This is a message from the California Regional Water Quality Control Board, Santa Ana Region (8).

This is to inform you that Item#8 "Basin Plan Amendments to Incorporate Total Maximum Daily Loads (TMDLs) for Copper and Non-TMDL Action Plans for Zinc, Mercury, Arsenic and Chromium in Newport Bay" currently agendized for the October 28, 2016 Regional Board meeting, will no longer be a public hearing to consider adoption of these BPAs, but will now be a workshop to discuss the Cu TMDLs and Action Plans. The Regional Board will not take action on these items at the October 28, 2016 meeting. At the meeting, Regional Board staff will provide an update to the Board regarding the TMDLs and Action Plans and will summarize comments received. Interested parties will have an opportunity to address the Board to provide their input regarding the TMDLs and Action Plans. The Regional Board intends to schedule a public hearing to consider adoption of the TMDLs and Actions Plans at a future meeting of the Regional Board, and all parties and the public will be properly notified of this future public hearing.

California Regional Water Quality Control Board
Santa Ana Region 8

October 28, 2016

ITEM: 8

SUBJECT: <u>Basin Plan Amendments to Incorporate Total Maximum Daily Loads (TMDLs) for Copper and Non-TMDL Action Plans for Zinc, Mercury, Arsenic and Chromium in Newport Bay</u> – The Regional Board will conduct a public hearing to consider: (1) confirming the preliminary determination by Regional Board staff that the proposed amendments could not have a significant effect on the environment and certifying the environmental checklist and analysis document; and, (2) adopting the proposed Basin Plan Amendments. Order No. R8-2016-0059

Included in this package:

1. Project Summary
2. Resolution No. R8-2016-0059
3. Basin Plan Amendment Attachment A – Clean version
4. Basin Plan Amendment Attachment B – Strikeout/underline
5. Metals Staff Report
6. Substitute Environmental Document (SED)
7. Comments/Responses

Project Summary
Protecting Newport Bay by Reducing Copper (and other Metals)

The Santa Ana Regional Water Quality Control Board (SARWQCB, or Regional Board), a state agency, is tasked with protecting and improving water quality in the Santa Ana Region, which includes Newport Bay. We are seeking cooperation from the City of Newport Beach, the County of Orange (and other local agencies), boaters, marinas and boatyards in Newport Bay to work towards improving water quality in the Bay to protect this important and valuable resource.

The Regional Board proposes to amend the Basin Plan to incorporate Copper (Cu) TMDLs and Non-TMDL Action Plans (Action Plans) for Zinc (Zn), Mercury (Hg), Arsenic (As) and Chromium (Cr) in Newport Bay. The goals of these TMDLs and Action Plans for Newport Bay are to correct impairment in Bay waters due to Cu; sediment impairment due to Cu, Zn and Hg; and fish/mussel tissue impairment due to Zn, As and Cr.

Background

In Newport Bay, copper (Cu) exceeds the water quality standards. The source analysis shows that Cu discharges from Cu hull paints are the largest source of Cu to the Bay (~36,000 lbs per year), followed by tributary runoff (~3000 lbs per year), and storm drain runoff (~300 lbs per year). Cu paints, the largest source of Cu to the Bay, are designed to release Cu into the surrounding waters to prevent fouling on the boat hulls; however, the Cu released may also harm “non-target” organisms in the water and sediment. Cu can cause “sublethal” effects on fish (gill and nervous system damage), and mortality in invertebrates (animals that live in the sediments and that fish eat). The Cu concentrations in Newport Bay are harmful to aquatic life, and must be decreased to meet the water quality standards to protect the fish and other marine animals living in the Bay. In addition, sediment Cu exceeds guidelines in parts of the Lower Bay (mostly marinas and the Turning Basin areas).

One regulatory document that addresses pollution in a water body is a TMDL (Total Maximum Daily Load), which includes limits for the discharge of a pollutant into a water body. The U.S. Environmental Protection Agency (USEPA) promulgated Toxics TMDLs for Newport Bay in 2002, including TMDLs for Cu, Zn, cadmium (Cd) and lead (Pb). In their analysis, USEPA also found that Cu hull paints are the largest source of Cu to the Bay. USEPA’s Metals TMDLs, including Cu, must be revised based on new data, and a plan and schedule for pollutant reduction must be identified. Regional Board staff have developed proposed revised Cu TMDLs to reduce the Cu discharges from Cu hull paints on boats in a timely manner.

In addition, other metals exceed sediment and fish tissue guidelines in Newport Bay. These include zinc (Zn) and mercury (Hg) in sediments and Zn in fish tissue in Lower Newport Bay; and arsenic (As) and chromium (Cr) in fish tissue in the Upper and Lower Bay. Regional Board staff have developed proposed Non-TMDL Action Plans (Action Plans)[1] for Zn, Hg, As and Cr.

[1] A Non-TMDL Action Plan (Action Plan) is similar to a TMDL, but does not include pollutant allocations.

The Cu TMDLs and Action Plans will help to restore Newport Bay to a healthier and more natural environment to ensure that aquatic life will be protected.

Note that Cu exceedances of the water quality standard are a problem in other marinas in southern California, including Marina del Rey (Los Angeles county) and Shelter Island Yacht Basin (San Diego county); and similar Cu TMDLs have been adopted for both of these marinas. Implementation of these TMDLs has already begun.

Cu TMDLs and Action Plans for Zn, Hg, As and Cr

The proposed Cu TMDLs and Action Plan for Zn would replace the Cu and Zn TMDLs promulgated by USEPA in June 2002. USEPA also promulgated Hg and Cr TMDLs but only in the Rhine Channel, and did not promulgate a TMDL for As; so the proposed Action Plans, if approved, would impose new requirements, but not allocations, on responsible parties.

Proposed Cu TMDLs

Cu hull paints are the largest source of Cu to the Bay (~36,000 lbs per year), and the allocation for boats was calculated to be approximately 6,060 lbs per year. In order to meet the proposed Cu TMDLs, therefore, Cu discharges from boat hulls must be reduced by 83%. (This is a lower reduction than the 92% required for boats in USEPA's Cu TMDLs.) This 83% reduction will be accomplished by a phased compliance schedule, that will allow 15 years to reduce Cu discharges from boats. This schedule will allow boaters to convert their boats from Cu to nontoxic paints ***as hull repainting is needed during normal boat maintenance.*** Additional methods to reduce Cu from boat hulls include 1) the use of best management practices (BMPs) by all hull cleaners (such as the use of soft pads), 2) the use of slip liners, especially during hull cleaning, and 3) the use of Cu hull paints with lower leach rates.

Regional Board staff and partners have been working with paint manufacturers and boatyards to provide to boaters alternative non-toxic paints that are both viable and cost-effective. Board staff have also been working to investigate potential funding options to assist with the conversion from Cu to non-toxic or non-Cu hull paints.

The Cu TMDLs also require that the allocations for tributary and storm drain runoff be met, and that monitoring continue. Cu discharges from storm drains are small compared to other sources but local impacts should be evaluated. In addition, sediment Cu exceeds the sediment guidelines, especially in marinas and the Turning Basin areas in the Lower Bay. Sediment Cu must be reduced in those areas, and dredging is recommended.

Proposed Non-TMDL Action Plans (Action Plans) for Zinc (Zn), Mercury (Hg), Arsenic (As) and Chromium (Cr)

Action Plans are recommended to address sediment exceedances of Zn and Hg in the Lower Bay, fish tissue exceedances of Zn in the Lower Bay, and fish tissue exceedances of As and Cr in the Upper and Lower Bay. These Action Plans are in line with USEPA's new Vision Framework to address pollutants more efficiently.

Action Plan for Zn and Hg

Action Plan(s), rather than TMDLs, are recommended for Zn and Hg since the remediation of sediment Cu (required by the Cu TMDLs) should also remediate sediment Zn and Hg; therefore, TMDLs are not warranted at this time. It is likely that the remediation of sediment Zn will also reduce Zn concentrations in fish tissue.

Action Plan for As and Cr
Action Plan(s), rather than TMDLs, are recommended for As and Cr since sources of As and Cr need to be characterized; therefore, allocations cannot be assigned at this time. The As and Cr implementation tasks include a source analysis study. Based on the results of the additional studies, subsequent regulatory action may include the development and implementation of future TMDLs.

Additional comments
Board staff's Metals Impairment Assessment found no impairment for Cd and Pb in the Upper and Lower Bay, no impairment for Zn in the Upper Bay, and Zn impairment in the Lower Bay that could be addressed by an Action Plan for Zn. USEPA should, therefore, depromulgate their TMDLs for Zn, Cd and Pb.

Note that if the Cu TMDLs or Zn, Hg, As and Cr Action Plans are not adopted, then USEPA's TMDLs for Cu, Zn, Cd and Pb will remain in place and will need to be implemented. These TMDLs include higher reductions for Cu loads from boats (92% compared to 83% in the proposed Cu TMDLs), and include allocations for Zn, Cd and Pb that must be met. In addition, the TMDLs do not include implementation plans or compliance schedules; therefore, dischargers would be required to meet the allocations immediately.

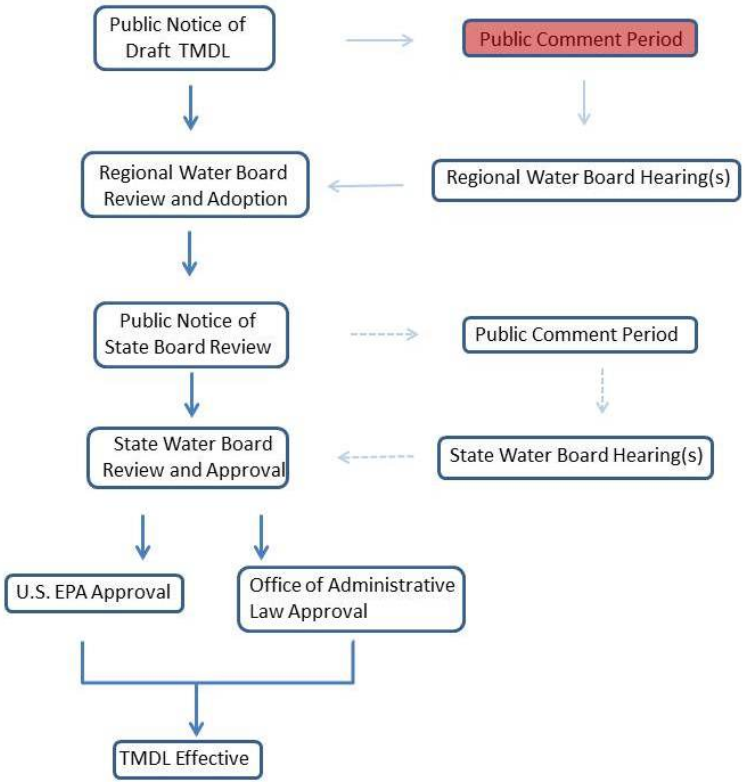
Note also that actions are already required to implement and achieve USEPA's TMDLs. This includes the issuance of National Pollutant Discharge Elimination System (NPDES) permits by the Regional Board for discharges of metals to surface waters. These permits specify discharge limitations and other requirements that are consistent with and appropriately implement USEPA's TMDLs.

TMDL Process
TMDLs must go through a lengthy approval process, including public notification and participation, before they become effective. The public process includes the following:

- *CEQA scoping meetings –to introduce the TMDLs and invite comments from the public on potential environmental impacts from BPAs (July 23, 2015)*
- *Presentation to the Regional Board (July 24, 2015)*
- *Notice of Public Hearing/Notice of Filing published in OC newspapers and posted RB website (August 31, 2016)*
- *Draft BPA, Staff report, SED and posted on RB website (August 31, 2016)*
- *Comment period (45 days) on draft BPA (Cu TMDLs & Action Plans) and staff report (ends October 17, 2016)*
- *Regional Board hearing for approval and adoption of the TMDLs (October 28, 2016)*

The public comment period is then followed by a Regional Board public hearing at which adoption of the TMDLs are considered. To become effective, the TMDL must also be approved by the State Water Board, the Office of Administrative Law and the U.S. Environmental Protection Agency.

Process for Adopting a TMDL[2] **Opportunities for Public Comment**
(approximately 1-2 years)



FURTHER INFORMATION

"Citizens Guide to Working with the California Water Boards
http://www.waterboards.ca.gov/publications_forms/publications/general/docs/citizenguide2011.pdf

Information on Alternative Antifouling Strategies
Copper Reduction Program, Port of San Diego:
http://www.portofsandiego.org/environment/copper-reduction-program.html

Technical information and documents for the proposed revised Copper (Cu) TMDL and Metals Non-TMDL Action Plans for Newport Bay
http://www.waterboards.ca.gov/santaana/water_issues/programs/tmdl/tmdl_metals.shtml

To receive updates regarding TMDLs for Newport Bay, please visit the following website and subscribe to the "TMDL Newport Bay Copper – Metals" list:
http://www.waterboards.ca.gov/resources/email_subscriptions/reg8_subscribe.shtml

For questions or comments, please send an email to:
RB8-CuTMDL@Waterboards.ca.gov

[2] "Process for Adopting a TMDL" diagram courtesy of LA Regional Board staff

California Regional Water Quality Control Board
Santa Ana Region

RESOLUTION NO. R8-2016-0059

Resolution Amending the Water Quality Control Plan for the Santa Ana River Basin to Incorporate Copper TMDLs and Non-TMDL Action Plans for Zinc, Mercury, Arsenic and Chromium for Newport Bay, Orange County, California

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WHEREAS, the California Regional Water Quality Control Board, Santa Ana Region (hereinafter, Regional Board), finds that:

1. An updated Water Quality Control Plan for the Santa Ana River Basin (Basin Plan) was adopted by the Regional Board on March 11, 1994, approved by the State Water Resources Control Board (State Water Board) on July 21, 1994, and approved by the Office of Administrative Law (OAL) on January 24, 1995. Subsequent amendments to the Basin Plan have been similarly adopted and approved.

2. The Basin Plan specifies the following beneficial uses (existing or potential) for Upper Newport Bay: water contact recreation (REC1); non-contact water recreation (REC2); commercial and sportfishing (COMM); preservation of habitats of special biological significance (BIOL); wildlife habitat (WILD); rare, threatened or endangered species (RARE); spawning, reproduction and development (SPWN); marine habitat (MAR); shellfish harvesting (SHEL); and, estuarine habitat (EST).

3. The Basin Plan specifies the following beneficial uses (existing or potential) for Lower Newport Bay: navigation (NAV); water contact recreation (REC1); non-contact water recreation (REC2); commercial and sportfishing (COMM); wildlife habitat (WILD); rare, threatened or endangered species (RARE); spawning, reproduction and development (SPWN); marine habitat (MAR); and, shellfish harvesting (SHEL).

4. In 2000, the United States Environmental Protection Agency (USEPA) promulgated numeric water quality criteria for toxic pollutants, including dissolved metals, for the State of California in the California Toxics Rule (CTR) (40 CFR § 131.38). The CTR includes criteria for toxic pollutants, including dissolved metals, in both salt and fresh waters.

5. The Basin Plan specifies the following narrative objectives for toxic substances in enclosed bays and estuaries, including Upper and Lower Newport Bay: *1) Toxic substances shall not be discharged at levels that will bioaccumulate in aquatic*

resources to levels which are harmful to human health; 2) The concentrations of toxic substances in the water column, sediments or biota shall not adversely affect beneficial uses.

6. On June 14, 2002, in response to a consent decree, USEPA promulgated Total Maximum Daily Loads (TMDLs) for certain toxic pollutants, including copper, cadmium, lead and zinc for Upper and Lower Newport Bay and the San Diego Creek watershed. USEPA's TMDLs were based on an impairment assessment conducted by USEPA. The purpose of those TMDLs is to correct the impairment and ensure that water quality standards, which include beneficial uses and water quality objectives, are achieved.

7. In support of these Basin Plan Amendments, Regional Board staff conducted an updated impairment assessment, using newer data from 2002-2014, and concluded that there is evidence of impairment in Upper and Lower Newport Bay due to copper in the water column and sediments, zinc and mercury in the sediments, and arsenic, chromium and zinc in fish tissue. With respect to San Diego Creek, State Water Board staff conducted an assessment of individual metals in 2006 and found that there was no impairment in San Diego Creek due to metals. USEPA approved the most recent (2010) Clean Water Act § 303(d) list of impaired waters on which San Diego Creek is no longer listed for metals.

8. In accordance with Clean Water Act § 303(d) and Water Code §13240 *et seq.,* Regional Board staff developed the proposed Basin Plan amendments shown in Attachments A and B (underline version) to this Resolution. The Basin Plan amendments are proposed for incorporation in a new "Chapter 6 – Total Maximum Daily Loads", in the Basin Plan. The proposed amendments include Copper TMDLs and Zinc, Mercury, Arsenic and Chromium Non-TMDL Action Plans (Action Plans) in Upper and Lower Newport Bay.

9. The Non-TMDL Action Plans (Action Plans) for zinc, mercury, arsenic and chromium are consistent with USEPA's new Vision Framework for addressing impaired waters. USEPA's Vision Framework encourages the use of alternative restoration approaches initially, such as the recommended Action Plans for zinc, mercury, arsenic and chromium, rather than the development of TMDLs, where such alternative approaches can meet the same goals as TMDLs in a more expeditious manner. (Action Plans are described in the Staff Report.)

10. The proposed Copper TMDLs and Action Plan for Zinc, if approved by the Regional Board, the State Water Board, the Office of Administrative Law, and USEPA will supplant the Copper and Zinc TMDLs promulgated by USEPA. The adoption and implementation of the proposed Copper TMDLs and Zinc Action

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Plan will fulfill the goals of the established USEPA TMDLs to achieve water quality standards in a scientifically and legally defensible manner. Likewise, the proposed Action Plans for Mercury, Arsenic and Chromium are the appropriate mechanism to investigate and correct impairment due to these metals at this time (since sediment zinc and mercury should be remediated via measures to remediate sediment copper, and source data for arsenic and chromium is insufficient so allocations cannot be assigned at this time.

11. De-promulgation of the USEPA 2002 TMDLs for zinc, lead and cadmium in Newport Bay and the San Diego Creek watershed, is appropriate based on the findings of the recent impairment assessment prepared by Regional Board staff, the 2010 USEPA-approved Clean Water Act § 303(d) list of impaired waters, and the implementation of the proposed Copper TMDLs and Zinc Action Plan, if and when they are fully approved.

12. The proposed Basin Plan amendments to incorporate Copper TMDLs and Zinc, Mercury, Arsenic and Chromium Action Plans will ensure the reasonable protection of the beneficial uses of Newport Bay.

13. Analysis of the proposed Basin Plan amendments was conducted to determine consistency with the antidegradation policy (State Water Board Resolution No. 68-16 "Statement of Policy with Respect to Maintaining High Quality Waters in California" and 40 CFR 131.12). None of the proposed amendments is expected to result in the lowering of water quality, except for short periods of time during dredging. Thus, the proposed amendments conform to antidegradation policy requirements.

14. Regional Board staff has prepared a comprehensive staff report that analyzes and describes the specific necessity and rationale for the proposed amendments to the Basin Plan. This staff report is an integral part of this Regional Board action and was reviewed and considered, and relied upon by the Regional Board.

15. Pursuant to Public Resources Code § 21080.5, the Resources Agency has approved the Regional Board's basin planning process as a "certified regulatory program" that adequately satisfies the California Environmental Quality Act (CEQA) (Public Resources Code § 21000 *et seq*.) requirements for preparing environmental documents. (14 Cal. Code Regs. § 15251(g); 23 Cal. Code Regs. § 3782.) potential environmental effects of the proposed amendments.

16. The Regional Board's environmental analyses are presented in "Environmental Checklist and Analysis - Substitute Environmental Document for Proposed Basin

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Plan Amendments for the Newport Bay Copper (Cu) TMDLs and Non-TMDL Action Plans for Zinc, Mercury, Arsenic and Chromium", August 30, 2016, (SED). The analyses of the potential environmental effects of the proposed amendments were conducted on a programmatic level. Those responsible dischargers subject to the amendments, if approved, are responsible for identifying specific compliance strategies and conducting required project level CEQA analyses of the implementation of those strategies.

17. Based on the environmental analyses described in the SED, the Regional Board finds that there is no fair argument that the proposed amendments could result in any reasonably foreseeable significant adverse environmental impacts; therefore, no alternatives or mitigation measures are proposed.

18. Pursuant to the Health and Safety Code §57004 proposed rules, such as the proposed Basin Plan amendments, that have a scientific basis or components, must be submitted for scientific peer review. This additional review is not required if a new application of an adequately peer reviewed product does not depart significantly from its scientific approach. The recommended Cu TMDLs rely on the same scientific approach and peer-reviewed model employed by USEPA in establishing the Toxics TMDLs for Cu and other metals in 2002. Peer reviewed models developed by the US Navy were used to calculate load allocations for Cu. Therefore, additional scientific peer review of the proposed Cu TMDLs is unnecessary. Findings of impairment for Zn, Hg, As and Cr were based on the methodology set forth in the State Board's Listing Policy, and used criteria set forth in that Listing Policy and/or recommended by the USFWS based on peer reviewed literature. The recommended Action Plans for these constituents rely on further investigations in the Bay and the characterization of sources to direct future action. Therefore, no scientific peer review of the proposed Action Plans is required.

19. The proposed amendments meet the necessity standard of the Administrative Procedures Act, Government Code §11353, subdivision (b). The proposed amendments are necessary to ensure conformance, in the most scientifically defensible manner, with state and federal law and implementation regulations that require that surface water quality standards be achieved and protected.

