)
Cu	4.8	3.1

TMDLs, Waste Load and Load Allocations, and Margin of Safety for Cu

In USEPA's Toxics TMDLs, mass based loads for dissolved metals were based on data prior to 2002. The total loading capacities were calculated by the bathtub model. A margin of safety of 20 percent (%) was subtracted from the total loading capacity and the remaining loading capacity was divided between the waste load allocations (WLAs) and the load allocations (LAs).

In this TMDL, Cu load estimates for Newport Bay were based on data obtained since 2002. The total loading *capacity* for dissolved Cu was calculated by the bathtub model as 11,646 pounds of Cu per year, which is the same total loading capacity used by USEPA in the Toxics TMDLs (see Loading Capacity Section above). A margin of safety of 20 percent (%) was subtracted from the total loading capacity, and the remaining loading capacity was divided between the WLAs and the LAs. If new data were not available for designated sources for WLAs and LAs, the Cu allocations from Tables E-10 and E-11 in the Toxics TMDLs were used (USEPA 2002). Agricultural runoff and air deposition were calculated as 80% of USEPA's allocations because some of USEPA's allocations were based on total Cu rather than dissolved Cu concentrations.

For freshwater discharges, the mean Cu discharge from San Diego Creek and Santa Ana Delhi was calculated to be approximately 3005 pounds of dissolved Cu per year for wet years (2009-10, 2010-11 monitoring years). (Cu loads from tributaries during wet years were used in this TMDL to be conservative, with respect to seasonal variation, as larger loads are discharged in wet years compared to dry years. With respect to Cu discharges from boats; however, it is assumed that discharges from passive leaching plus hull cleaning do not change drastically with high or low rainfall.) In addition, the mean Cu discharge from storm drains was approximately 171 pounds of dissolved Cu per year (mean of 2007, 2008).

The WLAs and LAs were divided into "tributary and storm drain allocations" and "boat and other allocations". The allocation for open space was considered to be part of the MS4 permit allocation as open space runoff enters the MS4 system and mixes with other runoff; therefore, there are no Cu data specific to open space runoff, and Cu concentrations in open space runoff are likely to be low compared to urban runoff.

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The dissolved Cu allocations were calculated as follows:

$$\text{Dissolved Cu Mass Loading Capacity - MoS} = [\text{Tributary+Storm drain allocations (WLAs+LAs)} + (\text{boats/other(LAs)})] \text{ (lbsCu/yr)}$$

$$11,646 - 2329 = 3176 + 6141 \text{ (lbs Cu/year)}$$

The Dissolved Cu Mass Loading Capacity minus the MoS (Margin of Safety) is equal to the Tributary and Storm drain allocations (WLAs and LAs) plus the LAs for boats and air deposition. There is no LA for open space, as in USEPA's allocations, since much of the runoff from open space goes into San Diego Creek, Santa Ana Delhi or smaller storm channels, and is accounted for in the WLAs for urban runoff.

These allocations apply to the water column in Upper and Lower Newport Bay. These allocations apply to the receiving waters of Newport Bay at all times of the year, regardless of freshwater flow from all tributaries, including San Diego Creek, Santa Ana Delhi, Costa Mesa Channel and other tributaries to Newport Bay.

Mass based Allocations for Copper (Cu) in Newport Bay		
Category	Type	Dissolved Copper
Tributary or Storm drain WLAs	MS4 permittees	2,501
	CalTrans	348
	Other NPDES permittees	156
Tributary or Storm drain LAs	Agricultural runoff	171 [#]
	Open space runoff	(part of MS4 WLA)
	Sub-total	3176* lbs/yr
Boatyards WLAs	Boatyards	0
Boats and other LAs	Boats ⁺	6060
	Air deposition	81 [#]
	Sub-total	6141 lbs/yr
MOS		2,329 lbs/yr
Total TMDL		11,646 lbs/yr

*Cu load from tributary (3005 lbs/yr) plus storm drain (171 lbs/yr) runoff (Tributary load is less in dry years (<1000 lbs/yr))

⁺There are approximately 15 commercial boats longer than 79 ft. that are covered under the federal Vessel General NPDES Permit. Cu discharges from those 15 boats are approximately 106 lbs/yr. Since this discharge is low compared to the total load from boats, a separate WLA for commercial boats longer than 79 ft is not recommended.

[#]LAs for agricultural runoff and air deposition were calculated from total Cu numbers in Table E-10 in the Toxics TMDLs (total Cu x 0.80).

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Concentration based Allocations for Copper in Newport Bay*		
Metal	Dissolved saltwater acute TMDLs and Allocations (µg/L)	Dissolved saltwater Chronic TMDLs and Allocations (µg/L)
Cu	4.8	3.1

*these concentrations are equivalent to the CTR criteria and are the same as those in the Toxics TMDLs (USEPA 2002)

Implementation Plan

Cu loading from boats is the largest source of Cu to Newport Bay; therefore, the highest priority of this Cu TMDL Implementation Plan is to reduce or eliminate Cu discharges from Cu AFPs on recreational and commercial boats. ***This TMDL cannot be met unless Cu loading from boats is reduced or eliminated.*** The second priority is to address sediment impairment from Cu in parts of Lower Newport Bay, and to sample & evaluate areas with no or limited sediment Cu data. The recommended approach to addressing sediment impairment due to Cu is also expected to address sediment impairment from zinc (Zn) and mercury (Hg), which also exceeded sediment ERM guidelines. The third priority of this plan is to meet the Cu allocations for tributary runoff since this is the second largest source of Cu to the Bay.

This recommended Cu TMDL includes compliance schedules that allow time to implement and adaptively manage the tasks to ensure effectiveness, efficiency and fairness. It is proposed that ***final compliance with the TMDL be achieved as soon as possible but no later than 15 years*** from the date of approval of the TMDL by USEPA. The compliance schedule approach also recognizes that responsible parties may elect to pursue investigation and adoption of site-specific objectives for Cu in Newport Bay that would supersede the CTR criteria.

TMDL implementation will be carried out in Newport Bay by the following:

1) Dischargers responsible to reduce Copper (Cu) Loads from Copper antifouling paints (Cu AFPs)

- (1) State Lands Commission
- (2) City of Newport Beach
- (3) County of Orange
- (4) Marina owner/operators
- (5) Individual recreational boat owners
- (6) Commercial vessel owners/operators
- (7) Underwater hull cleaners
- (8) Boatyards
- (9) Boat owners of transient vessels

2) Dischargers responsible to Correct Sediment Impairment from Copper (Cu)

- (1) State Lands Commission
- (2) City of Newport Beach
- (3) County of Orange

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- (4) Marina owner/operators
- (5) Individual recreational boat owners
- (6) Commercial vessel owners/operators
- (7) Underwater hull cleaners
- (8) Boatyards
- (9) Boat owners of transient vessels

3) Dischargers responsible to meet Copper (Cu) Loads from Tributary runoff and Storm Drains

- (1) County of Orange and other MS4 permittees
- (2) CalTrans
- (3) Agricultural dischargers
- (4) Other NPDES permittees

Implementation tasks and schedules are summarized below.

Recommended Implementation Tasks and Schedule for Copper (Cu) TMDL

Implementation Task	Schedule and Dischargers/Responsible Parties
1 Reduce Copper (Cu) loading from Cu antifouling paints (Cu AFPs) on recreational and commercial boats	<p>As soon as possible but no later than (15 years from date of USEPA approval of Basin Plan amendment (BPA)), with the following interim schedule:</p> <p>No later than (3 years from the date of USEPA approval of the BPA): A minimum 20% reduction of Cu discharges from AFPs shall be achieved</p> <p>No later than (7 years from the date of USEPA approval of the BPA): A minimum 50% reduction of Cu discharges from AFPs shall be achieved</p> <p>No later than (11 years from the date of USEPA approval of the BPA): A minimum 70% reduction of Cu discharges from AFPs shall be achieved</p> <p>No later than (15 years from the date of USEPA approval of the BPA): A minimum 83% reduction of Cu discharges from AFPs shall be achieved</p>
1.1 Restrict the sale and use of Cu AFPs	
1.1.1 Regional Board staff and dischargers will work with DPR and the State Board to restrict the sale and use of Cu antifouling paints (Cu AFPs) in Newport Bay to achieve/help achieve the load allocation for boats.	Ongoing by Regional Board staff
1.1.2 Regional Board staff and dischargers will work with USEPA to restrict the sale and use of	Ongoing by Regional Board staff