20. Two CEQA Scoping Meetings were held on July 23, 2015 to provide interested parties the opportunity to comment on the appropriate scope and content of the SED to be prepared for the proposed Basin Plan amendments. Written responses to comments provided were prepared and are included in a Comments/Response document. A presentation was also made to the Regional Board regarding the proposed amendments on July 24, 2015 during the Board's regularly scheduled public meeting. Public and agency participation in the consideration of the proposed amendments was actively sought.

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21. A Notice of Public Hearing/Notice of Filing regarding the proposed adoption of the recommended Basin Plan amendments and the availability of relevant documentation (staff report, draft Basin Plan amendments and environmental checklist and analysis document (SED)), were prepared and distributed to interested individuals and public agencies for review and comment on August 31, 2016. Written responses to comments received after the CEQA Scoping Meetings and comments received by October 17, 2016 were prepared and are included in the revised Comments/Response document.

NOW THEREFORE BE IT RESOLVED THAT:

1. The Regional Board has reviewed and considered the entire record of this matter, including the information contained in the staff report and SED, all written comments, and all oral testimony provided at the public hearing of this matter held on October 28, 2016.
2. The Regional Board hereby approves and adopts the Basin Plan amendments delineated in in Attachments A and B (underline version) to this Resolution, and certifies the SED.
3. The Executive Officer is directed to forward copies of this resolution with the attached Basin Plan amendments to the State Water Board in fulfillment of the requirement of §13245 of the Water Code.
4. The Regional Board requests that the State Water Board approve the Basin Plan amendments in accordance with the requirements of Sections 13245 and 13246 of the California Water Bode and, thereafter, forward the amendments to the Office of Administrative Law (OAL) and USEPA for their approval.
5. If during its approval process Regional Board staff, the State Water Board or OAL determine that minor, non-substantive corrections to the language of the amendments are needed for clarity or consistency, the Executive Officer may make such changes and shall inform the Regional Board forthwith.

I, Kurt V. Berchtold, Executive Officer, do hereby certify that the foregoing is a full, true, and correct copy of a resolution adopted by the California Regional Water Quality Control Board, Santa Ana Region, on October 28, 2016.

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Kurt V. Berchtold
Executive Officer

TENTATIVE

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.shtml.

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

Problem Statement for Cu
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 (*ibid.*)). 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. 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. 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. ***Impairment Assessment Results*** ***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). ***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. ***Fish and/or mussel tissue.*** Cu did not exceed fish tissue guidelines for either human health or wildlife.
Numeric Targets for Cu
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

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ERM guidelines are used to provide a conservative approach,.

Numeric Targets for Copper (Cu) in Water and Sediment in Newport Bay			
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.

*Summary of Copper (Cu) Loads to Newport Bay**			
	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%**	**58,002[7]**

[*] 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).
[1]Estimates of dissolved Cu loading from passive leaching and hull cleaning (USEPA Toxics TMDLs).
[2]Dissolved 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).
[3]Dissolved 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.
[4]Estimate for direct deposition of Cu to surface waters of Newport Bay (Toxics TMDLs, TSD sect. IV).
[5]Estimate 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).
[6]Cu 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.
[7]Cu 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.

Total allowable Dissolved Cu by mass =Bay volume x Criteria (C_c)
=19,000,000m^3(1000L/m^3) x 3.1µg/L (g/1000ug)
=58,900,000g x lb/453.6g
=129850.09lbs

Dissolved Cu Mass Loading Capacity =$Mass_{out}$ – $Mass_{in}$
=(Criteria *$Volume_{out}$) – $Mass_{in}$
$L_f + L_i$ = C_c* (Q_b + 1.25Av_sF_p) – Q_oC_o
= (3.1 ug/L *(g/1000µg) *(4980399.79 m^3/d*(1000 L/m^3))
- (4830917.9 m^3/d*(1000 L/m^3) *0.0002mg/L*(1000mg/g))
=14473.056 g/d *(lb/453.6g)*(365d/yr)
=11646.09 lbs/yr

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 µg/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 =0.00093mm/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:

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

11,646 - 2329 = 3176 + 6141 (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) City of Newport Beach
(2) County of Orange
(3) Marina owner/operators
(4) Individual recreational boat owners
(5) Commercial vessel owners/operators
(6) Underwater hull cleaners
(7) Boatyards
(8) Boat owners of transient vessels

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

(1) City of Newport Beach
(2) County of Orange

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(3) Marina owner/operators
(4) Individual recreational boat owners
(5) Commercial vessel owners/operators
(6) Underwater hull cleaners
(7) Boatyards
(8) 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	*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:* *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* *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* *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* *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*
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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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.	
1.2 Reduce Cu discharges from Cu AFPs	
1.2.1 Implementation Plan and Schedule to reduce Cu discharges from Cu AFPs *1.2.1 (1) 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).* *1.2.1 (2) The dischargers shall implement their plan(s) and schedule(s)*	*<u>Dischargers/Responsible Parties</u>* *City of Newport Beach (City)* *County of Orange (County)* *Marina owners/operators* *Individual boat owners* *Underwater hull cleaners (during phase-out of Cu paints)* *1.2.1 (1) As soon as possible but no later than (3 months from date of USEPA approval of BPA)* *1.2.1 (2) Upon Regional Board approval*
1.2.2 Implementation Tasks to reduce Cu discharges from Cu AFPs *The proposed implementation plan(s) and schedule(s), not to exceed 15 years, shall include consideration of the strategies listed below at a minimum.* *(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.)* *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. *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* *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.* *Additional BMPs that include hull cleaning in slip*	

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liners or dry dock storage may also be included. *1.2.2.3 Require boaters to convert to lower leach rate Cu AFPs with leach rates at or below 9.5 µg/cm^2/d.* *1.2.2.4 Continue Monitoring in the Bay, including marinas and channels* *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).* *1.2.2.5 Continue Education Program(s) for Boaters, Boatyards and Marinas* *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:* *(1) Cu water quality issues and TMDL requirements;* *(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;* *(3) Nontoxic AFP use requirements including recommended BMPs for hull cleaning and frequency of cleaning;* *(4) BMPs requirements for all underwater hull cleaners;* *(5) Use of lower leach rate Cu AFPs with leach rates at or below 9.5 µg/cm^2/d. (6) Conditions and requirements instituted by 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);* *(7) Potential boat storage options, and containment systems for boat cleaning and/or storage (e.g. slip liners).* *1.2.2.6 Coordinate with Regional Board staff on work with DPR and USEPA* Coordinate with Regional Board staff on work with DPR and USEPA to institute appropriate		

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restrictions on Cu AFPs to achieve the TMDL	
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)	*<u>Dischargers/Responsible Parties</u>* *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*
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 *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.* *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).* *2.1 (2) The dischargers shall implement their plan(s) and schedule(s)*	*<u>Dischargers/Responsible Parties</u>* *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* *2.1 (1) As soon as possible but no later than (3 months from date of USEPA approval of BPA)* *2.1 (2) Upon Regional Board approval*
3) Meet Copper (Cu) allocations for tributary runoff	
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.*	*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)* *New permits: as new permits are established*
3.2 (1) The dischargers shall conduct monitoring for Cu loading from tributary runoff to determine whether Cu wasteload and load allocations (WLAs, LAs) are consistently achieved.	*<u>Dischargers/Responsible Parties</u>* *County of Orange, City of Newport Beach and other MS4 permittees* *CalTrans*

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(Existing monitoring for MS4 systems may be utilized for this task.) *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.* *3.2 (3) The dischargers shall implement their plan(s) and schedule(s)*	*Agricultural dischargers* *Other NPDES permittees* *3.2 (1) As soon as possible but no later than (3 months from date of USEPA approval of BPA)* *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* *3.2 (3) Upon Executive Officer approval*
4) Evaluate Copper (Cu) discharges from storm drains for local impacts	
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. *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.* *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.* *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.*	*4.1 (1) As soon as possible but no later than (3 months from date of USEPA approval of BPA)* *4.1 (2) Upon Executive Officer approval.* *4.1 (3) As soon as possible but no later than 3 months from the findings of negative impacts to an area* *4.1 (4) Upon Executive Officer approval.* *Dischargers/Responsible Parties* *County of Orange, City of Newport Beach and other MS4 permittees* *CalTrans* *Agricultural dischargers* *Other NPDES permittees*
5) Continue Monitoring *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* *--Tributary runoff including San Diego Creek, Santa Ana Delhi and Big Canyon Wash*	*5 (1) As soon as possible but no later than (3 months from date of USEPA approval of BPA)* *5 (2) Upon Regional Board approval* *<u>Dischargers/Responsible Parties</u>* *County of Orange and other MS4 permittees*

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--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.* *5 (2) The dischargers shall implement the plan and schedule for the monitoring of Cu described in 5 (1).*	*City of Newport Beach* *CalTrans* *Agricultural dischargers* *Other NPDES permittees*
6) Conduct Special Studies *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:* *6.1) Determine the Cu loading from In-Bay Sediments* *Cu discharges from Bay sediments have not yet been quantified.* *6.2) Determine the Cu loading from Algae & Other Vegetation* *Cu loading from algae and other vegetation has not yet been quantified.*	*Special studies shall be implemented by the dischargers in accordance with direction from the Regional Board Executive Officer per Water Code Section 13267.* *<u>Dischargers/Responsible Parties</u>* *County of Orange and other MS4 permittees* *City of Newport Beach* *CalTrans* *Agricultural dischargers Other NPDES permittees*
7) Submit Updated TMDL Report, and Reevaluate and Revise the TMDL	*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.* *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.*

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

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Problem Statement for Zn, Hg, As and Cr Non-TMDL Action Plans (Action Plans)

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.(*ibid.*)) 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.

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.

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 approached 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.

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.)

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.

Impairment Assessment Results
Water. No dissolved metals, except Cu, exceeded the CTR saltwater criteria.

Sediments. Metals that exceeded the ERM sediment quality guidelines (plus sediment 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.

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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 topsmelt 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
	Fish Tissue Human Health (ug/g ww)		**Fish Tissue Wildlife (ug/g ww)**
Zn	40[3]		45[4]

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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
[1]Dissolved metals saltwater criteria are from the California Toxics Rule (CTR) (USEPA 2000)
[2]Sediment guidelines are from Long et al 1995 (ERL =effects range low)
[3]Zn human health target from Median International Standards (MIS), Nauen 1983
[4]Zn wildlife target from Eisler 1993
[5]Total Hg human health target from Johnson & Looker 2004, San Francisco Bay Mercury TMDL
[6]Methyl Hg human health target from Klasing & Brodberg 2008 (OEHHA)
[7]Methyl 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)
[8]Inorganic As human health target (carcinogen target) from USEPA 2000a Fish consumption guidance Volume 1 (Table 5-3)
[9]Total As wildlife target from Stanley 1994 (wet wt. conversion from dry wt. screening value-(assumes fish contain 75% moisture)
[10]Cr human health target from Median International Standards (MIS), Nauen 1983
[11]Cr 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**	**Hg**[7]
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			

[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

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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:

1) Dischargers responsible to Correct Sediment Impairment from Zinc (Zn) and Mercury (Hg)
(1) City of Newport Beach

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(2) County of Orange
(3) Marina owner/operators
(4) Individual recreational boat owners
(5) Commercial vessel owners/operators
(6) Underwater hull cleaners
(7) Boatyards
(8) 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***
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)	*Dischargers/Responsible Parties* *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*
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) *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.* *The proposed Action 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 Zn and Hg (and Cu) impairment; and, (2)*	*Dischargers/Responsible Parties* *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* *2.1 (1) As soon as possible but no later than (3 months from date of USEPA approval of BPA)* *2.1 (2) Upon Regional Board approval*

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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). *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).* *1.1(2) The dischargers shall implement their plan(s) and schedule(s)*		
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	*Dischargers/Responsible Parties* *City of Newport Beach (City)* *County of Orange (County)*	
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. *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.* *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.* *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 include continued monitoring of As and Cr in fish and mussel tissue (in both the Upper and Lower Bay).* *2.1 (2) The dischargers shall implement their*		

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plan(s) and schedule(s)		
3) Consider Revisions to the Action Plans for Zn, Hg, As and Cr when Above Tasks are Completed	*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.*	
4) The general category of "Metals" should be DELISTED from Upper Newport Bay	*In the next listing cycle.*	

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ATTACHMENT B 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.shtml.

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

Problem Statement for Cu
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 (*ibid.*)). 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. 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. 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. ***Impairment Assessment Results*** ***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). ***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. ***Fish and/or mussel tissue.*** Cu did not exceed fish tissue guidelines for either human health or wildlife.
Numeric Targets for Cu
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

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ERM guidelines are used to provide a conservative approach,.

Numeric Targets for Copper (Cu) in Water and Sediment in Newport Bay			
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.

Summary of Copper (Cu) Loads to Newport Bay*			
	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%**	**58,002[7]**

[*] 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).
[1]Estimates of dissolved Cu loading from passive leaching and hull cleaning (USEPA Toxics TMDLs).
[2]Dissolved 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).
[3]Dissolved 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.
[4]Estimate for direct deposition of Cu to surface waters of Newport Bay (Toxics TMDLs, TSD sect. IV).
[5]Estimate 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).
[6]Cu 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.
[7]Cu 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.

Total allowable Dissolved Cu by mass =Bay volume x Criteria (C_c)
=19,000,000m^3(1000L/m^3) x 3.1µg/L (g/1000ug)
=58,900,000g x lb/453.6g
=129850.09lbs

Dissolved Cu Mass Loading Capacity =$Mass_{out}$ – $Mass_{in}$
=(Criteria *$Volume_{out}$) – $Mass_{in}$
$L_f + L_i$ = C_c* (Q_b + 1.25Av_sF_p) – Q_oC_o
= (3.1 ug/L *(g/1000µg) *(4980399.79 m^3/d*(1000 L/m^3))
- (4830917.9 m^3/d*(1000 L/m^3) *0.0002mg/L*(1000mg/g))
=14473.056 g/d *(lb/453.6g)*(365d/yr)
=11646.09 lbs/yr

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 µg/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 =0.00093mm/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:

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

11,646 - 2329 = 3176 + 6141 (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) City of Newport Beach
(2) County of Orange
(3) Marina owner/operators
(4) Individual recreational boat owners
(5) Commercial vessel owners/operators
(6) Underwater hull cleaners
(7) Boatyards
(8) Boat owners of transient vessels

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

(1) City of Newport Beach
(2) County of Orange

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(3) Marina owner/operators
(4) Individual recreational boat owners
(5) Commercial vessel owners/operators
(6) Underwater hull cleaners
(7) Boatyards
(8) 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	*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:* *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* *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* *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* *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*
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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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.	
1.2 Reduce Cu discharges from Cu AFPs	
1.2.1 Implementation Plan and Schedule to reduce Cu discharges from Cu AFPs *1.2.1 (1) 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).* *1.2.1 (2) The dischargers shall implement their plan(s) and schedule(s)*	*Dischargers/Responsible Parties* *City of Newport Beach (City)* *County of Orange (County)* *Marina owners/operators* *Individual boat owners* *Underwater hull cleaners (during phase-out of Cu paints)* *1.2.1 (1) As soon as possible but no later than (3 months from date of USEPA approval of BPA)* *1.2.1 (2) Upon Regional Board approval*
1.2.2 Implementation Tasks to reduce Cu discharges from Cu AFPs *The proposed implementation plan(s) and schedule(s), not to exceed 15 years, shall include consideration of the strategies listed below at a minimum.* *(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.)* *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. *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* *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.* *Additional BMPs that include hull cleaning in slip*	

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liners or dry dock storage may also be included. *1.2.2.3 Require boaters to convert to lower leach rate Cu AFPs with leach rates at or below 9.5 µg/cm^2/d.* *1.2.2.4 Continue Monitoring in the Bay, including marinas and channels* *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).* *1.2.2.5 Continue Education Program(s) for Boaters, Boatyards and Marinas* *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:* *(1) Cu water quality issues and TMDL requirements;* *(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;* *(3) Nontoxic AFP use requirements including recommended BMPs for hull cleaning and frequency of cleaning;* *(4) BMPs requirements for all underwater hull cleaners;* *(5) Use of lower leach rate Cu AFPs with leach rates at or below 9.5 µg/cm^2/d. (6) Conditions and requirements instituted by 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);* *(7) Potential boat storage options, and containment systems for boat cleaning and/or storage (e.g. slip liners).* *1.2.2.6 Coordinate with Regional Board staff on work with DPR and USEPA* Coordinate with Regional Board staff on work with DPR and USEPA to institute appropriate		

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restrictions on Cu AFPs to achieve the TMDL	
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)	*Dischargers/Responsible Parties* *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*
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 *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.* *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).* *2.1 (2) The dischargers shall implement their plan(s) and schedule(s)*	*Dischargers/Responsible Parties* *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* *2.1 (1) As soon as possible but no later than (3 months from date of USEPA approval of BPA)* *2.1 (2) Upon Regional Board approval*
3) Meet Copper (Cu) allocations for tributary runoff	
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.*	*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)* *New permits: as new permits are established*
3.2 (1) The dischargers shall conduct monitoring for Cu loading from tributary runoff to determine whether Cu wasteload and load allocations (WLAs, LAs) are consistently achieved.	*Dischargers/Responsible Parties* *County of Orange, City of Newport Beach and other MS4 permittees* *CalTrans*

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(Existing monitoring for MS4 systems may be utilized for this task.) *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.* *3.2 (3) The dischargers shall implement their plan(s) and schedule(s)*	*Agricultural dischargers* *Other NPDES permittees* *3.2 (1) As soon as possible but no later than (3 months from date of USEPA approval of BPA)* *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* *3.2 (3) Upon Executive Officer approval*
4) Evaluate Copper (Cu) discharges from storm drains for local impacts	
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. *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.* *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.* *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.*	*4.1 (1) As soon as possible but no later than (3 months from date of USEPA approval of BPA)* *4.1 (2) Upon Executive Officer approval.* *4.1 (3) As soon as possible but no later than 3 months from the findings of negative impacts to an area* *4.1 (4) Upon Executive Officer approval.* *Dischargers/Responsible Parties* *County of Orange, City of Newport Beach and other MS4 permittees* *CalTrans* *Agricultural dischargers* *Other NPDES permittees*
5) Continue Monitoring *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* *--Tributary runoff including San Diego Creek, Santa Ana Delhi and Big Canyon Wash*	*5 (1) As soon as possible but no later than (3 months from date of USEPA approval of BPA)* *5 (2) Upon Regional Board approval* *Dischargers/Responsible Parties* *County of Orange and other MS4 permittees*

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--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.* *5 (2) The dischargers shall implement the plan and schedule for the monitoring of Cu described in 5 (1).*	*City of Newport Beach* *CalTrans* *Agricultural dischargers* *Other NPDES permittees*
6) Conduct Special Studies *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:* *6.1) Determine the Cu loading from In-Bay Sediments* *Cu discharges from Bay sediments have not yet been quantified.* *6.2) Determine the Cu loading from Algae & Other Vegetation* *Cu loading from algae and other vegetation has not yet been quantified.*	*Special studies shall be implemented by the dischargers in accordance with direction from the Regional Board Executive Officer per Water Code Section 13267.* *Dischargers/Responsible Parties* *County of Orange and other MS4 permittees* *City of Newport Beach* *CalTrans* *Agricultural dischargers Other NPDES permittees*
7) Submit Updated TMDL Report, and Reevaluate and Revise the TMDL	*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.* *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.*

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

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Problem Statement for Zn, Hg, As and Cr Non-TMDL Action Plans (Action Plans)

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.(*ibid.*)) 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.

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.

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 approached 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.

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.)

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.

Impairment Assessment Results
Water. No dissolved metals, except Cu, exceeded the CTR saltwater criteria.

Sediments. Metals that exceeded the ERM sediment quality guidelines (plus sediment 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.