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<p><i>Cu antifouling paints (Cu AFPs) in water bodies impaired by Cu, including Newport Bay; and on the development and implementation of Clean Boating Act (CBA) requirements.</i></p>	
<p>1.2 Reduce Cu discharges from Cu AFPs</p>	
<p>1.2.1 Implementation Plan and Schedule to reduce Cu discharges from Cu AFPs</p> <p>1.2.1 (1) <i>The dischargers shall submit one or more implementation plan(s) and schedule(s) to achieve reductions of Cu discharges from Cu AFPs in accordance with the requirements identified in Task 1 above (see also section 5.6.3.1.2.2).</i></p> <p>1.2.1 (2) <i>The dischargers shall implement their plan(s) and schedule(s)</i></p>	<p><u>Dischargers/Responsible Parties</u> <i>State Lands Commission City of Newport Beach (City) County of Orange (County) Marina owners/operators Individual boat owners Underwater hull cleaners (during phase-out of Cu paints)</i></p> <p>1.2.1 (1) <i>As soon as possible but no later than (3 months from date of USEPA approval of BPA)</i></p> <p>1.2.1 (2) <i>Upon Regional Board approval</i></p>
<p>1.2.2 Implementation Tasks to reduce Cu discharges from Cu AFPs <i>The proposed implementation plan(s) and schedule(s), not to exceed 15 years, shall include consideration of the strategies listed below at a minimum.</i></p> <p><i>(These plan(s) may include controls/incentives for marina owner/operators and individual boat owners such as restricting the use of Cu AFPs through marina leases, permits or other mechanisms.)</i></p> <p>1.2.2.1 Transition from Cu AFPs to nontoxic AFPs A plan and schedule, not to exceed 15 years, to transition from Cu AFPs to nontoxic AFPs/coatings on recreational and commercial boats moored in the Bay permanently or intermittently for more than 30 consecutive days; to require new boats to use nontoxic AFPs; and to determine the current usage of Cu AFPs in the Bay.</p> <p>1.2.2.2 Require all underwater hull cleaners to use BMPs including soft cloths or hull cleaning containment methods, and develop a diver certification program</p> <p><i>A plan and schedule to identify, implement and enforce the use of BMPs by all underwater hull cleaners, by a certification, permit or licensing system, that includes education, training and certification of all underwater hull cleaners.</i></p>	

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<p><i>Additional BMPs that include hull cleaning in slip liners or dry dock storage may also be included.</i></p> <p><i>1.2.2.3 Require boaters to convert to lower leach rate Cu AFPs with leach rates at or below 9.5 µg/cm²/d.</i></p> <p><i>1.2.2.4 Continue Monitoring in the Bay, including marinas and channels</i> <i>A monitoring plan for marinas, channels and open water sites in the Bay, to monitor dissolved and total Cu concentrations in water and sediment, and water and sediment toxicity; and data evaluation to determine Cu load reduction and the effects of the reduced Cu load from Cu AFPs on Cu concentrations in marina and channel waters and sediments. Monitoring shall include dissolved and total Cu concentrations in water and sediment, water and sediment toxicity, water quality parameters (DOC, pH, salinity, temperature, TSS, TOC), and benthic testing (if necessary).</i></p> <p><i>1.2.2.5 Continue Education Program(s) for Boaters, Boatyards and Marinas</i> <i>Identify and evaluate existing boater and/or boat related education program(s) in the Bay, and revise those programs as necessary to include the following tasks, at a minimum:</i></p> <ul style="list-style-type: none"><i>(1) Cu water quality issues and TMDL requirements;</i><i>(2) Transitioning from Cu to nontoxic AFPs including costs, availability and efficacy of nontoxic AFPs/coatings; conversion costs from Cu to nontoxic AFPs; application and maintenance costs; and hull cleaning costs;</i><i>(3) Nontoxic AFP use requirements including recommended BMPs for hull cleaning and frequency of cleaning;</i><i>(4) BMPs requirements for all underwater hull cleaners;</i><i>(5) Use of lower leach rate Cu AFPs with leach rates at or below 9.5 µg/cm²/d. (6) Conditions and requirements instituted by the State Lands Commission, the City of Newport Beach and Orange County to reduce Cu AFP discharges to achieve TMDL requirements by responsible parties (e.g. new conditions in marina lease agreements and marina slip agreements; hull cleaning permits or licenses that include BMP requirements);</i><i>(7) Potential boat storage options, and containment systems for boat cleaning and/or storage (e.g. slip liners).</i> <p><i>1.2.2.6 Coordinate with Regional Board staff on work with DPR and USEPA</i> <i>Coordinate with Regional Board staff on work with</i></p>	
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<p>DPR and USEPA to institute appropriate restrictions on Cu AFPs to achieve the TMDL</p>	
<p>2) Remediate areas of known sediment Cu impairment, and identify/remediate sediment impairment in areas with no or limited sediment Cu data (including marina and boatyard areas)</p>	<p><u>Dischargers/Responsible Parties</u> State Lands Commission City of Newport Beach (City) County of Orange (County) Marina owners/operators Individual boat owners Underwater hull cleaners (during phase-out of Cu paints) Boatyard owners/operators</p>
<p>2.1 Implementation Plan and Schedule to remediate areas of known areas of impairment from sediment Cu; and identify/remediate areas of the Bay with limited or no sediment data</p> <p>2.1 (1) The dischargers shall submit an implementation plan and schedule to correct Cu sediment impairment in areas that exceed the ERM sediment guideline for Cu, including the Turning Basin and S. Lido Channel.</p> <p>The proposed plan shall include recommended corrective strategies for areas of known sediment impairment, and monitoring and evaluation necessary to determine: (1) the effectiveness of the corrective actions on sediment Cu impairment; and, (2) the extent of sediment Zn and Hg (and Cu) impairment in areas of the Bay that have not been monitored especially in marina and boatyard areas).</p> <p>2.1 (2) The dischargers shall implement their plan(s) and schedule(s)</p>	<p><u>Dischargers/Responsible Parties</u> State Lands Commission City of Newport Beach (City) County of Orange (County) Marina owners/operators Individual boat owners Underwater hull cleaners (during phase-out of Cu paints) Boatyard owners/operators</p> <p>2.1 (1) As soon as possible but no later than (3 months from date of USEPA approval of BPA)</p> <p>2.1 (2) Upon Regional Board approval</p>
<p>3) Meet Copper (Cu) allocations for tributary runoff</p>	
<p>3.1 The Regional Board will revise existing WDRs and NPDES permits, including the MS4 storm water permit, as necessary to implement the Cu TMDL requirements. New permits will implement applicable Cu TMDL requirements.</p>	<p>Existing permits : Upon permit renewal (or earlier, if dictated by circumstances that require revisions to an existing permit) after (date of USEPA approval of BPA)</p> <p>New permits: as new permits are established</p>
<p>3.2 (1) The dischargers shall conduct monitoring for Cu loading from tributary runoff to determine</p>	<p><u>Dischargers/Responsible Parties</u> County of Orange, City of Newport Beach and</p>