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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 topsmelt 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
	Fish Tissue Human Health (ug/g ww)		**Fish Tissue Wildlife (ug/g ww)**
Zn	40[3]		45[4]

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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
[1]Dissolved metals saltwater criteria are from the California Toxics Rule (CTR) (USEPA 2000)
[2]Sediment guidelines are from Long et al 1995 (ERL =effects range low)
[3]Zn human health target from Median International Standards (MIS), Nauen 1983
[4]Zn wildlife target from Eisler 1993
[5]Total Hg human health target from Johnson & Looker 2004, San Francisco Bay Mercury TMDL
[6]Methyl Hg human health target from Klasing & Brodberg 2008 (OEHHA)
[7]Methyl 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)
[8]Inorganic As human health target (carcinogen target) from USEPA 2000a Fish consumption guidance Volume 1 (Table 5-3)
[9]Total As wildlife target from Stanley 1994 (wet wt. conversion from dry wt. screening value-(assumes fish contain 75% moisture)
[10]Cr human health target from Median International Standards (MIS), Nauen 1983
[11]Cr 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**	**Hg[7]**
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			

[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:

1) Dischargers responsible to Correct Sediment Impairment from Zinc (Zn) and Mercury (Hg)
(1) City of Newport Beach

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(2) County of Orange
(3) Marina owner/operators
(4) Individual recreational boat owners
(5) Commercial vessel owners/operators
(6) Underwater hull cleaners
(7) Boatyards
(8) 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***
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)	*Dischargers/Responsible Parties* *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*
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) *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.* *The proposed Action 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 Zn and Hg (and Cu) impairment; and, (2)*	*Dischargers/Responsible Parties* *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* *2.1 (1) As soon as possible but no later than (3 months from date of USEPA approval of BPA)* *2.1 (2) Upon Regional Board approval*

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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). *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).* *1.1(2) The dischargers shall implement their plan(s) and schedule(s)*		
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	*Dischargers/Responsible Parties* *City of Newport Beach (City)* *County of Orange (County)*	
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. *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.* *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.* *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 include continued monitoring of As and Cr in fish and mussel tissue (in both the Upper and Lower Bay).* *2.1 (2) The dischargers shall implement their*		

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plan(s) and schedule(s)		
3) Consider Revisions to the Action Plans for Zn, Hg, As and Cr when Above Tasks are Completed	*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.*	
4) The general category of "Metals" should be DELISTED from Upper Newport Bay	*In the next listing cycle.*	

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STAFF REPORT - BASIN PLAN AMENDMENTS FOR COPPER TMDLs AND NON-TMDL METALS ACTION PLANS FOR ZINC, MERCURY, ARSENIC AND CHROMIUM IN NEWPORT BAY, CALIFORNIA

California Regional Water Quality Control Board
Santa Ana Region

August 30, 2016

Prepared by L. M. Candelaria, PhD, CPSS
Environmental Scientist

METALS IMPAIRMENT ASSESSMENT, COPPER TMDLS AND ZINC, MERCURY, ARSENIC AND CHROMIUM NON-TMDL METALS ACTION PLANS FOR NEWPORT BAY

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1.0 INTRODUCTION

This document presents the required elements of the proposed Total Maximum Daily Loads (TMDLs) for Copper in Upper and Lower Newport Bay and recommended Non-TMDL Action Plans for zinc (Zn), mercury (Hg), arsenic (As) and chromium (Cr). A TMDL identifies the maximum daily load of a pollutant that can be discharged into a waterbody without causing exceedances of the water quality objectives and/or impairment of the beneficial uses of those waters. A TMDL must also include seasonal variations and a margin of safety. This document summarizes the metals TMDLs promulgated in the Toxics TMDLs for Newport Bay and San Diego Creek by the U.S. Environmental Protection Agency (USEPA 2002) and the 303d listings for metals in Newport Bay and San Diego Creek, and presents an impairment analysis of the new data collected from 2002 through 2010 for Newport Bay. The goal of this staff report is to identify the metals causing impairment to Upper and Lower Newport Bay, in particular Copper (Cu), Mercury (Hg) and Zinc (Zn), Arsenic (As) and Chromium (Cr), and to outline an implementation plan to reduce metal concentrations in and discharged to Newport Bay.

1.1 ENVIRONMENTAL SETTING

The Newport Bay/San Diego Creek watershed is located in Central Orange County in the southwest corner of the Santa Ana River Basin, about 35 miles southeast of Los Angeles and 70 miles north of San Diego (Appendix 0). The watershed encompasses 154 square miles and includes portions of the Cities of Newport Beach, Irvine, Laguna Hills, Lake Forest, Tustin, Orange, Santa Ana, and Costa Mesa. Mountains on three sides encircle the watershed; runoff from these mountains drains across the Tustin Plain and enters Upper Newport Bay via San Diego Creek. Newport Bay is a combination of two distinct water bodies - Lower and Upper Newport Bay, divided by the Pacific Coast Highway (PCH) Bridge. The Lower Bay, where the majority of commerce and recreational boating exists, is highly developed. The Upper Bay contains both a diverse mix of development in its lower reach and an undeveloped ecological reserve to the north.[1]

San Diego Creek

San Diego Creek flows into Upper Newport Bay and is divided into two reaches. Reach 1 is located downstream of Jeffrey Road and Reach 2 lies upstream of Jeffrey Road to the headwaters. The San Diego Creek watershed (105 square miles) is divided into two main tributaries:

- Peters Canyon Wash, which drains Peters Canyon, Rattlesnake Canyon, and Hicks Canyon Washes that have their headwaters in the foothills of the Santa Ana Mountains, and
- San Diego Creek itself, which receives flows from Peters Canyon Wash in Reach 1 and includes Bee Canyon, Round Canyon, Marshburn Channel, Agua Chinon Wash, Borrego Canyon Wash and Serrano Creek[1]

Important freshwater drainages to Upper Newport Bay, together covering 49 square miles, include the San Diego Creek, Santa Ana-Delhi Channel, Big Canyon Wash, Costa Mesa Channel and other local drainages.

San Diego Creek is the largest contributor (95%) of freshwater flow into Upper Newport Bay, followed by Santa Ana-Delhi Channel (~5%) (ACOE 2000). Table 1-1 summarizes the drainage areas of the major tributaries.

[1]USEPA. Toxics TMDLs for San Diego Creek and Newport Bay, 2002.

Table 1-1 Drainage Areas of the Newport Bay Watershed

Tributary	Drainage Area (acres)	Drainage Area (%)
San Diego Creek	47,300	48
Peters Canyon Wash	28,200	29
Santa Ana-Delhi	11,000	11
Other Drainage Areas	12,000	12
Total	98,500	100

*Table 1-2 in the Toxics TMDLs, 2002

Upper Newport Bay Upper Newport Bay contains one of the highest quality wetland areas remaining in Southern California. The Upper Bay estuary contains a State Ecological reserve in the upper half with habitat designated for sensitive species, including several endangered bird species including –Ridgway's rail, the California least tern and Least Bell's vireo, and Belding's savannah sparrow (which is listed as endangered by the state). Several sediment basins are found in the Upper Bay and are periodically dredged by the Army Corps of Engineers (ACOE). The last sediment dredging and restoration project was conducted in 2005. The Upper Bay also contains the Newport Dunes Recreation area (Dunes) , a small public beach which is the main swimming area in the Upper Bay. The Dunes area is located in the lower part of Upper Bay, south of the Ecological Reserve. North Star Beach is also located in the Upper Bay just south of the Ecological Reserve. The lower part of the Upper Bay also contains several marinas, including the Dunes DeAnza marinas, which are located near the Dunes Recreation area and just north of Pacific Coast Highway bridge, respectively. Historical water uses for Upper Bay included water skiing, commercial and sport fishing (although limited fishing occurs presently), shellfish harvesting, preservation of rare species, marine habitat and recreation including kayaking, boating and bird watching.

Lower Newport Bay
The Lower Newport Bay area, including Lido and Balboa Islands, is highly urbanized and residential. The Lower Bay also includes a number of marinas and mooring areas that contain approximately 10,000 boats, and approximately 5 boatyards. The Rhine Channel, a small dead-end reach in the southwestern part of Lower Bay, is an isolated area with poor tidal flushing and minimal storm drain input. The Regional Board has identified Rhine Channel as a toxic hotspot based on previous investigations (BPTCP 1997). West Newport Bay and the Turning Basin area are also areas that tend to have low tidal flushing and tend to accumulate pollutants in waters and sediments. The entire Newport Bay up to the mouth of San Diego Creek is subject to tidal influence.

The climate is characterized by short, mild winters, and warm dry summers. Average rainfall is approximately 13 inches per year. Ninety percent (90%) of annual rainfall occurs between November and April, with minor precipitation during summer months. From 2006 to 2011, San Diego Creek had a mean base flow rate of less than 10 cubic feet per second (cfs) for flows less than 25 cfs (mean cfs of 8.4). This is a decrease from the mean base flow rate of 12 cfs for 1994 to 2002, reported in the Toxics TMDL. For storm events, flows may be as high as 8000 cfs. San Diego Creek is mostly freshwater with a wide range of hardness values and small influences by the slightly saline water table (less than 1 or 2% salinity). Santa Ana Delhi had a mean base flow rate of less than 5 cubic feet per second (cfs) for flows less than 25 cfs (mean cfs of 3.2) for 2006 to 2011, with storm flows almost to 500 cfs. The Upper Bay is an estuary with mostly saline water during dry weather, and heavy freshwater inflow from San Diego Creek and Santa Ana-Delhi Channel during major storms, which mostly occur in winter. Lower Bay waters are dominated by saline waters (30 to 35 parts per thousand (ppt)) due to twice-daily ocean tides which enter the Bay via the jetty entrance.

1.2 WATERSHED HISTORY

The description below is taken largely from Regional Board staff report prepared for its draft Newport Bay TMDLs (RWQCB 2000).

The nature of the Newport Bay watershed has changed dramatically over the last 150 years, both in terms of land use and drainage patterns. In the late 19th and early 20th centuries, land use changed from ranching and grazing to open farming. During this time the Santa Ana River flowed into Newport Bay, while San Diego Creek and the small tributaries from the Santiago Hills drained into an ephemeral lake and the neighboring area called "La Cienega de las Ranas" (Swamp of the Frogs) and then into the River. To accommodate rural farming, the ephemeral lake and Swamp of the Frogs were drained and vegetation cleared. Channels were constructed (but often did not follow natural drainage patterns) to convey runoff to San Diego Creek and then Newport Bay. After a major flood event in 1920's, the Santa Ana River was permanently diverted into the current flood control channel which now discharges to the Pacific Ocean. As a result of these land use and drainage changes, surface and groundwater hydrology have been substantially altered from natural conditions. Following World War II, land use again began to change from grazing and open farming to residential and commercial development. As urban development in the watershed proceeded (and continues), drainages were further modified through removal of riparian vegetation and lining of stream banks to expand their capacity and to provide flood protection. These changes culminated in the channelization of San Diego Creek in the early 1960s by the Orange County Flood Control Department. The channelization isolated the San Joaquin Marsh, the last remaining portions of the historic marsh upstream of Upper Newport Bay, from San Diego Creek (Trimble 1987).

Conversion of rural farmland to residential, commercial and light industrial use has been constant in the watershed. Land use statistics supplied by Orange County demonstrate this urban development (ACOE 2000). In 1983, agriculture accounted for 22% and urban uses for 48% of the Newport Bay watershed. In 1993, agricultural uses accounted for 12% and urban uses for over 64% of the area. As of 2000, agriculture had dropped to approximately 7% (<7,500 acres), including row crops (primarily strawberries and green beans), lemons, avocados and commercial nurseries. Currently, San Diego Creek watershed is greater than 90% urbanized whereas Santa Ana-Delhi is approximately 95% urbanized. Projected land use suggests 81% urban land use, 11% open, 8% rural and no agriculture (ACOE 2000).

Land use and drainage modifications changed the nature and magnitude of toxic substance discharges to the Bay. Converting from grazing type agriculture to orchards and row crops has increased the amount of pesticide use in the watershed, resulting in discharges of pesticides from these areas. The commercial nurseries drain to Peters Canyon Wash via Central Irvine Channel and to San Diego Creek via Marshburn Channel and Serrano Creek. Tustin and El Toro military bases exist within the watershed and have historically used various toxic substances during operations. Both military sites are involved with base closure procedures and may ultimately be converted to more urban/suburban areas.[2]

Urban development introduced new sources of toxic substances, including different pesticides and metals associated with human habitation (e.g., buildings, landscaping, and motor vehicles). In

[2] El Toro Marine Corps Air Station was decommissioned in 1999. The site was remediated for contaminated soils (volatile organic compounds (VOCs)). The former air station is planned to be converted into a large recreational center, the Orange County Great Park. Tustin Marine Corps Air Station was operationally closed in 1999, and approximately 13,000 acres were conveyed to the City of Tustin. The base site is now the home of the Orange County Sherriff Department academy.)

addition, land use activities which cause erosion may contribute to the delivery of pesticides and other pollutants that adhere to sediments or normally remain in solid form.

Table 1-2 Land Use types in watersheds of Newport Bay

	San Diego Creek Subwatershed		Newport Bay Watershed	
Land Use	**Acres**	**Percent**	**Acres**	**Percent**
Vacant	21,324	28.3	22,166	23.3
Residential	22,128	29.4	33,063	34.8
Education/Religion/Recreation	5,412	7.2	8,071	8.5
Roads	2,459	3.3	2,978	3.1
Commercial	10,004	13.3	13,030	13.7
Industrial	5,875	7.8	7,010	7.4
Agriculture	6,174	8.2	6,255	6.6
Transportation	122	0.2	602	0.6
No code	1,726	2.3	1,778	1.9
Total	75,224	100	94,953	100

Source: OC Public Works, provided May 2014

1.3 TMDL ELEMENTS

The elements of a TMDL are described in 40 CFR 130.2 and 130.7 and Section 303(d) of the CWA, as well as in the USEPA guidance (USEPA, 2000a). A TMDL is defined as the "sum of the individual waste load allocations for point sources and load allocations for nonpoint sources and natural background" (40 CFR 130.2) such that the capacity of the waterbody to assimilate pollutant loads (the loading capacity) is not exceeded. A TMDL is also required to account for seasonal variations and include a margin of safety to address uncertainty in the analysis (USEPA, 2000). In addition states must develop water quality management plans which incorporate approved TMDLs and implementation measures necessary to implement the TMDLs (40 CFR 130.6).

The goal of the TMDL process is to attain water quality standards and protect the beneficial uses of water bodies, including aquatic habitat, fishing, and recreation. A TMDL is a written, quantitative assessment of water quality problems and contributing pollutant sources. It identifies one or more numeric targets (endpoints) based on applicable water quality standards, specifies the maximum amount of a pollutant that can be discharged (or the amount of a pollutant that needs to be reduced) to meet water quality standards, allocates pollutant loads among sources in the watershed, and provides a basis for taking actions needed to meet the numeric target(s) and implement water quality standards.[3]

For all TMDLs, seven components must be included:

1 **Problem Statement**—a description of the water body setting, beneficial use impairment of concern, and pollutants causing the impairment.
2 **Numeric Targets—**for each pollutant addressed in the TMDL, appropriate measurable indicators and associated numeric target(s) based on numeric and/or narrative water quality standards which express the target or desired condition for the water body which will result in protection of the designated beneficial uses of water.
3 **Source Analysis**—an assessment of relative contributions of pollutant sources or causes to the use impairment.

[3] USEPA. Toxics TMDLs for San Diego Creek and Newport Bay, 2002.

4 Loading Capacity/Linkage Analysis—a connection between the numeric targets and pollutant sources which yields calculations of the assimilative capacity of the water body for each pollutant.

5 TMDL and Allocations— an expression of the total allowable pollutant loads as divided between pollutant sources through load allocations for nonpoint sources and wasteload allocations for point sources. The TMDL is defined as the sum of the allocations (plus a margin of safety) and cannot exceed the loading capacity for each pollutant.

6 Margin of Safety—an explicit and/or implicit margin of safety must be specified to account for technical uncertainties in the TMDL analysis.

7 Seasonal Variation/Critical Conditions—an account of how the TMDL addresses various flows and/or seasonal variations in pollutant loads and effects."

1.4 THIS STAFF REPORT FOR COPPER (Cu) TMDLS AND NON-TMDL ACTION PLANS FOR ZINC (Zn), MERCURY (Hg), ARSENIC (As), CHROMIUM (Cr)

This Staff Report includes the following sections:

Section 1.0 INTRODUCTION

This section includes a description of Newport Bay –the Environmental Setting and Watershed History, and outlines the TMDL elements.

Section 2.0 REGULATORY BACKGROUND

This section outlines the regulatory authority and oversight for the development and implementation of Total Maximum Daily Loads (TMDLs) in the state of California.

Section 3.0 TOXICS TMDLS AND 303(d) BACKGROUND

This section outlines the history of 303(d) listings for metals in Newport Bay, the Metals TMDLS promulgated by USEPA in the Toxics TMDLs for Newport Bay in 2002, the State Board assessment of metals in Newport Bay in 2006, and the current 303(d) listings and decisions for metals in Newport Bay (2008-2010 303(d) List).

Section 4.0 METALS IMPAIRMENT ASSESSMENT AND PROBLEM STATEMENT

This section outlines the metals impairment assessment for Newport Bay for data after 2002. This section includes the water quality objectives (WQOs), sediment guidelines, and fish tissue guidelines used for this data assessment; the data analysis; and a summary of the impairment assessment for Newport Bay. This section also includes a problem statement of the metals causing impairment to Newport Bay, and identifies the metals that require a TMDL.

Section 5.0 COPPER (Cu) TMDLS

This section outlines a TMDL for Copper including Numeric Targets, a Source Analysis, the Loading Capacity and Linkage Analysis, the TMDL and Allocations including the Margin of Safety and Seasonal Variations and Critical Conditions, and an Implementation Plan and Schedule to achieve the Cu TMDLs.

Section 6.0 NON-TMDL ACTION PLANS FOR ZINC (Zn), MERCURY (Hg), ARSENIC (As), CHROMIUM (Cr)

This section outlines an Action Plans for metals that are causing impairment but which do not require TMDLs, including Zinc (Zn), Mercury (Hg), Arsenic (As) and Chromium (Cr). This section includes Numeric Targets, Source Analysis, and Action Plans to achieve the Numeric Targets for these non-TMDL metals.

Section 7.0 RELATED ACTIONS FOR ALL METALS

This section outlines an additional action needed for all metals.

Section 8.0 CEQA ANALYSIS, ANTIDEGRADATION AND ECONOMICS

This section outlines CEQA analysis, antidegradation and economics.

Section 9.0 PEER REVIEW, STAKEHOLDER PARTICIPATION, AND STAFF RECOMMENDATION

This section discusses peer review, stakeholder participation and staff recommendation.

2.0 REGULATORY BACKGROUND

The objective of the Clean Water Act (CWA) is to "restore and maintain the chemical, physical and biological integrity of the Nation's waters" to ensure that the waters of the U.S. are "fishable and swimmable".

Section 303(d)(1)(A) of the CWA requires that "Each State shall identify those waters within its boundaries for which the effluent limitations are not stringent enough to implement any water quality standard applicable to such waters". Water bodies that have been identified in accordance with that requirement are placed on the CWA 303(d) list; these waters are not expected to meet water quality standards even after implementation of technology-based control practices. The CWA also requires states to establish a priority ranking of these waters on the 303(d) list; and to develop Total Maximum Daily Loads (TMDLs) for these waters. In the approved 2010 Section 303d list, both Upper and Lower Newport Bay are listed as impaired for Copper (Cu). Upper Newport Bay is also listed for the general category of "Metals"; however, this general listing for "Metals" needs to be removed. This de-listing has been proposed to the State Board, and should be approved in the next listing cycle.

When a TMDL is established by the USEPA or the State, the State must develop an implementation plan, and must incorporate the TMDL along with appropriate implementation measures into the State Water Quality Management Plan (Basin Plan) (40 CFR 130.6(c)(1), 130.7). The Basin Plan, and applicable state-wide plans, serve as the State Water Quality Management Plan which governs the Newport Bay watershed.

USEPA has oversight authority for the 303(d) program and is required to review and approve or disapprove the TMDLs submitted by states to determine if they meet all TMDL requirements. In California, the State Water Resources Control Board (State Board) and the nine Regional Water Quality Control Boards are responsible for preparing lists of impaired waterbodies under the 303(d) program and for preparing TMDLs, both subject to USEPA approval. If USEPA approves the State TMDLs, they will supercede applicable TMDLs that have been established by USEPA. If USEPA disapproves a TMDL submitted by a state, then USEPA is required to establish a TMDL for that water body. The Regional Boards also have the regulatory authority for many tools used to implement the TMDLs such as the National Pollutant Discharge Elimination System (NPDES) permits and Waste Discharge Requirements (WDRs).

3.0 TOXICS TMDLS AND 303(d) BACKGROUND

3.1 HISTORY OF 303(d) LISTINGS FOR METALS

Metals were not specifically listed as a pollutant in Newport Bay until 1996 (Table 3). Before that time in the early 1990s, the general category of Toxic Pollutants was listed for Newport Bay. In 1998 and 2002, both Upper and Lower Newport Bay were listed for metals. In 2006, copper (Cu) was listed for both Upper and Lower Newport Bay, and the general metals category was delisted for the Lower Bay. In 2010, both Upper and Lower Newport Bay remain listed for copper, and the Upper Bay remains listed for the general category of metals. For San Diego Creek, metals were first listed for Reaches 1 and 2 in 1998. Metals were delisted list for Reach 1 in 2002 and for Reach 2 in the 2008-2010 list. A summary of the 303d list history is included in Appendix 1.

The 303d listings in the early 1990s, and subsequent monitoring data supporting those listings, prompted SARWQCB staff to begin the development of TMDLs for toxic pollutants.

3.2 TOXICS TMDLS FOR NEWPORT BAY AND SAN DIEGO CREEK USEPA 2002

The United States Environmental Protection Agency (USEPA) has oversight authority for the 303(d) impaired waters program, and may establish TMDLs for a state if they do not approve TMDLs developed by a state. USEPA Region 9 was required by a consent decree to complete Total Maximum Daily Loads (TMDLs) for toxic pollutants, including metals, in Newport Bay by June 2002. This consent decree, which was entered into by USEPA and Defend the Bay, Inc. vs. Marcus, on October 31, 1997 (N.D. Cal. No. C97-3997 MMC) established a schedule for the development of TMDLs in San Diego Creek and Newport Bay. The decree required the development of TMDLs for a variety of pollutants by January 15, 2002; this date was subsequently extended to June 15, 2002. Because the SARWQCB was unable to complete the development of TMDLs for toxic pollutants by the date specified in the consent decree, USEPA was required to do so.

Metals identified in the consent decree included cadmium (Cd), chromium (Cr), copper (Cu), lead (Pb), mercury (Hg), silver (Ag) and zinc (Zn); however, USEPA was required to establish TMDLs only for those pollutants they deemed necessary (USEPA 2002, Part H). Metals which were assessed by USEPA were arsenic (As), Cd, Cr, Cu, Pb, Hg, Ag and Zn (USEPA 2002). Nickel (Ni) was not part of the assessment for the Toxics TMDL (reason unknown); however, Ni will be assessed for this metals TMDL.

In June 2002, the USEPA promulgated TMDLs for Toxic Pollutants in Newport Bay and San Diego Creek (USEPA 2002). These TMDLs included metals TMDLs for dissolved copper (Cu), cadmium (Cd), lead (Pb) and zinc (Zn) for Upper Newport Bay and San Diego Creek; and dissolved copper, lead and zinc for Lower Newport Bay (Table 3-1). Arsenic (As) was assessed but did not require a TMDL since applicable criteria were not being exceeded. Mercury (Hg) and chromium (Cr) were also assessed and TMDLs for these metals were only promulgated for the Rhine Channel. (Selenium (Se) is addressed by a separate TMDL). The toxics TMDLs can be found at http://www.epa.gov/region09/water/tmdl/final.html.

USEPA determined the metals that required TMDLs using a two-tiered approach based on exceedances of the dissolved metals chronic or acute CTR saltwater criteria, the sediment guidelines and fish tissue guidelines (Part H, USEPA 2002). For sediment data, exceedances of the high sediment guidelines (ERMs, PELs) or low sediment guidelines (ERLs +TELs) (Long et al, 1995) were determined. In addition to the sediment chemistry data, sediment toxicity was also evaluated. Sediment toxicity was found in the Upper and Lower Newport Bay. Metal concentrations in fish and mussel tissue were also examined for exceedances of fish tissue guidelines. Cu and Zn concentrations in bivalves showed bioconcentration in the Lower Bay (SMW 2000); however, fish tissue concentrations were not elevated with respect to OEHHA screening values (OEHHA, 1999). Cu, Cd, Pb and Zn do not tend to bioaccumulate (magnify up the food chain).

Table 3-1 Metals TMDLs promulgated by USEPA in 2002

Upper Newport Bay (marine)	Cadmium (Cd), Copper (Cu), Lead (Pb), Zinc (Zn)
Lower Newport Bay (marine)	Cu, Pb, Zn
San Diego Creek (freshwater)	Cd, Cu, Pb, Zn

3.3 STATE BOARD DATA ASSESSMENT 2006

Subsequent to USEPA's promulgation of technical TMDLs, the State Water Resources Control Board (SWRCB) adopted the Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List (State Listing Policy) in September 2004. This policy specifies methodology for placing a water body on the CWA 303(d) list.

Upper and Lower Newport Bay In 2006, State Board staff conducted an extensive analysis of individual metals in both the Upper and Lower Bay, including As, Cd, Cr, Cu, Pb, Hg, Ni, Ag and Zn. All metals examined in both the Upper and Lower Bay were designated as DO NOT LIST decisions, except for Cu which was designated as LIST for both Upper and Lower Newport Bay. This analysis was based on one data set for water and sediment (Bay & Greenstein, 2003), a fish tissue data set (TSMP 2000), and sediment toxicity data (Bay *et al.* 2004, Phillips *et al.* 1998); however, some metals analyzed in these reports are missing in the 303(d) list decision sheets. The decision sheets outline data used to list, not list or delist a waterbody. (A summary of the decision sheets can be found in Appendix 2.) County of Orange (OC) storm water data (which were used to determine the metals for which USEPA promulgated TMDLs in 2002), were not analyzed during the 2006 assessment of data.

During this State Board assessment, it was also determined that the general category of "Metals" is inadequate to characterize the specific pollutants causing water quality impairment in a water body; therefore, individual metals were assessed for the Upper and Lower Bay.
Specifically decision sheet #6772 states that
"Currently Newport Bay, lower, is listed for metals. It is not possible, in a general listing, to determine which specific pollutant is causing or contributing to a water quality impacts. There is sufficient justification for removing the general listing for metals from the 303(d) list and replace these general listings with the specific pollutants when found to be exceeding."
http://www.waterboards.ca.gov/water_issues/programs/tmdl/2010state_ir_reports/00033.shtml#6772
It was therefore recommended that general "Metals" category be DELISTED for the Lower Bay. The same DELIST decision was not however, applied to the Upper Bay even though the same analyses for individual metals were conducted in the Upper Bay and a DELIST decision was justified for the general "Metals" category (decision sheet #7267). This inconsistency was discussed with the State Board staff in February 2008, however, no DELIST sheet was ultimately prepared for the "Metals" listing in the Upper Bay for the 2010 303d list, and the general category of "Metals" has not yet been DELISTED for the Upper Bay.

San Diego Creek In 2006, State Board staff conducted an extensive analysis of individual metals for Reach 1, and all metals examined in San Diego Creek were designated as Do Not List (Cu, Cd, Pb, Zn, Ni, As, Ag, Hg). (A Do Not List sheet for Cr is appropriate but was missing.) Individual metals were not, however, analyzed for Reach 2; therefore, the general listing of metals was removed for Reach 1 but remained for Reach 2.

3.4 CURRENT 303(d) LISTINGS AND DECISIONS –2008-2010 SECTION 303(d) LIST

Newport Bay In the 2008-2010 303(d) list, Lower Newport Bay is listed for copper and sediment toxicity, and Upper Newport Bay is listed for copper, metals and sediment toxicity (Table 3-2). Note that the general category of "Metals" was removed for the Lower Bay, but not for the Upper Bay as discussed above. Regional Board staff believe this to be an oversight and inconsistency that needs to be corrected since the same assessment was conducted in 2006 for both the Upper and Lower Bay and the general category of "Metals" in the Lower Bay was DELISTED in 2006. (In the 2006 State Board assessment, individual metals were separately analyzed for the Upper as well as the Lower Bay.) Based on the assessment for the 2008-2010 303(d) list, no metals except Cu exceed the CTR criteria; however, County of Orange monitoring data were not evaluated, and some data from reports referenced were not evaluated. These data are evaluated in this report.

San Diego Creek In the 2008-2010 303(d) list, Reach 2 was DELISTED for metals, based on monitoring data from the County of Orange which indicated minimal exceedances of the dissolved metals CTR freshwater criteria (Cu, Cd, Pb, Zn, Cr, Ni, Ag, As). Reaches 1 and 2 are no longer listed for metals. Since San Diego Creek is no longer listed for metals, no TMDL is required. San Diego Creek and the Santa Ana Delhi Channel will both be addressed as sources to the Upper Bay in this report.

Based on the findings from the 2010 303(d) list, where Reaches 1 and 2 were delisted for the general category of metals and no individual metals were listed, USEPA should depromulgate TMDLs for Cd, Cu, Pb, Zn in San Diego Creek.

Table 3-2 2010 303d List for Newport Bay and San Diego Creek

Upper Newport Bay (marine)	Copper (Cu), Metals, Sediment Toxicity
Lower Newport Bay (marine)	Cu, Sediment Toxicity (General Metals Category Delisted in 2006)
San Diego Creek (freshwater)	
Reach 1*	No Metals Listed
Reach 2^	No Metals Listed

*Reach 1 is downstream of Jeffrey Road
^Reach 2 is upstream of Jeffrey Road to the headwaters

In reviewing the decision sheets for metals for this TMDL, some errors were found by Regional Board staff and corrections were submitted to the State Board. Appendix 2 is a summary of the decision sheets used for the 2008-2010 listing process plus corrections and additions of newer data. These corrections and new data referenced will be incorporated into the 2012 listing process and decision sheets. Decision sheets for the 2010 303d list can be found at the following links: http://www.waterboards.ca.gov/water_issues/programs/tmdl/2010state_ir_reports/table_of_contents.shtml#r8

4.0 METALS IMPAIRMENT ASSESSMENT AND PROBLEM STATEMENT

This section includes applicable water quality standards, the State Listing Policy (SWRCB, 2004) which was used to assess the data, and the analysis of the data to determine the metals causing impairment in Newport Bay.

4.1 WATER QUALITY STANDARDS

The Clean Water Act (CWA) requires that states adopt water quality standards, which include 1 - beneficial uses, 2 -water quality objectives (numeric and narrative), and 3 -an antidegradation policy. Water quality standards for the Santa Ana Region are specified in the Water Quality Control Plan for the Santa Ana River Basin (Basin Plan, SARWQCB 1995). The Basin Plan can be found at http://www.waterboards.ca.gov/santaana/water_issues/programs/basin_plan/index.shtml.
In addition to the Basin Plan, USEPA promulgated numeric water quality objectives for priority toxic pollutants for the State of California in the California Toxics Rule (CTR) (40 CFR 131) for the protection of human health and wildlife. The federal water quality criteria established by the CTR are equivalent to state water quality objectives and are legally enforceable.

4.1.1 BENEFICIAL USES

Beneficial uses of Newport Bay are designated in the region's Basin Plan, and are shown in Table 4-1. Adverse impacts to these beneficial uses that result from discharges of toxic pollutants are violations of the second narrative objective for toxic substances specified in the Basin Plan (Section 4.1.3 below).

Table 4-1 The Beneficial Uses of San Diego Creek and Newport Bay

	NAV	REC1	REC2	COMM	BIOL	WILD	RARE	SPWN	MAR	SHELL	EST
Upper Newport Bay		X	X	X	X	X	X	X	X	X	X
Lower Newport Bay*	X	X	X	X		X	X	X	X	X	

X = Existing or potential beneficial use, I = Intermittent beneficial use, * Includes the Rhine Channel
NAV =Navigation, REC1 =Water contact recreation, REC2 =Non-contact water recreation,
COMM =Commercial and sportfishing, BIOL =Preservation of biological habitats of special significance,
WILD =Wildlife habitat, RARE =Rare, threatened, or endangered species,
SPWN =Spawning, reproduction, and development, MAR =Marine habitat,
SHEL =Shellfish harvesting, EST =Estuarine habitat

4.1.2 NUMERIC WATER QUALITY OBJECTIVES

In 2000, USEPA promulgated numeric water quality criteria for toxic pollutants, including dissolved metals, for the State of California in the California Toxics Rule (CTR) (40CFR131.38) for the protection of human health and aquatic life. The CTR established numeric aquatic life criteria and numeric human health criteria for 23 and 57 priority toxic pollutants, respectively. In the CTR, USEPA established concentration-based criteria; so that the criteria would be applicable in both wet and dry weather conditions. (There is no exception for wet weather conditions in the CTR since a pollutant concentration accounts for an increase in water volume, and aquatic life is present in wet weather as well as dry weather conditions.) Metals criteria were established for dissolved metals. Because the CTR criteria were promulgated by USEPA in 2000 for toxic pollutants, including dissolved metals in saltwater and freshwater, the criteria are legally enforceable.

For the protection of aquatic life, the CTR established criterion maximum concentrations (CMC) as acute (short-term criteria) and criterion continuous concentrations (CCC) as chronic (long-term

criteria) for toxic pollutants in both saltwater and freshwater. The CTR includes acute and chronic criteria for dissolved Arsenic (As), Cadmium (Cd), Chromium (Cr), Copper (Cu), Lead (Pb), Mercury (Hg), Nickel (Ni), Silver (Ag) and Zinc (Zn). These are also the metals of concern that are most commonly found in estuaries and bays.

These metals were assessed in the Newport Bay Toxics TMDL (USEPA 2002), and all are included in this TMDL assessment. Since Newport Bay is an estuary and is mostly saltwater, the CTR Saltwater Criteria for Dissolved Metals were used for this assessment of metals in Newport Bay.

4.1.3 NARRATIVE WATER QUALITY OBJECTIVES

The Basin Plan specifies two narrative water quality objectives for toxic substances (SARWQCB 1995). These are:

1) Toxic substance shall not be discharged at levels that will bioaccumulate in aquatic resources to levels which are harmful to human health, and
2) The concentration of toxic substances in the water column, sediment or biota shall not adversely affect beneficial uses.

Evidence that toxic substance concentrations in the water column, sediment or biota exceed applicable numeric or narrative objectives indicates that beneficial uses are being impaired or threatened.

4.1.4 ANTIDEGRADATION POLICY

The CWA requires that each state develop and adopt a statewide antidegradation policy. California's antidegradation policy is addressed by the "Policy with Respect to Maintaining High Quality Waters in California"(State Board Resolution No.68-16) which is incorporated by reference in the Basin Plan. This State Board policy requires "the continued maintenance of existing high quality waters" with some exceptions under which a decrease in water quality may be allowed.

4.1.5. POTENTIAL REVISIONS TO COPPER (Cu) OBJECTIVES: WATER EFFECTS RATIO AND MARINE Cu BIOTIC LIGAND MODEL (Cu BLM)

As discussed in Section 4.1.2, the California Toxics Rule, which was promulgated by USEPA in 2000, specifies the water quality criteria for dissolved copper (Cu) applicable to California's marine waters. These criteria ("water quality objectives" in California Water Board language) form the basis for regulatory actions by USEPA and the Regional Boards to address Cu discharges, including discharges from Cu antifouling paints (Cu AFPs). The CTR criteria for dissolved Cu are expressed as a function of the water-effects ratio (WER). The WER is generally computed as the acute or chronic toxicity value for a pollutant measured in the affected receiving water, divided by the respective acute or chronic toxicity value in laboratory dilution water. A default WER of one (1) is assumed for the purposes of determining the applicable numeric objectives. This means that the numeric values identified in the CTR for dissolved Cu apply, unless an alternative, scientifically defensible WER is developed, approved and applied to modify the numeric value of the objective. If approved, the revised objectives form the basis for discharge requirements and other regulatory actions.

More recently in 2007, USEPA developed an alternative approach to the determination of Cu criteria/objectives based on a freshwater Biotic Ligand Model (BLM) that considers the chemical speciation of Cu in a water body. The model is based on the hypothesis that the most toxic form of Cu is the free Cu ion (Cu^{+2}) (i.e. the more free Cu in solution, the higher the potential toxicity), and ligands in solution, such as chloride, sulfate and dissolved organic carbon (DOC), bind Cu so that

less free Cu is available (i.e. the higher the concentration of ligands in water, the higher the concentration of Cu complexes (bound Cu) and the lower the concentration of free Cu).

CTR Cu criterion is based on → dissolved Cu in water (Cu^{+2} + Cu complexes)

BLM Cu criterion is based on → estimated Cu^{+2} in water

The freshwater BLM also uses water chemistry parameters of a specific water body, including pH, salinity, temperature and dissolved organic carbon (DOC), to calculate a freshwater Cu criterion for each sample.

The Marine Copper Biotic Ligand Model (Cu BLM) is similar to the freshwater BLM in that DOC, pH, salinity and temperature are used to calculate a dissolved Cu criterion for a single sample. The dissolved Cu criterion calculated by the marine Cu BLM, however, is based primarily on DOC since pH, salinity and temperature are relatively constant in ocean waters; therefore, the marine Cu BLM criterion is highly dependent on the DOC concentration. Since the DOC may vary throughout the year, it is critical to characterize the range of DOC concentrations in a water body, or a particular site, throughout the year (and potentially over several years) to establish an accurate Cu BLM criterion for that water body or site. Note that when the DOC concentration is close to 1 mg/L or less, the marine Cu BLM objective is nearly equivalent to the acute CTR saltwater criterion for dissolved Cu (4.8 µg/L), and the Cu BLM criterion increases as the DOC decreases below 1mg/L. A technical report on the marine Cu BLM may be found at
http://water.epa.gov/scitech/swguidance/standards/criteria/aqlife/copper/upload/2009_04_27_criteria_copper_2007_blm-tsd.pdf
USEPA also has a presentation on the Cu BLM:
http://water.epa.gov/learn/training/standardsacademy/upload/2008_08_20_standards_academy_special_blm_presentation-notes.pdf

The draft Marine Cu BLM was released for public comment on July 29, 2016, and may be found at: https://www.epa.gov/wqc/aquatic-life-criteria-copper.
If sanctioned by USEPA, the Marine Cu BLM may be used in the future to develop site-specific Cu objectives that may differ from those specified in the CTR. Again, to achieve an accurate Cu BLM criterion, the DOC must be characterized at least throughout a year.

As discussed below (Section 5.6.3.1.2), adjustments to the CTR criteria/objectives for dissolved Cu may be pursued for Newport Bay. Revised objectives, if approved, would likely necessitate review and possible revision of this TMDL, including the impairment assessment, Cu allocations and this implementation plan. The recommended TMDL implementation plan described below accommodates such actions.

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4.2 DATA ANALYSIS AND METHODOLOGY
New Metals Data and Studies Completed/In Progress Since 2002

In 2002, USEPA promulgated Toxics TMDLs, including metals, for Newport Bay and San Diego Creek. USEPA's assessment to determine the metals that required TMDLs included the review of water and sediment data from 1996-2000.

USEPA's impairment assessment for Newport Bay was based on a two-tiered approach where a Tier 1 designation represented "clear evidence of impairment with probable adverse effects", while a Tier 2 designation represented "incomplete evidence and/or evidence of possible adverse effects or potential for future impairment" (USEPA 2002). Water samples were compared to acute and chronic CTR criteria, sediments were evaluated with a triad approach (sediment chemistry, sediment toxicity, infaunal analysis), and sediment metal concentrations were compared to TEL, ERL and PEL sediment guidelines (threshold effects levels, effects range low and probable effects levels, respectively) to determine exceedances. Fish tissue impairment was based on fish consumption advisories and tissue concentrations compared to screening values. Fish tissue metals were compared to the lower screening value of USEPA (2000b) or OEHHA (1999). A minimum of ten samples and a percent exceedance of 10% for water samples, and 25% for sediment (high guideline) and tissue samples, were required to determine a Tier 1 designation. A Tier 2 designation was determined by one exceedance in 3 years for water samples, and a 10% exceedance for sediment (low guideline) and tissue samples. A water segment could also be designated as Tier 2 if it was adjacent to a water segment where impairment was determined and a TMDL was required.

USEPA's impairment assessment decisions for Newport Bay were based on the following data and criteria shown in Table 4-2 and detailed in Part H of the Toxics TMDL (USEPA 2002). (Data for San Diego Creek is not shown.)

Table 4-2 Metals Assessment by USEPA (Toxics TMDLs –Part H, 2002)

Upper Newport Bay TMDLs	*Data supporting a TMDL*
Cadmium (Cd)	**Sediments* 21% (8/42) >ERL (1.2 µg/g) *Tier 2* Potential threat to UNB based on sediment data, and evidence of impairment in San Diego Creek (exceedances of the CTR criteria) *TMDL needed based on adjacent water analyses (SD Creek)*
Copper (Cu)	*Water* many exceedances of CTR criteria *Tier 2* *Sediments* 17% (7/42) >TEL (35.7µg/g) *Tier 2*
Lead (Pb)	*Sediments* 5% (2/42) >ERL (46.7µg/g) Potential threat to UNB based on sediment data, and impairment in Rhine Channel (exceedances of sediment ERM)
Zinc (Zn)	*Water* many exceedances of CTR criteria *probably Tier 2* *Sediments* 17% (8/48) >ERL (150 µg/g) *Tier 2* *Tissue* 10% (1/10) > screening value *Tier 2*
Lower Newport Bay TMDLs	*Data supporting a TMDL*
Copper (Cu)	*Water* many exceedances of CTR criteria *Sediments* 33% (9/27) >PEL (108 µg/g) *Tier 2* *Porewater* 5/10 with elevated Cu *Tier 2*
Lead (Pb)	*Sediments* 12% (5/30) >ERL (46.7µg/g) *Tier 2* Potential threat to UNB based on sediment data, and

	Impairment in Rhine Channel (exceedances of sediment ERM)
Zinc (Zn)	*Water* many exceedances of CTR criteria *probably Tier 2* *Sediments* 37% (14/48) >ERL *Tier 2*

*Sediment TELs, ERLs and PELs are not used for listing purposes based on the current State Listing Policy (SWRCB 2004)

In 2004, the State Listing Policy (SWRCB 2004) was adopted to provide statewide guidance to identify waters that do not meet applicable water quality standards with technology-based controls alone and to prioritize those waters for TMDL development (i.e. to determine waterbodies that are exceeding the standards for any pollutant(s). In 2006, the state board used this State Listing Policy to assess metals in water and sediment data from Newport Bay studies (1998-2006) to determine the metals causing impairment to Newport Bay.

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4.2.1 METHODOLOGY

Criteria and Guidelines Used for this Impairment Assessment

In this impairment assessment, metals data were analyzed according to the State Listing Policy (SWRCB, 2004) to determine the metals that are causing impairment to Newport Bay. Data from 2002 through 2010 were assessed. Data not assessed for the 2008-2010 303(d) list were also analyzed for this impairment analysis, and data used for the 2006 and 2010 303d lists were reviewed again.

The methodology based on the State Listing Policy was different, although similar, to that used by USEPA for the data assessment for the Toxics TMDL. In the State Listing Policy, waterbodies may be considered to be impaired by exceedances of the CTR water quality criteria, exceedances of fish or mussel tissue guidelines for human health or aquatic life, or the presence of water or sediment toxicity. In addition, a waterbody may be considered to be impaired by exceedances of the higher sediment guidelines if sediment toxicity is also present in that water segment. The number of exceedances of the water quality criteria or sediment or tissue guidelines which indicate impairment are determined by the application of the binomial distribution as explained below and shown in (Appendix 3, Table 3.1).

The State Listing Policy (SLP), Section 3 states the following:

"Water segments shall be placed on the section 303(d) list if any of the following conditions are met.

SLP 3.1 Numeric Water Quality Objectives and Criteria for Toxicants in Water

Numeric water quality objectives for toxic pollutants, including maximum contaminant levels where applicable, or California/National Toxics Rule water quality criteria are exceeded as follows:

- *Using the binomial distribution, waters shall be placed on the section 303(d) list if the number of measured exceedances supports rejection of the null hypothesis as presented in Table 3.1 [Appendix 3]...*

SLP 3.5 Bioaccumulation of Pollutants in Aquatic Life Tissue

A water segment shall be placed on the section 303(d) list if the tissue pollutant levels in organisms exceed a pollutant-specific evaluation guideline (satisfying the requirements of section 6.1.3) using the binomial distribution as described in section 3.1.
Acceptable tissue concentrations may be based on composite samples measured either as muscle tissue or whole body residues. Residues in liver tissue alone are not considered a suitable measure. Samples can be collected either from transplanted animals or from resident populations.