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<p><i>whether Cu wasteload and load allocations (WLAs, LAs) are consistently achieved. (Existing monitoring for MS4 systems may be utilized for this task.)</i></p> <p><i>3.2 (2) If Cu loading exceeds TMDL allocations for urban and/or agricultural runoff, appropriate dischargers must develop and submit a plan and schedule to meet the TMDL allocations for Cu discharges from tributary runoff.</i></p> <p><i>3.2 (3) The dischargers shall implement their plan(s) and schedule(s)</i></p>	<p><i>other MS4 permittees CalTrans Agricultural dischargers Other NPDES permittees</i></p> <p><i>3.2 (1) As soon as possible but no later than (3 months from date of USEPA approval of BPA)</i></p> <p><i>3.2 (2) As soon as possible but no later than 3 months after data results showing that WLAs or LAs have not been achieved</i></p> <p><i>3.2 (3) Upon Executive Officer approval</i></p>
<p>4) Evaluate Copper (Cu) discharges from storm drains for local impacts</p>	
<p><i>4.1 (1) The dischargers shall develop and submit a plan and schedule to determine the significance of localized Cu discharges from storm drain loads to the Upper and Lower Bay. Storm drain loads to Newport Bay and the receiving waters and sediments shall be monitored and the data shall be evaluated to determine the Cu loads from storm drains and whether those loads result in water quality standards impairment. to water and sediments.</i></p> <p><i>4.1 (2) The dischargers shall implement the plan and schedule to determine the significance of localized Cu discharges from storm drain loads in the Upper and Lower Bay.</i></p> <p><i>4.1 (3) If impairment is found, the dischargers shall develop and submit a plan and schedule to reduce Cu discharges from storm drains to areas impacted and correct the impairment. Impairment shall be determined in accordance with the State Board's 303(d) Listing Policy.</i></p> <p><i>4.1 (4) The dischargers shall implement the plan and schedule to correct impairment resulting from Cu discharges from storm drain loads in the Upper and Lower Bay.</i></p>	<p><i>4.1 (1) As soon as possible but no later than (3 months from date of USEPA approval of BPA)</i></p> <p><i>4.1 (2) Upon Executive Officer approval.</i></p> <p><i>4.1 (3) As soon as possible but no later than 3 months from the findings of negative impacts to an area</i></p> <p><i>4.1 (4) Upon Executive Officer approval.</i></p> <p><i>Dischargers/Responsible Parties County of Orange, City of Newport Beach and other MS4 permittees CalTrans Agricultural dischargers Other NPDES permittees</i></p>
<p>5) Continue Monitoring</p>	
<p><i>5 (1) The dischargers shall develop and submit a plan and schedule for monitoring of Cu in water and sediments, toxicity testing in water and sediments, and benthic testing in sediments. Monitoring for the following discharges and waters shall be included: --Marina and channel waters and sediments</i></p>	<p><i>5 (1) As soon as possible but no later than (3 months from date of USEPA approval of BPA)</i></p> <p><i>5 (2) Upon Regional Board approval</i></p>

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<p>--Tributary runoff including San Diego Creek, Santa Ana Delhi and Big Canyon Wash --Storm drain runoff The proposed monitoring plan may rely, to the extent appropriate, on other monitoring that is currently being conducted in response to other programs/requirements. Where such reliance is proposed, justification must be provided.</p> <p>5 (2) The dischargers shall implement the plan and schedule for the monitoring of Cu described in 5 (1).</p>	<p><u>Dischargers/Responsible Parties</u> State Lands Commission County of Orange and other MS4 permittees City of Newport Beach CalTrans Agricultural dischargers Other NPDES permittees</p>
<p>6) Conduct Special Studies</p> <p>Special studies may be necessary to refine the TMDL and/or the TMDL implementation plan, particularly if implementation of the preceding tasks proves insufficient to achieve the TMDL. These studies may include:</p> <p>6.1) Determine the Cu loading from In-Bay Sediments Cu discharges from Bay sediments have not yet been quantified.</p> <p>6.2) Determine the Cu loading from Algae & Other Vegetation Cu loading from algae and other vegetation has not yet been quantified.</p>	<p>Special studies shall be implemented by the dischargers in accordance with direction from the Regional Board Executive Officer per Water Code Section 13267.</p> <p><u>Dischargers/Responsible Parties</u> State Lands Commission County of Orange and other MS4 permittees City of Newport Beach CalTrans Agricultural dischargers Other NPDES permittees</p>
<p>7) Submit Updated TMDL Report, and Reevaluate and Revise the TMDL</p>	<p>Within six months of the completion of implementation tasks 1.2.2.1 through 1.2.2.8, an updated TMDL report shall be submitted by the dischargers. This report shall evaluate the efficacy of the implemented Cu reduction strategies, and provide recommendations for revisions to those strategies and this Cu TMDL.</p> <p>The Regional Board will reevaluate this TMDL in (five years after the approval of the basin plan amendment by USEPA) or earlier if warranted by new data, the adoption of site-specific Cu objectives or the Updated TMDL report.</p>

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Table 6.1. Zn,Hg,As,Cr-1: Non-TMDL Action Plans (Action Plans) for Zinc (Zn), Mercury (Hg), Arsenic (As) and Chromium (Cr)

Problem Statement for Zn, Hg, As and Cr Non-TMDL Action Plans (Action Plans)
<p>In 2002, USEPA promulgated TMDLs for copper (Cu), lead (Pb), zinc (Zn) and cadmium (Cd) in the Upper Bay and Cu, Pb and Zn in the Lower Bay, based on an impairment assessment conducted by USEPA (USEPA, 2002). (USEPA also promulgated certain metals TMDLs for San Diego Creek.(<i>ibid.</i>)) Sediment metal concentrations were also shown to be high, and sediment toxicity was found in sediment samples across the Upper and Lower Bay (Bight '98, '03). Increased Zn concentrations were found in mussels in the Lower Bay. Cd, Pb and Zn are known to bioaccumulate in benthic organisms, but do not generally biomagnify up the food chain. The concentrations of heavy metals in aquatic plants in Newport Bay have not been documented, although Allen et al (2008) tested concentrations in algae.</p> <p>In 2006, the State Board assessed individual metals in Newport Bay and listed the Upper and Lower Bay for Cu. No other individual metals were listed based on the State Board assessment, although USEPA's 2002 TMDLs remained in place. State Board also demonstrated no metals impairment in San Diego Creek.</p> <p>This impairment assessment, based on data collected after 2002, showed impairment due to zinc (Zn), mercury (Hg), arsenic (As) and chromium (Cr) in Newport Bay. Non-TMDL Action Plans for these metals, rather than TMDLs, are identified below. The rationale for this alternative remediation approach is described below. The Action Plans include a Problem Statement, Source Analysis (if available) and Recommended Action Plan Tasks to Address Impairment. No allocations or linkage analyses are included. These Non-TMDL Action Plans replace the TMDLs for these metals that were promulgated by USEPA in 2002. The Non-TMDL Action Plan approach may be modified via future Basin Plan amendment if additional data and information warrant a TMDL or other alternative approach.</p> <p>Zn and Hg. Action Plans are recommended for Zn and Hg since Zn and Hg exceeded sediment guidelines, but not CTR saltwater criteria for dissolved metals, and sediment Zn and Hg impairment is expected to be addressed by sediment Cu remediation requirements in the Cu TMDL. (Zn and Hg exceeded sediment guidelines in mostly the same areas as sediment Cu; therefore, as sediment Cu is remediated, likely with dredging, sediment Zn and Hg should also be remediated. In addition, a more extensive marina study is recommended in the Cu TMDL to determine the extent of sediment Cu (and other metals) contamination in marina areas not previously tested. The results of this expanded marina study will determine the extent of remediation needed for sediment Cu, Zn and Hg.)</p> <p>As and Cr. Action Plans are recommended for Arsenic (As) and Chromium (Cr) since (As) and Cr exceeded fish and/or mussel tissue guidelines, but did not exceed the CTR saltwater criteria nor ERM sediment guidelines in Upper and Lower Newport Bay. In addition, sources of As and Cr are unknown; therefore, neither TMDLs nor allocations can be assigned until a more complete source analysis is conducted and considered.</p> <p>Impairment Assessment Results</p> <p>Water. No dissolved metals, except Cu, exceeded the CTR saltwater criteria.</p> <p>Sediments. Metals that exceeded the ERM sediment quality guidelines (plus sediment</p>

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toxicity), include Zn and mercury (Hg) (and Cu) in parts of Lower Newport Bay, particularly in the Turning Basin/South Lido Channel areas. In addition, sediment toxicity is present in areas where Zn and Hg (and Cu) exceeded the ERM guidelines.