SLP 3.6 Water/Sediment Toxicity

A water segment shall be placed on the section 303(d) list if the water segment exhibits statistically significant water or sediment toxicity using the binomial distribution as described in section 3.1. The segment shall be listed if the observed toxicity is associated with a pollutant or pollutants. Waters may also be placed on the section 303(d) list for toxicity alone. If the pollutant causing or contributing to the toxicity is identified, the pollutant shall be included on the section 303(d) list as soon as possible (i.e., during the next listing cycle).

Reference conditions may include laboratory controls (using a t-test or other applicable statistical test), the lower confidence interval of the reference envelope, or, for sediments, response less than 90 percent of the minimum significant difference for each specific test organism.

Appropriate reference and control measures must be included in the toxicity testing. Acceptable methods include, but are not limited to, those listed in water quality control plans, the methods used by Surface Water Ambient Monitoring Program (SWAMP), the Southern California Bight Projects of the Southern California Coastal Water Research Project, American Society for Testing and

Materials (ASTM), USEPA, the Regional Monitoring Program of the San Francisco Estuary Institute, and the Bay Protection and Toxic Cleanup Program (BPTCP).

Association of pollutant concentrations with toxic or other biological effects should be determined by any one of the following:

A. Sediment quality guidelines (satisfying the requirements of section 6.1.3) are exceeded using the binomial distribution as described in section 3.1. In addition, using rank correlation, the observed effects are correlated with measurements of chemical concentration in sediments. If these conditions are met, the pollutant shall be identified as "sediment pollutant(s).

B. For sediments, an evaluation of equilibrium partitioning or other type of toxicological response that identifies the pollutant that may cause the observed impact. Comparison to reference conditions within a watershed or ecoregion may be used to establish sediment impacts.

C. Development of an evaluation (such as a toxicity identification evaluation) that identifies the pollutant that contributes to or caused the observed impact."

Section 6 of the State Listing Policy addresses Policy Implementation.
Section 6.1.3, Evaluation Guideline Selection Process, shows the following additional guidelines which are supplemental to Section 3:

"Narrative water quality objectives shall be evaluated using evaluation guidelines. When evaluating narrative water quality objectives or beneficial use protection, RWQCBs and SWRCB shall identify evaluation guidelines that represent standards attainment or beneficial use protection. The guidelines are not water quality objectives and shall only be used for the purpose of developing the section 303(d) list.

To select an evaluation guideline, the RWQCB or SWRCB shall:

- *Identify the water body, pollutants, and beneficial uses;*
- *Identify the narrative water quality objectives or applicable water quality criteria;*
- *Identify the appropriate interpretive evaluation guideline that potentially represents water quality objective attainment or protection of beneficial uses. If this Policy requires evaluation values to be used as one line of evidence, the evaluation value selected shall be used in concert with the other required line(s) of evidence to support the listing or delisting decision. Depending on the beneficial use and narrative standard, the following considerations shall be used in the selection of evaluation guidelines:*

  1. *<u>Sediment Quality Guidelines for Marine, Estuarine, and Freshwater Sediments</u>:*
     A. If sediment quality objectives apply, the Regional Water Boards shall use the methods and procedures that were adopted to interpret the objective and any provisions adopted to develop the section 303(d) list.

     B. If no applicable sediment quality objectives apply, or insufficient data exists to interpret sediment quality objectives, the Regional Water Boards may select sediment quality guidelines that have been published in the peer-reviewed literature or by state or federal agencies. Acceptable guidelines include selected values (e.g., effects range-median, probable effects level, probable effects concentration), and other sediment quality guidelines. Only those sediment guidelines that are predictive of sediment toxicity shall be used (i.e., those guidelines that have been shown in published studies to be predictive of sediment toxicity in 50 percent or more of the samples analyzed).

  2. *<u>Evaluation Guidelines for Protection from the Consumption of Fish and Shellfish</u>:*

The Regional Water Boards may select evaluation guidelines published by U.S. EPA or OEHHA. Maximum Tissue Residue Levels (MTRLs) and Elevated Data Levels (EDLs) shall not be used to evaluate fish or shellfish tissue data.

3. *Evaluation Guidelines for Protection of Aquatic Life from Bioaccumulation of Toxic Substances: The Regional Water Boards may select the evaluation values for the protection of aquatic life published by the National Academy of Science."*

"RWQCBs shall assess the appropriateness of the guideline in the hydrographic unit. Justification for the alternate evaluation guidelines shall be referenced in the water body fact sheet."
The above citations show that individual Regional Boards may use best professional judgement in choosing the sediment and tissue criteria for evaluation and listing purposes. The water quality objectives, sediment guidelines and fish/mussel tissue screening values used to evaluate data for this metals impairment assessment are summarized below and shown in Table 4-3.

Water data
For this metals assessment, exceedances of the CTR saltwater criteria (acute & chronic) were evaluated for dissolved metals, including Cu, Zn, Cd, Cr, Ni, Pb, Hg, As, Ag (Table 4-3), to determine impairment based on the Listing Policy. These are the same metals that were evaluated in the Newport Bay Toxics TMDLs (USEPA 2000).

Sediment data
In September 2008, new sediment quality objectives (SQOs) for metals and other toxicants were adopted by the State Board in an amendment (Resolution No. 2008-0070) to the Water Quality Control Plan for Enclosed Bays and Estuaries of California (Resolution No. 95-84). These objectives take a somewhat different approach from the 2004 State Listing Policy (SLP) as the SQOs approach is 1) site driven, 2) it requires three lines of evidence –sediment chemistry, sediment toxicity and benthic community assessment, and 3) in the sediment chemistry analyses, it requires that data for both metals and organics be analyzed at the same time. In February 2015, the SQOs were added to the SLP. Since the application of the SQOs requires both metals and organics data (and more data than previously required by the SLP for sediment evaluation), the SLP states that "If no applicable sediment quality objectives apply, or insufficient data exists to interpret sediment quality objectives, the Regional Water Boards may select sediment quality guidelines that have been published in the peer-reviewed literature or by state or federal agencies." http://www.waterboards.ca.gov/water_issues/programs/tmdl/303d_listing.shtml

Since this impairment analysis addressed only metals, and since there are no corresponding organic data for each site, nor benthic community analyses, this impairment assessment is based on the 2004 SLP guidelines in which the State and Regional Water Boards use published Sediment Quality Guidelines to assess metals for 303(d) Listing and TMDLs rather than the SQOs. The Regional Boards have routinely used ERMs (Effects Range Median) and ERLs (Effects Range Low) (Long et al. 1995) to determine sediment contamination by metals and other pollutants in marine waters (NOAA SQuiRTS 1999). *Exceedances of the ERMs along with sediment toxicity, are currently used to list marine areas with impaired sediments when there is insufficient data to use the SQOs.* (For saltwater sediments, ERMs and ERLs were constructed by the National Oceanic Atmospheric Administration (NOAA) which examined biological effects and chemistry from bioassay results and field data (Long *et al.* 1995). ERM values represent the 50th percentile of the ranked data and the point above which adverse effects are expected, while ERL values represent the 10th percentile and the point below which adverse biological effects are not expected to occur.) (While ERMs indicate probable impairment and are used along with sediment toxicity to list a waterbody, ERLs indicate low probability of impairment and are more protective of benthic organisms. ERLs have been used as conservative numeric targets for TMDLs in other Regions.)

For this metals impairment assessment, exceedances of the ERM (Effects Range Median) sediment guidelines for metals along with sediment toxicity were evaluated to determine impairment, based on the State Listing Policy, since both ERM exceedances and sediment toxicity are required to consider a waterbody as impaired. Metals assessed include Cu, Zn, Cd, Cr, Ni, Pb, Hg, As, Ag (Table 4-3). These are the same metals that were evaluated in the Newport Bay technical Toxics TMDLs (USEPA 2000). Exceedances of the ERL (Effects Range Low) sediment guidelines for metals were also evaluated to determine the metals that should continue to be monitored since ERLs are commonly used as conservative numeric targets in metals TMDLs.

Toxicity data

For this metals assessment, toxicity data were used in addition to metal exceedances of the ERM sediment guidelines to determine impairment based on the State Listing Policy.

Fish/Mussel Tissue data

For this metals assessment**,** exceedances of the human health guidelines (OEHHA, USEPA) and the wildlife guidelines (Fish & Wildlife Service (FWS)) were evaluated to determine impairment based on the State Listing Policy (Table 4-3). Median International Standards (MIS, Nauen 1983) for fish tissue for human health are also shown in Table 4-3, and were only used if no other human health criteria were available. Fish tissue criteria for human health from the Toxics TMDLs (USEPA 2002) are also shown in Table 4-3 but were not used unless they were verified. Criteria that were used for this analysis are highlighted in Table 4-3.

A few metals require explanation.

Arsenic

Arsenic speciation. Arsenic (As) exists in the environment and in fish tissue as several different chemical species. Inorganic As species, AsIII (arsenite) or AsV (arsenate), are the more toxic forms of As and the fraction of inorganic As ranges from <1 to 20% of the total arsenic in fish tissue (USEPA 2000a). Most As in fish tissue occurs as organic species (mostly as arsenobetaine) which are inert and nontoxic. While the preferred measurement for As in fish tissue is the measurement of inorganic As, as recommended by USEPA, it is an expensive analysis; therefore, most studies measure total As in fish tissue and estimate inorganic As from the total As concentration. USFDA recommends measuring total As in fish tissue and using 10% of the total As to represent the inorganic fraction of As (USFDA 1993). The literature shows that inorganic As in fish and shellfish tissue is generally lower than the 10% described above: < 4% by Donahue and Abernathy 1999; <3% by Vazquez 2005; 1.2% by Greene *et al.* 2011a, Greene 2011;, 1% by Creed 2011 and Peshut *et al.* 2007. This assessment used 10% of the total As to represent the inorganic As fraction, as a conservative value, which is similar to the As analysis conducted in the Toxics TMDL (USEPA 2002).

Arsenic (As) guidelines. In addition to speciation issues, there are several recommended guidelines for As in fish tissue. For human health, several guidelines exist for total As; however, total As guidelines will not be used in this assessment since inorganic As has been shown to be the toxic form of As (USEPA 2000a). Consumption guidelines for inorganic As in fish tissue for human health have been outlined by USEPA including a noncarcinogen guideline of 1.2 µg/g wet weight (ww) and a carcinogen guideline of 0.026 µg/g ww (USEPA 2000a). While USEPA used the 1.2 µg/g ww guideline for inorganic As in the Toxics TMDL, there was insufficient explanation as to why the carcinogen guideline was not used to assess As impairment. Later studies, such as the National Lakes Study (USEPA 2009), used an even lower inorganic As carcinogen guideline (0.016µg/g ww) to assess fish tissue data for human health. This assessment evaluated inorganic As with both the 1.2 and the 0.026 µg/g ww guidelines to assess human health impacts.

For wildlife, there is no consensus on whether the fish tissue guideline should be for inorganic or total As since there is not enough data to show that organic As species are nontoxic to wildlife (pers. communication K. Zeeman, PhD, USFWS). The fish tissue guideline shown in the Toxics TMDLs is 0.25 µg/g ww; however, this value could not be verified in the reference document. Stanley *et al.* (1994) showed sublethal effects in mallards exposed to 100µg/g dw (25 µg/g ww). This assessment evaluated total As in fish tissue for wildlife with the 25 µg/g ww guidelines since Stanley et al's study evaluates total As effects on a waterfowl species. (Estimates from K. Zeeman suggest using a fish tissue guideline for wildlife consumption of 3 to 6 µg/g ww for total As; however, this value range is based on risk assessment methodology and is unpublished).

Mercury

For mercury (Hg), the organic form, methylmercury (methyl Hg), is more toxic than inorganic Hg. However, since the analysis of methylmercury is expensive, USEPA recommends measuring total mercury in fish tissue and using a conservative assumption that all mercury is equal to methylmercury to be protective of human health (USEPA 2000a). The USEPA fish tissue guideline for methylmercury is 0.3 µg/g ww (USEPA 2002, Toxics TMDLs); however, OEHHA has recommended a somewhat lower fish tissue guideline of 220ng/g ww. To be protective, this assessment will use the OEHHA guideline of 220 ng/g ww as a human health guideline for methyl Hg.

Since Hg is commonly analyzed as total Hg, the San Francisco Bay Hg TMDL states numeric targets for total Hg based on USEPA's methyl Hg guideline (Johnson and Looker 2004). The human health guideline for total Hg is 200 ng/g ww. This assessment used the human health guideline in the SF TMDL for total Hg in fish tissue, and the OEHHA guideline of 220 ng/g ww for methyl Hg in fish tissue.

For wildlife, the fish tissue guideline for methyl Hg of 30ng/g ww should be protective of the California least tern, an endangered bird species found in Newport Bay (Russell 2003). The number for the Ca. least tern is for small fish (<5 cm). In addition, Russell gives a methyl Hg guideline of 55ng/g ww for the protection of the sea otter. This number was used to assess larger fish (>5 cm). Both guidelines were used in this assessment based on fish size.
The fish tissue guideline for total Hg is 30 ng/g ww (Johnson and Looker 2004). This assessment also used the total Hg wildlife guideline for total Hg fish tissue data.

Cadmium

For Cadmium (Cd), there are several recommended fish tissue guidelines for human health including 1.0, 3.0 and 4.0 µg/g ww (Yeardley *et al.* 1998, OEHHA 1999, USDI 1998, respectively). To be conservative, this assessment used the 1.0 µg/g ww guideline by Yeardley et al.
For wildlife, Eisler (1985) recommends a not to exceed fish tissue guideline of 0.1 *µg/*g ww. This assessment used this value to evaluate fish tissue for wildlife.

Chromium

For Chromium (Cr), the Toxics TMDLs used a fish tissue guideline for human health of 1.0 µg/g ww (MIS value). This assessment used this value to determine impairment for human health.
For wildlife, the fish tissue guideline in the Toxics TMDLs is 0.2 µg/g ww, a fish tissue target in the Rhine Channel (USEPA 2002, Table 7-1); however, the reference for this value could not be located. Eisler (1986) recommends a not to exceed fish tissue guideline of 10 µg/g dw (2.5 µg/g ww) for Cr^{3+}. This assessment used the value of 2.5 µg/g ww to evaluate fish tissue for wildlife since there was no value for total Cr, and the lower value in the Toxics TMDLs could not be verified.

Copper

For Copper (Cu), there are currently no fish tissue guidelines for human health by USEPA or OEHHA; however, there are MIS guidelines from Australia, New Zealand and Zambia (Nauen 1983). This assessment used fish tissue guidelines from Australia (10 and 70 µg/g ww for fish and mussels). For wildlife, the fish tissue guideline in the Toxics TMDLs is 15 µg/g ww; however, this guideline could not be verified in the reference document. Puls (1988) recommends a not to exceed guideline of 200 µg/g dw (50 µg/g ww) based on his study with waterfowl. This assessment used the guideline of 50 µg/g ww to evaluate fish tissue for wildlife since the lower guideline could not be verified.

Lead and Zinc

For Lead (Pb) and Zinc, the human health guidelines in the Toxics TMDLs (2.0, 45 fish/70 mussels µg/g ww could not be verified in the MIS fish tissue guidelines; however, there are MIS guidelines from a number of countries (Table 4-3 and Nauen 1983). This assessment used the guidelines of 1.5 and 2.5 µg/g ww for Pb in fish and shellfish, respectively, for human health, since these values were closest to the Toxics TMDLs guidelines. This assessment used the guideline of 40 µg/g ww for Zn.

Fish tissue guidelines for wildlife also include Nickel (Ni) 50 µg/g ww (200 µg/g dw), Lead (Pb) 10 µg/g ww, Silver (Ag) 50 µg/g ww (200 µg/g dw) and Zinc 45 µg/g ww (178µg/g dw) (Eisler 1998, 1988, 1996, 1993, respectively). This assessment used the above values to evaluate fish tissue for wildlife.

A summary table below shows the water quality criteria, and sediment and tissue guidelines used for this assessment (Table 4-3). Numerous tissue guidelines were found for human health and wildlife; however, not all the guidelines were used in this assessment. The guidelines used in this assessment are highlighted in Table 4-3. Data collected after 2002 (after USEPA's Toxics TMDLs for Newport Bay) were evaluated using these criteria/guidelines and the application of the State Listing Policy to determine whether waters, sediments and/or fish and mussel tissue showed impairment. The data assessment and studies evaluated are described in Section 4.2.2.

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Table 4-3 Numeric Criteria/Guidelines for Metals in Saltwater, Sediment, Tissue

	Dissolved Metals Saltwater criteria[1] (µg/L)		Sediment quality guidelines (saltwater)[2] (µg/g)			Tissue guidelines (µg/g ww)		
	Acute	Chronic	ERL	ERM		Human health (µg/g ww) OEHHA[3,4] USEPA[5,6,7]	Human health (µg/g ww) MIS[9]	Wildlife (µg/g ww) DOI/FWS[10] HgTMDL[11] FWS[12]
Arsenic (As)	69	36	8.2	70		1.0[3], 0.7[8]	1.4SF[9HK] 3.5FF,5.0F[9Z]	25[14]
Inorganic Arsenic[6,7] (As^i)						1.2[5,7] 0.026[5,7] 0.016[7]	1.0,1.5[9A] 3.5FF[9CA]	
Cadmium (Cd)	42	9.3	1.2	9.6		4.0[10], 3.0[3], 1.0[8]	0.2F,2.0M[9A] 0.5FF[9G] 2.0FSF[9HK]	0.1[13]
Chromium –total (Cr)	1100	50	81	370			1.0FSF[9HK]	2.5[13]
Copper (Cu)	4.8	3.1	34	270			10F[9A], 70/30M[9A] 30F[9NZ] 100F[9Z]	50[15]
Mercury (Hg)		51ng/L[1a]	0.15	0.71		200ng/g[11]		
Methyl Mercury (meHg)						300 (288) ng/g[5] 220ng/g[4]		30ng/g[12] 55ng/g[12]*
Nickel (Ni)	74	8.2	20.9	51.6				50[13]
Lead (Pb)	210	8.1	46.7	218			1.5F,2.5SF[9A] 0.5FF[9CA] 0.5FF[9G] 0.5FSF[9NE] 0.5F[9PH] 1.0F[9SW] 0.5FF, 10F[9Z]	10[13]*
Silver (Ag)	1.9	None	1.0	3.7				50[13]
Zinc (Zn)	90	81	150	410			150F[9A], 1000O[9A] 40F[9NZ] 100F[9Z]	45[13]

[1] All dissolved metals saltwater criteria are from the California Toxics Rule (CTR) (USEPA 2000)
[1a] Dissolved mercury (Hg) saltwater criteria have units of ng/L, and are for the protection of human health (CTR) (USEPA 2000)

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[2]Sediment guidelines are from Long *et al.* 1995 (ERM =effects range median, ERL =effects range low)
[3]OEHHA tissue guidelines 1999
[4]OEHHA tissue guidelines, Klasing & Brodberg 2008, guideline for methyl Hg is 220ng/g
[5]USEPA 2000a Fish consumption guidance Volume 1 (Table 5-3)
Recommended guidelines for Cd (4.0µg/g) and methyl Hg (0.3µg/g) are higher than OEHHA guidelines and were not used for this analysis.
(USEPA methyl Hg guideline is also in USEPA 2001 Water quality criteria for the protection of human health: methyl mercury. EPA-832-R-01-001. January 2002. U.S.EPA, Office of Water, Washington, D.C. http://water.epa.gov/scitech/swguidance/standards/criteria/health/methylmercury.cfm
[6] Note that according to USEPA, inorganic As is the most toxic form of As and ranges from <1 to 20% of the total arsenic in fish tissue, while most As found in fish tissue is in the organic form (arsenobetaine) which is nontoxic (USEPA 2000a). USEPA recommends that inorganic arsenic be measured in fish tissue rather than total As; however, much of the As analysis for fish tissue measures total As rather than inorganic As. The FDA, therefore, recommends measuring total As in fish tissue and estimating inorganic As as approximately 10% of the total As (USFDA, 1993). For human health criteria, this assessment will use 10% of total As to represent the inorganic fraction which is similar to this analysis in the Toxics TMDL.
[7]In the Newport Bay Toxics TMDL (2002), USEPA used a fish tissue guideline for inorganic As of 1.2µg/g wet weight (ww) for recreational fishermen; however, the USEPA Guidance for Fish Advisories for human health includes a noncarcinogen guideline of 1.2 µg/g ww and a carcinogen guideline of 0.026 µg/g ww (USEPA 2000a). In addition, in the Lakes Fish Tissue study used an even lower carcinogen guideline of 0.016µg/g as a human health guideline for inorganic As in fish tissue (USEPA 2009). This assessment evaluates inorganic As for human health using both the 0.026 and 1.2 µg/g guidelines in fish tissue.
[8] Yeardley et al, 1998 (used formula from USEPA 1997)
[9] Median International Standards (MIS), Nauen 1983 (F=fish, FF=fish filets, SF =shellfish, M=mussels, O=oysters); A =Australia, 9CA =Canada, 9G =Germany, 9HK =HongKong, 9NZ =NewZealand 9NE =Netherlands, 9PH =Phillipines, 9SW =Sweden, 9Z =Zambia; German criteria is for freshwater fish filets
[10] DOI/FWS =US Department of the Interior Biological Effects Guidelines (NIWQP) 1998
[11] Johnson and Looker. Mercury in San Francisco Bay. Basin plan amendment and staff report (2004)
[12]Methyl Hg value from Russell 2003 (USFWS); this screening value is also used in the Newport Bay Toxics TMDL (Table 7-1 (USEPA 2002). The 30ng/g value should be protective of the California least tern (Russell 2003). The California least tern is an endangered species found in Newport Bay.
This Hg value was used for smaller fish (average of 5cm).
[12a]Methyl Hg value from Russell 2003 (USFWS) for larger fish (>100cm) for the protection of the southern sea otter.
[13]Eisler 1985 for Cd; Eisler 1986 for Cr; Eisler 1993 for Zn; Eisler 1996 for Ag; Eisler 1998 for Ni
–for Cr, Zn, Ag, Ni, wet wt. conversion from dry wt. screening values (assumes fish contain 75% moisture)
Cr value is for Cr3+, no value could be found for total Cr
[13a]Eisler 1988 for Pb –value is for reproduction impairment not a no effects level
[14]Stanley 1994 for As –wet wt. conversion from dry wt. screening value (assumes fish contain 75% moisture)
[15]Puls 1988 for Cu, effects level –wet wt. conversion from dry wt. screening value (assumes fish contain 75% moisture)
Various tissue guidelines were found for human health and wildlife –the highlighted numbers are the values used in this assessment.
F=fish, SF=shellfish, M=mussels

4.2.2 DATA ANALYSIS

Metals targeted in the Toxics TMDLs (USEPA 2002) include Cd, Cu, Pb and Zn in the Upper Bay; Cu, Pb and Zn in the Lower Bay; and Cd, Cu, Pb and Zn for San Diego Creek (Table 1).
In the 2008-2010 303(d) List, Cu and sediment toxicity are listed for both the Upper and Lower Bay, and no metals are listed for San Diego Creek. The general category of "Metals" is still listed for the Upper Bay. Delisting for this category will be recommended as part of the 2012 303(d) listing process. (Table 2)

Since the USEPA Toxics TMDLs were promulgated in 2002, additional data have been collected and analyzed, and the 303(d) List was revised in 2006 and 2010. This metals impairment assessment evaluates data not assessed for the 2010 303(d) list, and reviews data used for the 2006 and 2010 assessments (data after the USEPA Toxics TMDL, 2002) (Table 5). These data are also summarized in the sections below. The two largest data sets, the Cu-Metals Marina study and County of Orange (OC) monitoring data are presented first, followed by discussions of the other studies listed in Table 5.

Table 4-4 Data reviewed in this assessment

Study/monitoring	***Water data***	***Sediment data***	***Sediment toxicity***	***Fish/Mussel tissue***
4.2.2.1 Copper Metals Marina Study (OC Coastkeeper & L.M.Candelaria 2007)	X	X	X	
4.2.2.2 County of Orange (OC) stormwater monitoring data (2006-09, 2009-11)	X	X	X	
4.2.2.3 Copper Reduction in Lower Newport Bay study (319(h) grant) (OC Coastkeeper & L.M.Candelaria 2013)	X			
4.2.2.4 Sediment Evaluation for Lower Newport Bay Dredging study (NewFields 2009)		X		
4.2.2.5 Food Web Study in Fish (Allen *et al.* 2008)		X		X
4.2.2.6 Dept. of Fish & Game (DFG) monitoring data (Frueh & Ichikawa 2007)		X		X
4.2.2.7 Bioaccumulation Fish Tissue study (Allen *et al.* 2004)				X
4.2.2.8 Newport Bay Sediment Toxicity study (Bay *et al.* 2004)	X	X	X	
4.2.2.9 Newport Bay and San Diego Creek -Chemistry study (Bay & Greenstein 2003)	X	X	X	
4.2.2.10 Metals Sediment Study in Lower Newport Bay (Post-dredging) (OC Coastkeeper & L.M.Candelaria 2014)	Bottom water	X	X	

X = data collected
ND = no data at this time (data will be available at a later date)

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4.2.2.1 Copper-Metals Marina study and 4.2.2.2 County of Orange (OC) stormwater monitoring data (OC Coastkeeper and L.M.Candelaria 2007; OC Stormwater data 2006-09, 2009-11)

For studies after 2002, the two largest data sets in Newport Bay are from the Cu-Metals Marina Study (OC Coastkeeper 2007) and OC monitoring data (OC Stormwater data 2006-09, 2009-11). They are summarized together in Table 4-5, and discussed below. Additional details of these two studies are shown in Appendix 4. Additional studies with smaller data sets were also analyzed, and are discussed individually below. The Bay Protection and Toxics Cleanup Study, an older but important study, (Phillips'98) is summarized in Appendix 5.

For both the Marina study and OC monitoring, USEPA priority metals were analyzed including Cu, Zn, Cd, Cr, Ni, Pb, Hg, As, Ag). These metals are normally the metals of highest concern since they are the most common metals, and may be toxic at elevated concentrations.
Marina study link is:
http://www.waterboards.ca.gov/santaana/water_issues/programs/tmdl/docs/newport/finalcufinal_report.pdf

Results
Metals that exceeded the CTR saltwater criteria and/or the ERM/ERL sediment guidelines are discussed below and shown in Table 6. OC monitoring data for 2009-11 was analyzed separately to show a more recent data set in comparison to 2006-09.

Water. Of the metals analyzed, only Cu exceeded the dissolved CTR saltwater criteria in water samples in all sets of data (Marina study, OC data). Dissolved Cu exceeded the acute or chronic CTR saltwater criteria in 13/27 and 53/78 samples in the Upper and Lower Bay, respectively (Marina study), in 5/88 and 7/44 samples in the Upper and Lower Bay, respectively (OC data 2006-09), and in 48/68 and 22/34 samples in the Upper and Lower Bay, respectively (OC data 2009-11). Note that the percent exceedances were higher for the Marina study data and OC data 2009-11)

Sediment. In sediments, Cu, Zn and Hg exceeded the ERM sediment guidelines in the Lower Bay (16/78, 12/78, 24/78 samples, respectively), and the highest exceedances were found in the Turning Basin area of the Lower Bay (14/48, 12/48, 22/48 samples, respectively) (Marina study). Sediment Ag exceeded the ERM guideline in only one sample in the Turning Basin (Marina study). In the OC monitoring data, there were 2/11 exceedances of the Hg ERM in the Turning Basin area in 2006-09, and 1/8 exceedance in 2009-11.
(Note that the number of dissolved Cu exceedances and sediment metal exceedances are higher in the Marina study compared to OC monitoring data of 2006-09; this is likely due to inclusion of marina sites in the Marina study compared to OC monitoring sites which do not include marinas.)
In addition, many metals exceeded the ERL sediment guidelines including Cu, Zn, Cd, Ni, Pb, Hg, As and Ag in all data sets. (The ERL sediment guidelines are generally used as targets in sediments in metals tmdls in California.)

Sediment toxicity. Sediment toxicity was also found at most sites (12/14) tested in the Marina study, and in 22/60 sites tested in OC monitoring data (2006-09). Sediment toxicity was determined with *Eohaustorius estuarius* in both data studies. It is interesting to note that in the Marina study, the relative proportion of toxic sites was only slightly higher in the Upper vs Lower Bay (6/6, 6/8, respectively); while in OC monitoring, the proportion of toxic sites in the Upper Bay was almost double that of the Lower Bay (16/38, 6/22, respectively). This is likely due to the higher number of and wider distribution of sites sampled in the Upper Bay for OC monitoring compared to the limited number of Upper Bay sites sampled in the Marina study. In addition, the Marina study showed a higher percent of toxic sites compared to OC sites. This is likely due to the testing within marinas in

the Marina study. Further details on the Marina study and OC monitoring data are provided in Appendix 4.

Turning Basin area of Lower Newport Bay. The Turning Basin area exceeded the dissolved Cu CTR saltwater criteria in all data sets. In addition, the Turning Basin area exceeded both the ERM sediment guidelines for Cu, Hg, and Zn in the Marina study, and demonstrated sediment toxicity in Marina study and OC monitoring samples. Because of the ERM exceedances and the sediment toxicity, the Turning Basin area in particular needs future action including continued monitoring. The City of Newport Beach has been dredging parts of Lower Newport Bay in 2012; however, these dredge sites did not include the Turning Basin area.

Marinas. It is also evident from the data that marinas in Newport Bay generally have both higher concentrations of dissolved Cu and higher sediment concentrations of metals compared to the main channels of the Bay (Marina Study). Marinas also need future actions and need to be monitored as part of the routine monitoring by OC.

Impairment shown in this study: Copper (Cu) in water in the Upper and Lower Bay; Cu, Zinc (Zn), Mercury (Hg) in sediments in the Lower Bay; Sediment toxicity

***Water.** The data above demonstrate that both Upper and Lower Newport Bay waters are still impaired for Cu. Bay waters tested exceed the dissolved Cu CTR saltwater criteria. Bay waters tested include marina waters within the Bay (Marina study).

Sediment. The Marina study data show that sediments are impaired for Cu, Zn and Hg in the Lower Bay, especially in the Turning Basin area. Sediments exceed the ERM sediment guidelines and the majority of sediments analyzed were positive for sediment toxicity. The Turning Basin area shows the highest impairment in Lower Newport Bay (excluding the Rhine Channel).

Sediment toxicity. Sediment toxicity is present in both the Upper and Lower Bay at a majority of the sites tested.

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Table 4-5 Summary of Cu-Metals Marina study and County of Orange (OC) monitoring data in Newport Bay

Water data -Exceedances of acute or chronic CTR saltwater criteria						
	Marina Study (2006-07)			**OC monitoring data (2006-09, 2009-11)**		
Metal**	**Upper Bay (n=27)**	**Lower Bay (n=78)**	**Turning Basin^ (n=48)**	**Upper Bay (n=88, 68)**	**Lower Bay (n=44, 34)**	**CTR criteria (acute, chronic) (µg/L)**
***Cu**	13	53	43	5, 48	7, 22	(4.8, 3.1)
***Zn**	0	0	0	0, 0	0, 0	(90, 81)
Hg	0	0	0	0, 0	0, 0	(1.8, 0.94)
***Cd**	0	0	0	0, 0	0, 0	(42, 9.3)
***Pb**	0	0	0	0, 0	0, 0	(210, 8.1)
Ni	0	0	0	0, 0	0, 0	(74, 8.2)
Ag	0	0	0	0, 0	0, 0	(1.9, -)
As	0	0	0	0, 0	0, 0	(69, 36)
+Cr	0	0	0	0, 0	0, 0	(1100, 50)
Water Toxicity[1]	0/2	0/8	0/6			

Sediment data –Exceedances of ERM (ERL) sediment quality guidelines							
	Marina Study (2006-07)[2]			**OC monitoring data (2006-09, 2009-11)**			
Metal**	**Upper Bay (n=27)**	**Lower Bay (n=78)**	***Turning Basin^ (n=48)***	**Upper Bay (n=45,28)**	**Lower Bay (n=28,16)**	***Turning Basin^ (n=13,8)***	**Sediment ERM (ERL)[3] (µg/g)**
***Cu**	0 (25)	16 (60)	*14 (33)*	(19, 12)	(24, 12)	*(13, 8)*	270 (34)
***Zn**	0 (19)	12 (58)	*12 (34)*	(9, 11)	(16, 7)	*(13, 4)*	410 (150)
Hg	0 (1)	24 (31)	*22 (17)*	(0/43)# (1/28)	2 (12/25)# 1 (9/16)	*2 (11/11)# 1 (7/8)*	0.71 (0.15)
***Cd**	0 (16)	0 (26)	*0 (15)*	(10, 9)	(4, 1)	*(1, 0)*	9.6 (1.2)
***Pb**	none	0 (24)	*0 (24)*	(0, 0)	(7, 1)	*(7, 1)*	218 (46.7)
Ni	0 (16)	0 (62)	*0 (40)*	(8, 6)	(13, 5)	*(13, 4)*	51.6 (20.9)
Ag	none	1 (2)	*1 (2)*	(1, 0)	(1, 0)	*(1, 0)*	3.7 (1.0)
As	0 (10)	0 (63)	*0 (43)*	(9, 9)	(14, 6)	*(13, 4)*	70 (8.2)
+Cr	0 (0)	0 (0)	*0 (0)*	(0, 0)	(0, 0)	*(0, 0)*	370 (81)
Sediment Toxicity[4]	6/6	6/8	*5/6*	16/38	6/22	*2/11*	
SWI[5]	0/2	3/8	*3/6*				
PW[6]	2/8	4/12	*3/8*				

n =number of samples for water or sediment analyses; number of samples for toxicity is shown in toxicity data cells, # n for Hg is different from other metals for OC data 2006-09

* Metals requiring TMDLs in the Newport Bay Toxics TMDLs (USEPA 2002)

**USEPA priority metals were analyzed including Cu, Zn, Cd, Cr, Ni, Pb, Hg, As, Ag

+ Cr was included in this table to demonstrate low concentrations (even though fish tissue concentrations exceed guidelines –see Section 4.2.2.4)

^Turning Basin is part of the western Lower Bay; numbers are a subset of Lower Bay totals.

[1] Water toxicity determined using mussel embryo development test

[2] In Marina study, most metals analyzed exceeded ERL sediment guidelines (see Section 4.2.2.1)

[3] Sediment guidelines from Long *et al.* 1995

[4] Sediment toxicity was determined using *Eohaustorius estuarius*

[5] SWI = sediment-water interface toxicity, determined using mussel embryo development

[6] PW =pore water toxicity, determined using mussel embryo development

4.2.2.3 Copper (Cu) Reduction in Lower Newport Bay (CWA 319(h) grant) January 2009 – March 2013 (OC Coastkeeper and L.M.Candelaria 2013)
The goal of this grant was to decrease the number of boats using Cu antifouling paints (Cu AFPs) in a target marina (Balboa Yacht Basin) by 50% and in the Lower Bay by 10%. In addition, dissolved Cu, and other metals, was monitored in the target marina and reference areas during the study. This three year 319(h) grant was awarded to OC Coastkeeper in late 2008 and executed in January 2009. The grant consists of several major tasks: 1) boater education especially in the target marina, 2) an incentive program for the conversion of boats from Cu to nontoxic AFPs, 3) water monitoring, 4) a city resolution to promote the use of nontoxic AFPs.

Education. Coastkeeper developed and conducted an education program in the target marina and baywide to educate boaters on why Cu is a problem in the Bay, and the viability of using alternative nontoxic AFPs. Boater education included the creation of educational materials on the toxicity of Cu to aquatic organisms and a list of alternative nontoxic boat paints. Coastkeeper also conducted dock walking events to contact boaters individually. This task also included working with boatyards to educate them and coordinate with them on the availability, application and economics of nontoxic AFPs, so that nontoxic paints would be available to boaters.

Boat conversions. Balboa Yacht Basin (BYB) was chosen as the target marina for a 50% conversion of boats from Cu to nontoxic AFPs. A 10% conversion of boats from Cu to nontoxic application was anticipated Baywide. A database was kept on boat conversions to nontoxic and Cu-free AFPs (OC Coastkeeper 2013).

Monitoring. The target marina and several control sites were monitored throughout the project (Appendix 4, Figure 4-2). Water samples were collected and analyzed to determine potential changes in dissolved Cu concentrations. Monitoring occurred in summer and winter during dry weather so that storm drain runoff did not increase Cu concentrations.
City resolution. Coastkeeper and Regional Board staff also worked with the City of Newport Beach to pass a resolution promoting the use of nontoxic, Cu-free AFPs.

Results
Education. Coastkeeper successfully developed a boater education program and education materials, and worked with the City of Newport Beach, boat owners, boatyard owners, paint manufacturers and divers to educate boaters and to convert boats from Cu to nontoxic AFPs. Coastkeeper conducted meetings with boat owners, and dock visits for one on one boater contact. Coastkeeper worked with boatyards to provide nontoxic, Cu-free AFPs or coatings to boaters. In addition, Coastkeeper continues to work with project partners from the Port of San Diego boat paint study to obtain current information on newly developed nontoxic AFPs.

Boat conversions. Coastkeeper worked with individual boaters and Newport boatyards to accomplish the conversion of boats from Cu to nontoxic AFPs with limited success. Ten (10) boats were converted from Cu to nontoxic AFPs or coatings during this project. Note that only three boats were converted in the first two years of the project due to non-cooperation of the boatyards; while seven boats were converted in the last six months of the project when Balboa Shipyard began supporting this project. This demonstrates that support from the boatyards is critical to the success of the conversion from Cu to nontoxic AFPs or coatings in Newport Bay. In addition, Coastkeeper worked with Dr. Katy Wolf (IRTA) who worked with paint manufacturers to develop nontoxic AFPs that could be applied over old Cu AFPs and/or rolled on rather than sprayed on. These changes in application requirements of nontoxic AFPs or coatings reduced the cost of converting to nontoxics.

Water Monitoring. Dissolved and total metal concentrations were monitored twice near the beginning of this project (October 2010, January 20111) and twice near the end (August 2012, January 2013) to determine if a relationship existed between number of boats converting to

nontoxic or Cu-free AFPs and dissolved Cu concentrations. Since only ten boats were converted during this project, a relationship between boat conversions and dissolved Cu could not be determined, and Cu concentrations did not significantly decrease in the target marina during this project period. With respect to exceedances of water quality criterion, dissolved Cu concentrations exceeded the chronic and acute CTR saltwater criteria in all four marina stations in the target marina (BYB) in 15/16 and 6/16 samples, respectively, and in all three reference marinas in 10/15 and 5/15 samples, respectively. Dissolved Cu concentrations in the channel sites exceeded the CTR criterion much less than marina sites. The BYB channel site exceeded the dissolved Cu criterion in 1/4 samples; and there were no exceedances of the Cu criterion in 4 samples in the main channel sites. These data are further evidence that marinas consistently exceed the dissolved Cu criterion and are elevated in Cu with respect to channel sites, and this elevated Cu is due to the boats permanently docked at these marinas.

City resolution. Coastkeeper gave several presentations to the Coastal Bay Water Quality Committee and the City Council of Newport Beach. In June 2010, the City Council passed a resolution (Resolution No.2010-53) promoting the discontinuation of Cu boat bottom paints and the use of nontoxic, Cu-free boat paints. Regional Board staff sent a letter to the City of Newport Beach supporting the passage of this resolution. Coastkeeper continues to work with City staff to address the issue of Cu boat paints.

4.2.2.4 Sediment Evaluation for Lower Newport Bay Dredging (NewFields 2009)

Lower Newport Bay was analyzed in a pre-dredging study.

Results

Water. No water samples were analyzed.

Sediment. Sediment core samples were collected from 13 sites, homogenized and analyzed for multiple metals. Only Hg exceeded ERM sediment guidelines; Hg and other metals (Cu, Cd, Ni, As) exceeded ERL sediment guidelines (Tables 4-6, 4-7). Hg was also analyzed in multiple sediment samples at each site (Table 4-7). Several sites had multiple exceedances of the Hg ERM sediment guidelines. The highest number of exceedances was in the North and South Lido Isle Channels and the Yacht Anchorage Middle area. These data demonstrate that Hg contamination in sediments is widespread in Lower Newport Bay and not just limited to the Turning Basin area of Lower Newport Bay.

Impairment shown in this study: Mercury (Hg) in core sediments in the Lower Bay

***Sediment.** The data demonstrate that sediments exceed the ERM guidelines for Hg in the Lower Bay; however, these samples were homogenized cores and surface samples were not analyzed. Surface samples should be analyzed from these areas since impairment determination for sediments is based on surface sample data.

Table 4-6 Sediment Metals - Exceedances of ERM (ERL)

	Lower Bay 13 sites
Cu	**(12)**
Cd	**(7)**
Hg	**2 (11)**
Zn	**none**
Ni	**(6)**
Pb	**none**

Ag	**none**
As	**(1)**

Table 4-7 Sediment Hg - Exceedances of ERM, (ERL) by site		
	n	**Hg**
Balboa Reach	**10**	**(9)**
Harbor Isld Reach	**10**	**(9)**
Lido Isle Reach –N	**8**	**5 (3)**
Lido Isle Reach –S	**7**	**3 (4)**
W Lido Area B	**8**	**2 (6)**
Balboa Isld/Collin Isld	**9**	**2 (5)**
Balboa Isld Channel	**8**	**2 (5)**
Upper Newport Channel	**7**	**1 (2)**
Yacht Anchorage –North	**5**	**(4)**
Yacht Anchorage –Middle –U	**8**	**(1)**
Yacht Anchorage -Middle –L	**8**	**4 (3)**
Yacht Anchorage -South –U	**7**	**none**
Yacht Anchorage –South-L	**7**	**(3)**

n = number of samples

4.2.2.5 Assessment of Food Web Transfer of Organochlorine Compounds and Trace Metals in Fishes in Newport Bay, California (Allen *et al.* 2008)

This purpose of this study was to determine trace metal and organochlorine concentrations in fish tissue and compare to fish tissue guidelines for human health and wildlife; to determine pollutant sediment concentrations and compare them to sediment guidelines; to calculate bioconcentration, bioaccumulation, biomagnification and trophic transfer factors for target fish species; to determine fish species that could be used to assess water quality; and to identify Bay locations in which prey or sediment have elevated concentrations of contaminants of concern.
Multiple fish species were collected in Newport Bay and analyzed for trace metals and organochlorines; sediments were also collected and analyzed for trace metals and organochlorines. Trace metals examined included copper (Cu), zinc (Zn), cadmium (Cd), lead (Pb), arsenic (As), chromium (Cr), nickel (Ni), mercury (Hg) and silver (Ag). Whole fish were analyzed for seven species including topsmelt, California killifish, California halibut, deepbody anchovy, striped mullet, cheekspot goby and shadow goby; while filets were only analyzed for large striped mullet. No fish or sediment samples were collected in the Turning Basin area of the Lower Bay (an area shown in other studies to have elevated sediment concentrations of Cu, Zn and Hg).