Fish and/or mussel tissue. Metals that exceeded guidelines for fish and/or mussel tissue include arsenic (As), and chromium (Cr) in the Upper Bay, and As, Cr and Zn in the Lower Bay. Arsenic (As) exceeded the lower human health guideline, while Cr and Zn exceeded the wildlife guidelines.

Human health. Arsenic (As) exceeded the lower human health guideline (0.026 ug/g ww) in all fish filets (8) and mussels (4/4 samples). Fish filets were collected in the Upper Bay only.

Wildlife. The wildlife guidelines were exceeded for Cr (2.5 ug/g ww) in most fish (26/31, 18/32) in the Upper and Lower Bay, respectively in Allen’s study (2008) but not in DFG’s study (2006); and for Zn in 10/36 fish and 1/2 mussel samples in the Lower Bay (Allen 2008, DFG 2006).

Chromium (Cr) exceeded the guideline for wildlife in both resident and open water fish that were collected in Newport Bay. Residency is an issue with fish tissue exceedances with respect to sources of contaminants in fish tissue. Zn exceeded the guideline for wildlife in topmelt and mussels. Sources for As, Cr and Zn in the Lower Bay may include sediments, and algae for Cr and As (Allen 2008).

Non-TMDL Action Plans are recommended for Zn, Hg, As and Cr. These metals are recommended for 303(d) listing. The Non-TMDL Action Plans address metals impairment by strategies including monitoring and dredging but do not include waste load or load allocations.

Numeric Targets for Zn, Hg, As and Cr

The numeric targets for Zn, Hg, As and Cr include: 1) the CTR saltwater criteria for dissolved metals in water; 2) the Effects Range Low (ERL) sediment guidelines for sediments; and 3) fish tissue guidelines for human health and wildlife. Targets in sediments and fish tissue are based on total metal concentrations.

For sediments, ERL sediment guidelines are used as targets, rather than the ERM guidelines, as this is a conservative approach that has been used in other metals TMDLs in the state of California. For fish tissue, Office of Environmental Health Hazard Assessment (OEHHA) and USEPA guidelines are used for human health, and U.S. Fish and Wildlife Service (USFWS) guidelines are used for wildlife.

Numeric Targets for Zn, Hg, As, Cr			
Metal	Water (CTR saltwater criteria, ug/L) ¹		Sediment (ERL sediment guidelines, ug/g) ²
	acute	chronic	Effects Range Low
*Zn	90	81	150
Hg	1.8	0.94	0.15
As	69	36	70
Cr	1100	50	81

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	Fish Tissue Human Health (ug/g ww)	Fish Tissue Wildlife (ug/g ww)
Zn	40 ³	45 ⁴
Hg	200 ⁵ ng/g ww	
Methyl Hg	220 ⁶ ng/g	30 ⁷ , 55 ⁷ ng/g ww
As	0.026 ⁸	25 ⁹
Cr	1.0 ¹⁰	2.5 ¹¹

*Zn TMDL promulgated by USEPA in 2002

¹Dissolved metals saltwater criteria are from the California Toxics Rule (CTR) (USEPA 2000)

²Sediment guidelines are from Long et al 1995 (ERL =effects range low)

³Zn human health target from Median International Standards (MIS), Nauen 1983

⁴Zn wildlife target from Eisler 1993

⁵Total Hg human health target from Johnson & Looker 2004, San Francisco Bay Mercury TMDL

⁶Methyl Hg human health target from Klasing & Brodberg 2008 (OEHHA)

⁷Methyl Hg wildlife guidelines from Russell 2003 (USFWS) (30ng/g value for smaller fish (< 5cm) - protective of the California least tern; 55ng/g value for larger fish –protective of sea otter)

⁸Inorganic As human health target (carcinogen target) from USEPA 2000a Fish consumption guidance Volume 1 (Table 5-3)

⁹Total As wildlife target from Stanley 1994 (wet wt. conversion from dry wt. screening value-(assumes fish contain 75% moisture)