Results
Sediment. Only mercury (Hg) exceeded the sediment ERM guideline in 1/19 samples (Lower Bay sample). Sediment ERL guidelines were exceeded by copper (Cu), zinc (Zn), mercury (Hg), arsenic (As) and nickel (Ni) in 3/19, 1/19, 2/19, 1/19 and 1/19 sediment samples, respectively (Table 4-8). Mean and maximum sediment concentrations are shown in Table 4-8b. All sediment metal exceedances in the Lower Bay were found in the S. Lido Channel area (southwestern Newport Bay).
Fish/Mussel Tissue. Fish tissue guidelines and exceedances in fish species examined are shown in Table 4-8. Human health guidelines for inorganic arsenic (As), mercury (Hg), cadmium (Cd), copper (Cu), chromium (Cr), lead (Pb) and zinc (Zn) were evaluated only in striped mullet filets.

Wildlife guidelines for copper (Cu), mercury (Hg), zinc (Zn), lead (Pb), arsenic (As), chromium (Cr), nickel (Ni) and silver (Ag) were evaluated in whole fish. Mean and maximum fish tissue concentrations are shown in Table 4-8b.

For human health, two guidelines for inorganic arsenic (As) in fish tissue were evaluated (1.2 and 0.26 µg/g ww). Ten percent (10%) of the total As in fish filets was used to represent inorganic As and evaluated against the guidelines. There were no exceedances of the 1.2 µg/g ww guideline, and 7/7 exceedances of the 0.026 µg/g ww guideline in striped mullet filets. The lower value is a reasonable guideline since USEPA's Lakes Study used an even lower fish tissue guideline for inorganic As of 0.016 µg/g ww. Total As was also compared to a fish tissue guideline for total As of of 1.0 µg/g ww; there were 5/7 exceedances in striped mullet filets. The human health guideline was also exceeded for chromium (Cr) in 7/7 filets. All striped mullets were caught in the Upper Bay.

Wildlife guidelines in whole fish were exceeded for chromium (Cr) and zinc (Zn). The Cr guideline of 2.5 µg/g ww was exceeded in 26/31 and 18/32 fish in the Upper Bay and Lower Bay, respectively. The Zn guideline of 45 µg/g ww was exceeded in 2/31 and 10/32 fish in the Upper Bay and Lower Bay, respectively. Fish tissue Hg may have exceeded the guideline of 30ng/g ww in 3/32 fish in the Lower Bay; however, since the data was rounded to 0.03µg/g it is unclear whether Hg actually exceeded the guideline. Wildlife guidelines in whole fish were not exceeded for Cu, As, Cd, Pb, Ni and Ag. Many samples were non-detects for Cd, Hg and Ag. Metal concentrations were also determined in algae (fish food) and exceedances of the fish tissue guidelines for wildlife were found for Cu (1/8), Zn (8/8), Hg (3/8), Cd (7/8), Cr (8/8).

For the species examined, the California killifish, cheekspot goby, shadow goby and arrow goby are considered to be residents of Newport Bay (Allen personal communication 2011). Residency is an issue with fish tissue exceedances with respect to sources of contaminants in fish tissue. Since Cr and Zn exceeded the fish tissue guidelines in both resident and open water fish, it is likely that there are sources of Cr and Zn within or entering Newport Bay. Both Cr and Zn exceed the fish tissue guidelines in algae, and sediment Zn concentrations are known to exceed ERM guidelines especially in the Turning Basin area of the Lower Bay. In addition, more metals exceeded the wildlife guidelines in topsmelt than in other species.

Impairment shown in this study: Arsenic (As) and Chromium (Cr) in fish tissue (human health); Chromium (Cr) and Zinc (Zn) in fish tissue (wildlife)
Sediment. One sediment sample exceeded the ERM sediment guideline for mercury (Hg).

Fish/Mussel Tissue. Human health guidelines were exceeded for the lower inorganic As guideline of 0.026 µg/g ww and for Cr in all 7 fish filet samples (striped mullet). The total As guideline was also exceeded in 5/7 fish filets.
Wildlife guidelines were exceeded for Cr in most (43/63) samples in the both the Upper and Lower Bay, and for Zn in 10/32 samples in the Lower Bay.

Table 4-8a Sediment and Fish Tissue Exceedances and Mean Concentrations (data* from Allen et al, 2008)

Sediment exceedances of ERL guidelines[1] (µg/g)									
	Cu	**Zn**	**Cd**	**Pb**	**As**	**Cr**	**Ni**	**Hg**	**Ag**
ERL guidelines (µg/g)	34	150	1.2	46.7	8.2	81	20.9	0.15	1.0
(Samples 9U, 10L)	2U, 1L[2]	1L	0	0	1L	0	1L	2L	0
Mean total concentration (µg/g)	**25**	**52.5**	**0.3**	**7.1**	**4.2**	**11.2**	**6.6**	**1.3**	**0.2**
Fish tissue exceedances* (wet weight concentrations)									
	Cu	**Zn**	**Cd**	**Pb**	**As**	**Cr**	**Ni**	**Hg**	**Ag**
OEHHA/USEPA guidelines (hh) (µg/g ww)	*10F, 70M*	*40F*	*1.0*	*1.5F, 2.5SF*	*1.2[i], 0.026[i], 1.0[Total]*	*1.0FSF*		*0.2*	
Wildlife guidelines (wl) (µg/g ww)	*50, 15*	*45*	*0.1*	*10*	*25*	*2.5*	*50*	*0.03*	*50*
CA halibut[tf] (2U, 1L)*	0, 0	0	nd	0	0	2U	0	0	nd
CA killifish[tf] (3U, 8L)	0, 0	0	nd	0	0	3U	0	nd	nd
Cheekspot goby[tf] (1L)	0, 0	0	nd	0	0	1L	0	nd	nd
Shadow goby[tf] (1U)	0, 0	0	nd	0	0	1U	0	nd	nd
Deepbody anchovy[o] (2U)	0, 0	0	nd	0	0	2U	0	nd	nd
Topsmelt[tf,o] (23U, 22L)	0, 0	2,10	0	0	0	18U, 17L	0	wl 3L?	0
Striped mullet[o] (7U -filets)^	0	0	nd	0	hh 0,all,5	hh all	n/a	nd	n/a
TOTAL hh (7U filets) wl (31U, 32L)	**hh 0 wl 0, 0**	**hh 0 wl 2,10**	**hh 0 wl 0**	**hh 0 wl 0**	**hh 0,7,5 wl 0**	**hh 7U wl 26U/ 18L**	**0**	**hh 0 wl 3L?**	**0**
Mean concentration (µg/g ww)	**2.38**	**46.8**	**0.05**	**0.07**	**1.91**	**6.58**	**0.95**	**0.03**	**nd**

*Data from Allen *et al.* were compared to guidelines from Table 4-3
[1]Sediment criteria from Long *et al.* 1995 (ERL =effects range low, ERM =effects range median)
[2]All sediment metal exceedances in the Lower Bay were in S. Lido Channel
nd =non detects, n/a = nonapplicable, F =fish, M = mussels, SF =shellfish, ? =data unclear (Hg)
[tf]Fish found in tidal flats, [o]Fish found in open water
*Numbers in parentheses = number of samples analyzed; U =Upper Bay, L =Lower Bay
^Fish filets were collected for only one species (striped mullet)

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i =inorganic As; 10% of the total As (measured in this study) was used to represent the inorganic As fraction in fish tissue and compared to the inorganic As human health guidelines of 1.2µg/g and 0.026µg/g
Total =total As
? see text for Hg exceedances

Table 4-8b Sediment metal and Tissue data (data from Allen et al, 2008)

Sediment metal mean, maximum concentrations (µg/g)									
	Cu	**Zn**	**Cd**	**Pb**	**As**	**Cr**	**Ni**	**Hg**	**Ag**
ERL guidelines	*34*	*150*	*1.2*	*46.7*	*8.2*	*81*	*20.9*	*0.15*	*1.0*
(Sites 9Upper, 10Lower)	25.0, **217.6^**	52.5, **279.2**	0.3, 1.2	7.1, 40.4	4.2, **13.9**	11.2, 44.9	6.6, **26.0**	0.1, **1.3**	0.0, 0.2
Fish/Mussel (F, M) tissue mean, maximum concentrations* (µg/g)									
	Cu	**Zn**	**Cd**	**Pb**	**As**	**Cr**	**Ni**	**Hg**	**Ag**
OEHHA/USEPA guidelines (hh) (µg/g ww)	*10F, 70M*	*40F*	*1.0*	*1.5F, 2.5SF*	*1.2[i], 0.026[i]*	*1.0*		*0.2*	
Wildlife guidelines (wl) (µg/g ww)	*50, 15*	*45*	*0.1*	*10*	*25*	*2.5*	*200*	*0.03*	*50*
CA halibut[tf] (2U, 1L)*	0.4, 0.4	14.3, 18.0	nd	0.08, 0.23	**1.2[+], 2.1**	**4.8, 7.9**		0.01, 0.02	nd
CA killifish[tf] (3U, 8L)	2.3, 2.9	24.4, 27.6	nd	0.03, 0.04	**1.7, 2.1**	**2.6, 9.5**		nd	nd
Cheekspot goby[tf] (1L)	2.1, 2.1	27.5, 27.5	nd	0.01, 0.02	**2.4, 2.4**	**11.0, 11.0**		nd	nd
Shadow goby[tf] (1U)	0.8, 0.8	18.0, 18.0	nd	nd	**2.2, 2.2**	**14.4, 14.4**		nd	nd
Deepbody anchovy[o] (2U)	0.6, 0.7	16.1, 17.5	nd	nd	**1.8, 2.0**	**6.0, 6.9**		nd	nd
Topsmelt[o] (18)	1.5, 2.2	26.7, 43.0	0.03, 0.06	0.04, 0.09	**1.4, 2.0**	**5.5, 10.2**		0.01, 0.02	nd
Topsmelt[tf,o] (23U, 22L)	2.3, 5.7	27.8, 41.4	0.01, 0.06	0.05, 0.12	**1.3, 2.1**	**4.1, 7.9**		0.004, 0.02	nd
Striped mullet[o] (7U -filets)^	0.3, 0.8	3.3, 4.9	nd	0.01, 0.05	**0.8, 1.1**	**2.6, 4.4**		nd	nd
Algae mean, maximum concentrations[3] (µg/g)									
	6.9, 15.8"	31.7, **110.9**	0.06, **0.14**	1.4, 1.9	**1.4, 1.8**	**5.1, 11.2**	1.0, 1.4	0.01, 0.02	0.03, 0.16

*Data from Allen *et al.*were compared to guidelines from Table 4-3
^Bold numbers for sediments indicate exceedances of the ERL sediment guidelines
*Bold numbers for fish tissue indicate exceedances of the fish tissue wildlife guidelines
"Bold numbers for algae indicate exceedances of the wildlilfe guidelines
[tf]Fish found in tidal flats, [o]Fish found in open water
[tf]Fish found in tidal flats, [o]Fish found in open water
*Numbers in parentheses = number of samples analyzed; U =Upper Bay, L =Lower Bay
^Fish filets were collected for only one species (striped mullet)
nd =non detects, n/a = nonapplicable,
[+]One sample –not a mean value
i =inorganic As; 10% of the total As (measured in this study) was used to represent the inorganic As fraction in fish tissue and compared to the inorganic As human health guidelines of 1.2µg/g and 0.026µg/g

4.2.2.6 Department of Fish and Game (DFG) Monitoring Data* -Tissue, Sediment and Water Quality Monitoring for Bioaccumulative Contaminants and Metals in the San Diego Creek and Newport Bay Watershed (2005-2006 data) (Frueh and Ichikawa 2007)
*(DFG is now the Department of Fish and Wildlife (DFW))
DFG conducted monitoring in Newport Bay and the major tributaries (San Diego Creek and Santa Ana Delhi) for metals in sediments and fish and mussel tissue in 2006-07. There were 2 sites in the Upper Bay, 2 sites in the Lower Bay and 3 sites in the 2 major tributaries. Sediment and fish samples were collected in July and August 2006. Mussels were transplanted from northern California to Bay sites in October 2006, then collected in early February 2007.

Results
Sediment. Only sediment methyl mercury (methyl Hg) in the Turning Basin area exceeded the ERM sediment guidelines. Sediment copper (Cu), cadmium (Cd) and methyl Hg exceeded the ERL guidelines in the Upper Bay at the Jamboree and Dunes sites; and 5 sediment metals (Cu, zinc (Zn), nickel (Ni), arsenic (As) and methyl Hg) exceeded the ERL guidelines in the Lower Bay at the Turning Basin site (Table 4-9). The Turning Basin results are similar to those of the Marina Study in that the majority of the sediment exceedances were in the Turning Basin area. There were no exceedances of the ERM or ERL guidelines at the Police Docks site in the Lower Bay (Appendix 4, Figure 4.2, NW channel near Harbor Towers Marina and Lido Village Marina). Note that Zn, Ni and As exceeded the ERL guidelines only in the Turning Basin area, and Cd exceeded the ERL guidelines only in the Upper Bay, while Cu and methyl Hg exceeded the ERL guidelines in both the Upper and Lower Bay.

Fish/Mussel Tissue. For tissue analysis, the data were compared to the guidelines in Table 4-3. Fish tissue guidelines and exceedances are shown in Table 4-9.

Human health guidelines for inorganic arsenic (As), mercury (Hg), cadmium (Cd), copper (Cu), chromium (Cr), lead (Pb) and zinc (Zn) were evaluated only in the California halibut filet since this was the only fish denoted as a filet. Wildlife guidelines for copper (Cu), mercury (Hg), zinc (Zn), lead (Pb), arsenic (As), chromium (Cr), nickel (Ni) and silver (Ag) were evaluated in all fish.

For human health, inorganic As exceeded the lower guideline of 0.026 µg/g ww in the one fish fillet sample (California halibut) in the Upper Bay (Dunes), but did not exceed the higher guideline of 1.2 µg/g ww. In mussels, inorganic As exceeded the 0.026 µg/g ww guideline in all (4/4) mussel samples (2 Upper, 2 Lower Bay), but did not exceed the higher inorganic As guideline of 1.2 µg/g ww. All 4 mussels exceeded total As guideline for human health. The human health guidelines were also exceeded for Zn in 4/4 mussels (Upper and Lower Bay) and for Cd in 1/2 mussel (Upper Bay). More fish filets and mussels are needed to assess exceedances of the human health guidelines since the data set was limited.

The wildlife guidelines were exceeded for methyl Hg in 6/12 fish (Upper and Lower Bay), but not in mussels. The wildlife guidelines were also exceeded for Cd in 4/4 mussels (Upper and Lower Bay) but not in fish, and for Zn in 1/4 mussels (Upper Bay). The wildlife guideline for total As in fish tissue (25 µg/g ww) was not exceeded in fish or mussel samples across all species sampled. DFG used somewhat different fish tissue guidelines and found human health exceedances of As, and wildlife exceedances of methyl Hg, Cr and As but not Zn.

For the species examined, the diamond turbot, spotted sandbass and shiner perch are considered to be residents of Newport Bay (Allen personal communication 2011). Residency is an issue with fish tissue exceedances with respect to sources of contaminants in fish tissue. Since As exceeded the fish tissue guideline in both resident and open water fish, it is likely that there are source(s) of

As within Newport Bay. These may include sediments and algae for As (Allen 2008). Zinc exceeded the wildlife guideline in all fish species. Sediment Zn concentrations are known to exceed ERM guidelines especially in the Turning Basin area of the Lower Bay.

Impairment shown in this study: Mercury (Hg) in sediments in the Lower Bay Turning Basin area), and Arsenic (As), Cadmium (Cd), Methyl Mercury (methyl Hg) and Zinc (Zn) in fish tissue

Sediment , The data show that sediments exceed the ERM guidelines for Hg in the Lower Bay Turning Basin in only 1/1 sample. However, added to other data, this study adds to Hg exceedances in the Lower Bay.

Fish/Mussel Tissue. The lower human health guideline for inorganic As (0.026 µg/g ww) was exceeded in all 4 mussels (2 Upper, 2 Lower Bay) and the only fish filet (California halibut) using 10% of total As as inorganic As. (If 1% total As is used as inorganic As, The human health guideline for total As was also exceeded in 3/4 mussels but not in the one filet. Zn and Cd also exceeded the human health guidelines in 2/4 and 1/4 mussels, respectively. More fish filets and mussels are needed to assess exceedances of the human health guidelines for fish tissue.

Wildlife guidelines were exceeded by methyl Hg in most fish (6/12) but no mussel samples, and by Cd and Zn in 4/4 and 1/4 mussels, respectively, but not in fish. Note that the data set for mussels was limited and included only one mussel sample at each site.

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Table 4-9 Sediment metal and Tissue data –Department of Fish and Game data 2006

Sediment metal concentrations[1,2] (µg/g)									
1 sample/site	**Cu**	**Zn**	**Cd**	**Pb**	**As**	**Cr**	**Ni**	**Methyl Hg**	**Ag**
UNB – Jamboree	(50.4)[2]	149	(1.66)	19.6	7.41	35.5	17.8	(0.17)	0.41
UNB –Dunes	(50.7)	147	(1.67)	21.1	7.23	38.9	17.5	(0.37)	0.40
LNB –Turning Basin	(81.7)	(159)	1.11	25.8	(10.1)	54.0	(23.0)	**1.04[1]**	0.36
LNB –Police Docks	21.0	35.2	0.25	16.1	4.19	14.4	6.1	0.04	0.20
Fish, Mussel (F, M) tissue concentration exceedances (µg/g)									
	Cu	**Zn**	**Cd**	**Pb**	**As**	**Cr**	**Ni**	**Methyl Hg**	**Ag**
OEHHA[4]/USEPA guidelines (hh)	*10F, 70M*	*40F*	*1.0*	*1.5F, 2.5 SF*	*1.2[i], 0.026[i], 1.0[Total]*	*1.0FSF*		*0.2*	
Wildlife guidelines[5] (wl)	*50, 15*	*45*	*0.1*	*10*	*25*	*2.5*	*50*	*0.03*	*50*
UNB –Jamboree 4F, 1M	0	0	wl 1M	0	hh[i] low-1M[3], hh[T] 1M[3] wl 0	0	0	wl 2F	0
UNB –Dunes 5F(1 filet), 1M	0,0	hh1M wl 1M	hh 1M wl 1M	0,0	hh[i] low-1F1M, hh[T] 1M wl 0	0	0	wl 2F	0
LNB –Turning Basin 1F, 1M	0	hh1M	wl 1M	0	hh[i] low-1M wl 0	0	0	wl 1F	0
LNB –Police Docks 3F, 1M	0	0	wl 1M	0	hh[i] low-1M, hh[T] 1M wl 0	0	0	wl 1F	0
Totals 1filet, 8F2M U 4F2M L	0,0	hh2M wl1M	hh 1M wl 4M	0,0	hh[i] low-1F4M hh[T] 3M	0,0	0,0	wl 6F	0,0

Data from DFG were compared to guidelines from Table 4-3
F=fish, M =mussel, NF =no filets. wl =wildlife, hh-low =human health low guideline (0.026µg/g)
i =inorganic As; 10% of the total As in fish tissue and mussel tissue (measured in this study) was used to represent the inorganic As fraction in fish tissue and mussel tissue, both were compared to the As human health guidelines of 1.2 and 0.026µg/g (USEPA 2000a)
As wildlife guideline of 1.4 µg/g ww (USEPA 2002) and is for total As.
[1] Sediment concentration in bold exceeds the ERM sediment guideline (only for Hg)
[2] Sediment concentrations in parentheses exceed ERL sediment guidelines
[3] For fish and mussel tissue data, the numbers show the number of fish/mussel (#F, #M) samples exceeding the wildlife guidelines
*Methyl Hg value is for the most sensitive population (OEHHA 1999)
^Only one filet was analyzed in this data set

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4.2.2.7 Bioaccumulation of Contaminants in Recreational and Forage Fish in Newport Bay, California in 2000-2002 (Allen *et al.* 2004)

Multiple fish species were collected in Newport Bay (recreational fish (2000-01) and forage fish (2002)) to compare to human health guidelines and wildlife guidelines, respectively. Recreational fish tissue was analyzed for total As, total Hg and Se; forage fish tissue was analyzed for total As, Hg, Cd and Se.

Results

Fish (Recreational) tissue. There were no exceedances of the human health guideline (OEHHA) for metals in fish tissue.

Fish (Forage) tissue. There were no exceedances of the wildllife criteria in fish tissue for metals.

Impairment shown in this study: No impairment for metals was found in fish tissue

4.2.2.8 Newport Bay Sediment Toxicity Studies (Bay *et al.* 2004)

The purpose of these studies was to assess the extent of sediment toxicity in Newport Bay, to determine the influence of contaminated sediments on water qualty, and to identify the sediment contaminants responsible for adverse biological effects. Nine locations (excluding the Rhine Channel site) were sampled for chemistry and toxicity analyses in Newport Bay in September 2000 and May 2001. The summaries below do not include results for the Rhine Channel.

(1) Spatial sampling results (September 2000, May 2001)

Water Chemistry. Cu exceeded the CTR criteria in 2/2 stormwater samples in the Upper Bay.

Sediment Chemistry. Only Hg exceeded the ERM sediment guideline in the Turning Basin area (1/9 sites) in both September 2000 and May 2001. Metals that exceeded the ERL guidelines were Cu, Zn, Cd, Ni and Pb.

Water Toxicity. Sea urchin fertilization tests and development tests showed toxicity at 5/9 and 1/9 sites, respectively, in September 2000; and 6/9 and 0/4 sites, respectively, in May 2001.