¹⁰Cr human health target from Median International Standards (MIS), Nauen 1983

¹¹Cr wildlife target from Eisler 1998

Preliminary Source Analysis for Zn, Hg, As and Cr

Known and potential sources of Zn, Hg, As and Cr include urban runoff from tributaries and storm drains (freshwater), recreational boats (Zn) and boat repair yards (Zn, Hg), in-bay sediments, air deposition and ambient seawater. The table below shows metal load estimates from various sources and is a revision of Table E-11 from the USEPA Toxics TMDLs (2002). Mean metal loads from tributaries were estimated from Orange County monitoring data (OCPFRD, 2009-2013). Mean metal loads from storm drains were estimated from the Newport Bay Stormdrain Metals Study (2007). Zn loads from air deposition and ambient seawater were quantified in the Toxics TMDLs (2002). Other sources of metals shown below have not yet been measured and quantified.

Revised Summary of Metal Loads to Newport Bay (lbs/yr)				
	Zn	As	Cr	Hg⁷
Tributary runoff ¹	754 26,596* (USEPA)	321	54	4.6
Storm drain runoff ²	1123/336	66/17	24/9	NT ⁸
Recreational Boats ³	unknown	NL ⁹	NL	NL
Boatyards	unknown	unknown	unknown	unknown
Air deposition ⁴	606			
Ambient seawater ⁵	7464			
Bay Sediments ⁶	unknown	unknown	unknown	unknown
Total	43,181			

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- ¹ Dissolved metal loads are the mean annual loads estimated from 2009-13 data (OCPFRD)
- *For comparison, dissolved Zn in storm water samples from San Diego Creek and Santa Ana-Delhi calculated from total Zn (OCPFRD 2000 data in Table E-11, Toxics TMDLs) (total Zn x 0.80 = dissolved Zn) (USEPA 2002)
- ² Dissolved metal loads from storm drains (2008 load/ 2007 load) were calculated from the Newport Bay Stormdrain Metals Study (2009) at 0.9 runoff coefficient, 2007 =dry year, 2008 =wet year
- ³ Zn is discharged from Zn anodes and Zn boat bottom paints; however, these loads have not yet been quantified. Other metals listed in Table 6-2 are not likely to be discharged from boat hulls
- ⁴ Estimate for direct deposition load of dissolved Zn to surface waters of Newport Bay (total Zn is from Toxics TMDL, Table E-11; dissolved Zn = total Zn x 0.80)
- ⁵ Estimate of dissolved Zn loads from ocean based on local data (R. Gossett) and approximate ocean volume into Newport Bay(total Zn is from Toxics TMDLs, Table E-11; dissolved Zn = total Zn x 0.80)
- ⁶ Metal loads from resuspended bay sediments are unknown at this time and should be investigated, but are likely to be lower than contributions from major tributaries
- ⁷ Most Hg in Newport Bay is believed to be historical deposition in bay sediments
- ⁸ NT =Hg was not tested in most samples, (in samples where Hg was tested, concentrations were low 0.01 to 0.02 ug/L)
- ⁹ NL =not likely

Loading Capacity and Linkage Analysis for Zn, Hg, As and Cr

There is no linkage analysis for Zn, Hg, As and Cr Action Plans.

TMDLs, Waste Load and Load Allocations, and Margin of Safety for Cu

There are no TMDLs nor allocations for Zn, Hg, As and Cr Action Plans

Implementation Plan

The largest Zn loads are runoff from tributaries and storm drains; however, Zn loads from boats, boatyards and Bay sediment resuspension have not been quantified. Hg loads were very low from runoff from tributaries, but Hg loads from storm drains were not evaluated. Much of the sediment Hg is thought to be from historical sources.

The highest priorities for Zn and Hg are the remediation of sediment Zn & Hg (with sediment Cu remediation), and a more extensive marina study. The more extensive marina sediment study required under the Cu TMDL should also evaluate Zn and Hg.

(As) loads from tributary runoff are substantial, but As loads from storm drains are five times lower. Cr loads are low from both tributary runoff and storm drains. (As) and Cr loads from other sources have not been quantified.

The highest priorities for As and Cr are the completion of more extensive source analysis, and the development and implementation of remediation strategies to correct impairment.

TMDL implementation will be carried out in Newport Bay by the following:

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1) Dischargers responsible to Correct Sediment Impairment from Zinc (Zn) and Mercury (Hg)

- (1) State Lands Commission
- (2) City of Newport Beach
- (3) County of Orange
- (4) Marina owner/operators
- (5) Individual recreational boat owners
- (6) Commercial vessel owners/operators
- (7) Underwater hull cleaners
- (8) Boatyards
- (9) Boat owners of transient vessels

2) Dischargers responsible to Correct Fish/Mussel Tissue Impairment from As and Cr

- (1) County of Orange and other MS4 permittees
- (2) CalTrans
- (3) Agricultural dischargers
- (4) Boatyards
- (5) Other NPDES permittees

Implementation tasks and schedules are summarized below.

Recommended Action Plan Tasks and Schedules for Zinc (Zn), Mercury (Hg), Arsenic (As), Chromium (Cr), and all Metals

Action Plan Task	Schedule and Dischargers/Responsible Parties
<p>1) In coordination with sediment Cu remediation (Cu TMDL, remediate areas of known sediment Zn and Hg impairment, and identify/remediate sediment impairment in areas with no or limited sediment Cu, Zn, Hg data (including marina and boatyard areas))</p>	<p><u>Dischargers/Responsible Parties</u> State Lands Commission City of Newport Beach (City) County of Orange (County) Marina owners/operators Individual boat owners Underwater hull cleaners (during phase-out of Cu paints) Boatyard owners/operators</p>
<p>1.1 Develop an Action Plan and Schedule to 1) remediate areas of known impairment from sediment Zn and Hg (and Cu); and 2) identify and remediate areas of the Bay with limited or no sediment data; and implement the Action Plan and Schedule (Section 6.7.1)</p> <p>1.1 (1) The dischargers shall submit an Action Plan and schedule to correct Zn and Hg sediment impairment (and Cu), in areas that exceed the ERM sediment guideline for Zn and Hg (and Cu), including the Turning Basin and S. Lido Channel; and to identify and remediate areas of the Bay with limited or no sediment data.</p> <p>The proposed Action Plan shall include</p>	<p><u>Dischargers/Responsible Parties</u> State Lands Commission City of Newport Beach (City) County of Orange (County) Marina owners/operators Individual boat owners Underwater hull cleaners (during phase-out of Cu paints) Boatyard owners/operators</p> <p>2.1 (1) As soon as possible but no later than (3 months from date of USEPA approval of BPA)</p> <p>2.1 (2) Upon Regional Board approval</p>

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<p><i>recommended corrective strategies for areas of known sediment impairment, and monitoring and evaluation necessary to determine:</i> <i>(1) the effectiveness of the corrective actions on sediment Zn and Hg (and Cu) impairment; and, (2) the extent of sediment Zn and Hg (and Cu) impairment and remediation strategies in areas of the Bay that have not been monitored especially in marina and boatyard areas).</i></p> <p><i>The proposed Action Plan should also include continued monitoring of Zn and Hg in water and sediments, including marinas and boatyard areas (especially in the Lower Bay and the Turning Basin/S.Lido Channel areas), monitoring in tributary runoff, and load estimations for tributary runoff. The proposed Action Plan should also include continued monitoring of Zn in fish and mussel tissue (especially in the Lower Bay).</i></p> <p><i>1.1(2) The dischargers shall implement their plan(s) and schedule(s)</i></p>		
<p>2) Conduct source analysis studies to 1) determine and quantify sources of As and Cr and remediate those sources of As and Cr, and 2) evaluate the reduction of As loads from tributaries</p>	<p><u>Dischargers/Responsible Parties</u> State Lands Commission City of Newport Beach (City) County of Orange (County)</p>	
<p><i>2.1 Develop an Action Plan and Schedule to 1) determine the sources of As and Cr, and remediate those sources of As and Cr, and 2) evaluate the reduction of As loads from tributaries.</i></p> <p><i>2.1 (1) The dischargers shall submit an Action Plan and schedule to conduct source analysis studies for As and Cr, and to remediate those sources of As and Cr.</i></p> <p><i>The proposed Action Plan shall include characterization studies of As and Cr in sediments (especially in marinas and near boatyards) and vegetation/algae studies. Based on the results of the studies, corrective strategies should then be proposed for the remediation of As and Cr.</i></p> <p><i>The proposed Action Plan should also include continued monitoring of As and Cr in water and sediments including marinas and boatyard areas (especially in the Lower Bay and the Turning Basin/S.Lido Channel areas), monitoring in tributary runoff, and load estimations for tributary runoff. The proposed Action Plan should also</i></p>		

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<p><i>include continued monitoring of As and Cr in fish and mussel tissue (in both the Upper and Lower Bay).</i></p> <p><i>2.1 (2) The dischargers shall implement their plan(s) and schedule(s)</i></p>		
<p>3) Consider Revisions to the Action Plans for Zn, Hg, As and Cr when Above Tasks are Completed</p>	<p><i>Within six months of the completion of implementation of tasks 1 and 2, an Action Plan Evaluation report shall be submitted by the dischargers. This report shall evaluate the efficacy of the action plan tasks and studies, and provide recommendations for revisions to the Action Plan strategies.</i></p>	<p><i>of the</i></p>
<p>4) The general category of "Metals" should be DELISTED from Upper Newport Bay</p>	<p><i>In the next listing cycle.</i></p>	

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