Sediment Toxicity. Reduced amphipod survival was found at 7/10 sites (3/5 in Upper Bay, 4/5 in Lower Bay) for both sampling events, and NB10 (mouth of San Diego Creek) had the highest amphipod toxicity for both sampling events.

(2) Stormwater sampling results (January 2001, Limited number of samples)

Three runoff samples (2 in Upper Bay, 1 in Lower Bay) were collected and analyzed for metals and toxicity. Water toxicity was demonstrated by reduced mysid survival and growth in both Upper Bay samples, and dissolved Cu exceeded the CTR criteria at the Upper Bay-Jamboree and middle Lower Bay sites; however, since water samples were collected on one day only, data are limited.

(3) Sediment Toxicity/TIE Testing (November 2001, March 2002, Limited number of samples)

Water and sediment samples were collected from 2 areas in the Upper and Lower Bay (NB10 –near the mouth of San Diego Creek and NB3 –Rhine Channel, respectively). Since the Lower Bay site was the Rhine Channel site, only the Upper Bay site will be discussed below. Water and sediment samples were tested for metals and toxicity.

Results for Upper Bay site (NB10)

Water Chemistry. No metals exceeded the CTR saltwater criteria in the Upper Bay samples in November 2001 or March 2002 .

Sediment Chemistry. No metals exceeded the ERM sediment guidelines in November 2001 or March 2002 (1 sample for each event). The ERL guidelines were exceeded in the Upper Bay Cu, Zn and Cd; and in the Lower Bay by Cu, Zn, Cd, Pb, Hg, As and Ni.

Water Toxicity. No toxicity was found in the sea urchin fertilization test in one water sample in November 2001 or in 3 samples in March 2002.
Sediment Toxicity. The sediment was highly toxic; no amphipods survived in one sample in November 2001, or in 3 samples in March 2002.
Sediment-water interface Toxicity. (November 2001) The sea urchin fertilization test showed moderate toxicity. EDTA and C-18 column extractions (TIE test) removed toxicity.

(4) Major conclusions for all studies
1 Sediment toxicity is prevalent throughout Newport Bay, and the amphipod toxicity test results suggest that toxicity can be found year-round in the Bay. (Reduced amphipod survival was found in 12/18 samples and 6/9 sites).
2 The results the spatial studies above (2000-01) confirm the findings of the 1998 Southern California Bight regional monitoring survey (Bay *et al.* 2000 –not shown) that sediment toxicity in Newport Bay is more extensive and severe than in other developed Bays in southern California. In the spatial studies, toxicity was present at 70% of all stations, and 80% of the Lower Bay stations.
3 Sediment contamination [determined by chemistry] was also prevalent throughout Newport Bay. *[Hg exceeded the ERM sediment guidelines, and several metals (Cu, Cd, Zn, Hg, Pb) exceeded the ERL guidelines. LMC]*
4 Sediment chemistry had a low correlation with sediment toxicity; however, most metals were negatively correlated with sediment toxicity, and a decrease in survival occured as metal concentrations increased. Trace metals were highly correlated with each other (in particular Cu, Zn, Pb). Trace metals were also correlated with grain size (%fines) or iron (Fe).
5 Water column toxicity was also widespread throughout Newport Bay.
6 The sediment was highly toxic; no amphipods survived in 4/4 samples from the Upper Bay station. TIE tests suggest that nonpolar organics were likely the dominant toxic contaminant. Sediment-water interface tests also showed toxicity in 4/5 samples.
7 The TIE tests indicated that multiple contaminants are present at each site. TIEs were not sufficient to determine which chemicals were related to toxicity.

Impairment shown in this study: Sediment toxicity in the Upper and Lower Bay
Sediment. The data demonstrate that 1/9 sediments exceed the ERM guideline for Hg in the Lower Bay at the Turning Basin.

Sediment toxicity. Sediment toxicity is present in both the Upper and Lower Bay and the sediments were highly toxic.

4.2.2.9 Newport Bay and San Diego Creek -Chemistry Results for Water, Sediment, Suspended Sediment (Bay and Greenstein 2003)

Water and sediment samples were collected for water analyses (dissolved and total metals including methyl Hg, organics), sediment analyses (chemistry, toxicity) and sediment-water interface (SWI) analyses. Water and sediment sampling was conducted in November 2001 and March 2002 in the Upper Bay and the Rhine Channel (1 site each). Additional sediment sampling was conducted in May 2002 at the Upper Bay site and in the Lower Bay Turning Basin/ S. Lido Channel area. The summary below does not include results for the Rhine Channel.

Results
Water . No metals exceeded the dissolved metals CTR saltwater criteria in 2 samples in the Upper Bay for the metals analyzed (Cu, Zn, Hg, Cd, Cr, Ni, Pb, As, Ag). No Lower Bay sites were tested except the Rhine Channel. (Only Cu exceeded exceeded the dissolved Cu CTR saltwater criteria in 2/2 samples in the Rhine Channel.)

Sediment. Upper Bay. No metals exceeded the ERM sediment guidelines. Cu, Hg, Zn, Ni and Cd exceeded the ERL sediment guidelines in 2/2 samples.
Lower Bay (May 2002). Hg exceeded the ERM guideline in 1/3 samples, and Cu exceeded the Probable Effects Level (PEL) sediment guidelines (NOAA SQuiRTS, 1999) in 1/3 samples (both exceedances were in Lido Yacht area). Cu, Hg, Ni, Zn and Pb exceeded the ERL guidelines in 3/3, 3/3, 3/3, 2/3, 2/3 sites, respectively.
Sediment Water Interface test (November 2001 only). No metals exceeded the dissolved metals CTR saltwater criteria in one sample in the Upper Bay. (Only Cu exceeded the CTR saltwater criteria in 1 samples in the Rhine Channel.)

Impairment shown in this study: Mercury (Hg) in sediments in the Lower Bay (Turning Basin area)
Sediment. The data show that 1/3 sediment samples exceed the ERM guidelines for Hg in the Lower Bay (Lido Yacht site –Turning Basin area). (This data adds to Hg data from other studies which indicate Hg impairment.)

4.2.2.10 Metals Sediment Study in Lower Newport Bay (Post-dredging) Surface sediment and bottom water sampling in post-dredge and marina sites (OC Coastkeeper & L.M.Candelaria 2014)

Surface sediments were collected in post-dredge sites throughout Lower Newport Bay to determine metal concentrations in new surface sediments. In addition, three marina sites that exceeded the copper (Cu), mercury (Hg) and zinc (Zn) ERMs in the Cu Metals Marina study (4.2.2.1) were sampled to determine current concentrations of sediment metals. Bottom water samples were also collected to determine metal exceedances of the CTR criteria. Sediment samples were collected in October 2012, and March and August 2013. Bottom water samples were collected in October 2012 and March 2013. Sediment toxicity was determined in a subset of samples in August only.
http://www.waterboards.ca.gov/santaana/water_issues/programs/tmdl/tmdl_toxics.shtml

Results
Sediment. Sediment copper (Cu), mercury (Hg) and zinc (Zn) exceeded the ERM sediment guidelines. All ERM exceedances were in or near the marina sites (Harbor Marina, Lido Village, Lido Yacht Anchorage) and Balboa Island Channel which was just outside of Balboa Yacht Basin. Exceedances of the ERL sediment guidelines were common. Sediment Cu exceeded the ERL in *all samples at all sites* throughout the Lower Bay. Sediment Hg, Zn, arsenic (As) and nickel (Ni) exceeded the ERLs at most sites. Other ERL exceedances include sediment cadmium (Cd) at half the sites, sediment chromium (Cr) and lead (Pb) at the three marina sites, and sediment Pb at three additional sites.

Bottom water. Only dissolved Cu exceeded the metals CTR criteria only in October 2012 at less than half the sites. There were no metal exceedances in March 2013. These few exceedances suggest that most metals are not desorbing from the sediments into the bottom water, and that Cu exceedances found in surface waters in the marina study (4.2.2.1) are likely due to Cu discharges from boats.

Sediment toxicity. No toxicity to *Eohaustarius* survival was determined at any site tested, and percent survival ranged from 95 to 98%. These toxicity results differ from those in the marina study where toxicity was found in the majority of the sediments tested.

Impairment shown in this study: Copper (Cu), Zinc (Zn), Mercury (Hg) in sediments in parts of the Lower Bay
Sediment. This study demonstrates that sediment Cu, Zn and Hg exceed the ERM guidelines in marinas in the Turning Basin area and just outside Balboa Yacht Basin.

4.2.3 SUMMARY OF DATA ANALYSIS AND IMPAIRMENT ASSESSMENT

The data analyses from current studies (2002 -2014) show impairment to Newport Bay water and/or sediments by copper (Cu), mercury (Hg) and zinc (Zn) and are presented in summary tables (Tables 4-10, 4-12). Impairment analyses in fish and/or mussel tissue are also shown (Table 4-11).

Water. Upper and Lower Newport Bay are both impaired for Cu based on exceedances of the dissolved Cu CTR saltwater criteria (Table 4-10). No other metals exceeded the dissolved metals CTR saltwater criteria.

Sediment. The Lower Bay is impaired for sediment Cu, Zn and Hg based on exceedances of the ERM sediment guidelines and the presence of sediment toxicity in the areas of ERM exceedances (Table 4-10). Most of the ERM exceedances were found in the Turning Basin area of the Lower Bay.

In addition, multiple metals, including Cd, Ni, Pb and As exceeded the ERL sediment guidelines in both the Upper and Lower Bay (Table 4-12). ERLs are generally used as targets for metals TMDLs in California. While exceedances of the ERL guidelines do not indicate impairment, these results do indicate the need for continued monitoring in both the Upper and Lower Bay.

Fish/Mussel Tissue.
Human health The lower human health guideline of 0.026 µg/g ww for inorganic arsenic (As) was exceeded in all (7/7, 1/1) fish filets (Upper Bay) and (4/4) mussel samples (Upper and Lower Bay) (Allen 2008, DFG 2006). The human health guideline for total As was also exceeded in 5/7 filets (Upper Bay) and 3/4 mussels (Upper and Lower Bay). The human health guideline for Cr (1.0 µg/g ww) was exceeded in 7/7 fish filets (Allen 1008). No fish filets were collected in the Lower Bay for either study. The number of filets and mussel samples collected was also limited. The human health guidelines for cadmium (Cd) and Zn were both exceeded in 1/2 mussels (Upper Bay).

Wildlife The wildlife guidelines were exceeded for Cr (2.5 µg/g ww) in most fish (26/31, 18/32) in the Upper and Lower Bay (Allen 2008), but in no fish or mussels in DFG's study (2006). The wildlife guideline was exceeded for Zn in 2/31 and 12/63 fish in the Upper and Lower Bay, respectively (Allen 2008), and in 2/4 mussels but no fish in the Upper and Lower Bay (DFG 2006). Cd exceeded the fish tissue guideline (0.1 µg/g ww) in 3/4 mussels in the Upper and Lower Bay (DFG 2006), but no fish in Allen or DFG studies (Table 4-11). Methyl Hg exceeded the 55 ng/g ww guideline in only 2/12 fish and no mussels in the Upper and Lower Bay (DFG 2006).

Table 4-10 Summary of Metal Exceedances in Water and Sediments and Impairment Assessment for Newport Bay (2002-2010)

Upper Bay		
Water	**Impaired for Copper (Cu) based on exceedances of the dissolved Cu CTR saltwater criteria**	**Reference**
Cu	48/68, 13/27, 2/4 samples >CTR criteria	1, 4, 5
	2/2 stormwater samples >CTR	6
Sediment	**No Impairment based on exceedances of ERM* sediment guidelines**	
Toxicity	**Impaired Water, Sediment Toxicity**	
Water	toxicity in 8/10 samples (sea urchin fertilization)	6
Sediment	toxicity in 6/6 samples (amphipod survival)	4
	toxicity in 16/38 samples (amphipod survival)	2
	toxicity in 6/10 samples (amphipod survival) (high toxicity in 4/4 samples at one site)	6
Sed-Water Interface	toxicity in 2/4 samples (sea urchin fertilization) toxicity in 1/2 samples (sea urchin development)	6
Lower Bay		
Water	**Impaired for Copper (Cu) based on on exceedances of the dissolved Cu CTR saltwater criteria**	
Cu	22/34, 53/78, 7/52 samples >CTR criteria 25/31 marina samples, 1/10 channel samples > CTR	1, 4, 2 3
	4/14 > CTR (bottom water samples)	11
Sediment	**Impaired for mercury (Hg) –parts of Lower Bay, Impaired for Cu, zinc (Zn) –Turning Basin area in Lower Bay (based on exceedances of ERM guidelines + sediment toxicity)**	
Cu	16/78 samples, 7/44 (7/9 marina samples) >ERM*	4, 11
Zn	12/78 samples, 2/44 (2/9 marina samples) >ERM*	4, 11
Hg	24/78, 2/8, 1/3, 1/2, 1/19 samples 6/44 (6/9 marina samples) >ERM* 19/102 samples (7/13 sites) >ERM*	4, 6, 7, 9, 8 11 10 (core samples)
Toxicity	**Impaired Water, Sediment Toxicity**	
Water	toxicity in 3/8 samples (sea urchin fertilization), toxicity in 1/8 samples (sea urchin development)	6
Sediment	toxicity in 6/6 samples (amphipod survival)	4
	toxicity in 6/22 samples (amphipod survival)	2
	toxicity in 8/10 samples (amphipod survival)	6
Sed-Water Interface	toxicity in 1/4 samples (sea urchin fert.)	6

*ERM = Effects Range Median sediment guidelines (Long *et al.* 1995)
The majority of the sediment ERM exceedances were in the Turning Basin area.
References: [1]County of Orange 2009-2011, [2]County of Orange 2006-2009, [3]OC Coastkeeper 2013, [4]OC Coastkeeper & Candelaria 2007, [5]USEPA 2004, [6]Bay *et al.* 2004, [7]Bay & Greenstein 2003, [8]Allen 2008, [9]Frueh & Ichikawa 2007 (DFG), [10]NewFields 2009, [11]OCCoastkeeper & Candelaria 2014

Table 4-11 Summary of Metal Exceedances in Fish Tissue and Impairment Assessment for Newport Bay (2002-2010)

Upper Bay			
Fish Tissue	**Impaired for arsenic (As) and chromium (Cr) based on exceedances of human health (hh) and/or wildlife (wl) guidelines***		**Reference**
As (inorganic)	7/7 filets, 1/1 filet +2/2 mussels > 0.026µg/g (lower hh)	LIST	1, 2
As (total)	5/7 filets, 2/10 (2/2 mussels, 0/8 fish > 1.0 µg/g hh		1, 2
Cd	1/3 (1/2 mussels, 0/1 filet) > 1.0 µg/g hh 0/31 fish, 2/10 (2/2 mussels, 0/8 fish) > 0.1 µg/g wl	 DNL	2 1, 2
Cr	7/7 filets > 1.0 µg/g (hh) 26/31 fish, 0/10 fish/mussels > 2.5 µg/g wl	 LIST	1 1, 2
Hg **methyl Hg**	0/31 small fish, 0/2 mussels > 30 ng/g wl 1/8 larger fish > 55 ng/g wl	 DNL	1,2 2
Zn	1/3 (1/2 mussels, 0/1 filet) > 40 µg/g hh 2/31 fish, 1/12 (1/2 mussels, 0/8 fish) > 45 µg/g wl	 DNL	2 1, 2
Lower Bay			
Fish Tissue^	**Impaired for As, Cr and Zn based on exceedances of human health (hh) and/or wildlife (wl) guidelines**		
As (inorganic)	2/2 mussels > 0.026µg/g (lower hh)	LIST	2
As (total)	1/2 mussels > 1.0 µg/g ww hh (need more data)		2
Cd	0/32 fish, 2/6 (2/2 mussels, 0/4 fish) > 0.1 µg/g wl	DNL	1, 2
Cr	18/32 fish, 0/6 fish/mussels > 2.5 µg/g wl	LIST	1, 2
Hg **methyl Hg**	0/32 small fish, 0/2 mussels > 30 ng/g wl 1/4 larger fish > 55 ng/g wl	 DNL	1,2 2
Zn	10/32 fish, 1/6 (1/2 mussels, 0/4 fish) > 45µg/g wl	LIST	1, 2

References: [1]Allen *et al.* 2008, [2]Frueh & Ichikawa 2007

*There were no fish/mussel tissue exceedances for Cu or Pb in the Upper or Lower Bay

^No fish filets were collected in Lower Bay, so there is no human health analysis for fish tissue

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Table 4-12 Summary of Metal Exceedances of Sediment ERL* Guidelines for Newport Bay (2002-2010)

Upper Bay		
Sediment	**Exceedances of ERLs**	
Cu	25/27, 31/73, 4/10, 2/2 samples >ERL	1, 2, 3, 4
Zn	19/27, 20/73, 2/10, 2/2 samples >ERL	1, 2, 3, 4
Cd	16/27, 19/73, 2/10, 2/2 samples >ERL	1, 2, 3, 4
Hg	1/27, 0/10, 2/2 samples >ERL	1, 3, 4
Ni	16/27, 14/73, 1/10, 2/2 samples >ERL	1, 2, 3, 4
As	10/27, 0/10 samples >ERL	1, 3
Lower Bay		
Sediment	**Exceedances of Target ERLs**	
Cu	60/78, 36/44, 8/10, 3/3, 44/44 samples >ERL	1, 2, 3, 4, 5
Zn	58/78, 23/44, 6/10, 2/3, 34/44 samples >ERL	1, 2, 3, 4, 5
Hg	31/78, 21/41, 4/10, 3/3, 32/44 samples >ERL	1, 2, 3, 4, 5
Cd	26/78, 5/44, 4/10, 11/44 samples >ERL	1, 2, 3, 5
Cr	7/44 samples >ERL	5
Ni	62/78, 18/44, 6/10, 3/3, 34/44 samples >ERL	1, 2, 3, 4, 5
Pb	24/78, 8/44, 4/10, 2/3, 11/44 samples >ERL	1, 2, 3, 4, 5
As	63/78, 20/44, 3/10, 31/44 samples >ERL	1, 2, 3, 5
Ag	2/78, 1/73 samples >ERL	1, 2

*ERL = Effects Range Low sediment guidelines (Long *et al.* 1995)
References: [1]OC Coastkeeper & Candelaria 2007, [2]County of Orange 2006-2009, [3]Bay *et al.* 2004, [4]Bay & Greenstein 2003, [5]OC Coastkeeper & Candelaria 2014

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4.2.4 COMPARISON BETWEEN THIS IMPAIRMENT ASSESSMENT AND USEPA'S TOXICS TMDLS ASSESSMENT (2002)

This impairment assessment used somewhat different methodology than the assessment conducted by USEPA for the Toxics TMDL (Section 4.2.1, Table 4-3). USEPA used a Tier 1, Tier 2 approach with the triad of water, sediment and fish tissue exceedances to determine whether a TMDL was needed (USEPA 2002).

The findings of this assessment differ from USEPA's assessment conclusions that TMDLs were required for cadmium (Cd), copper (Cu), lead (Pb) and zinc (Zn) in Upper Newport Bay, and Cu, Pb and Zn in Lower Newport Bay. This assessment only agrees that a TMDL is required for Cu in the Upper and Lower Bay. Differences in impairment findings are summarized below and detailed in Table 4-14.

Water and Sediment Impairment
This assessment found that Cu is the only metal that exceeds the CTR criteria for dissolved metals in the Upper and Lower Bay; Cu also exceeds the sediment ERM guidelines in parts of the Lower Bay. Sediment toxicity is also present in the Upper and Lower Bay. This assessment found no water or sediment impairment for Cd, Pb or Zn in the Upper Bay, and no water or sediment impairment for Pb in Lower Bay water or sediments. This assessment found sediment impairment in parts of the Lower Bay for Cu, Zn and mercury (Hg) especially in the Turning Basin and South Lido Channel. Sediment Cu, Zn and Hg exceedances mostly occurred together in these areas of the Lower Bay in marinas and the Turning Basin areas (Cu-Metals Marina study-422.1 and Metals Sediment study-422.10). Since a subset of marinas were sampled in the above studies, a more extensive marina survey is indicated to fully assess the extent of sediment Cu, Zn and Hg exceedances and sediment toxicity in marina and boatyard areas in Newport Bay***.***

Water column impairment by metals was determined by exceedances of the dissolved metals CTR saltwater criteria in both assessments (USEPA and this assessment) (Table 4-3).
Sediment impairment determined by USEPA was based on exceedances of the sediment guidelines including the TELs + ERLs, or PELs, ERMs, which differs from the State Listing Policy guidelines (4.2.1 & Appendix 3). Sediment impairment in this assessment was based on exceedances of the ERM sediment guidelines plus sediment toxicity, as indicated in the State Listing Policy (Table 4-3).

This assessment supports the 303(d) Listing of Cu in Upper and Lower Newport Bay, but does not support the listing of the general category of metals in the Upper Bay as discussed in Section 3.3. Zn and Hg should be listed for the Lower Bay based on exceedances of the sediment guidelines.

Fish Tissue Impairment
This assessment found impairment in fish and/or mussels for arsenic (As) and chromium (Cr), in the Upper Bay; and As, Cr and Zn in the Lower Bay based on exceedances of the fish tissue guidelines (Table 4-3). Cd impairment was also found in mussels in the Upper and Lower Bay, but not in fish.

This assessment used the fish tissue guidelines in Table 4-3 to determine impairment. Experts on Hg, As and Cr were consulted to determine the most appropriate and current fish tissue guidelines. The fish tissue guidelines for human health were chosen from guidelines in the literature, and the fish tissue guidelines for wildlife were chosen from the literature in coordination with US Fish and Wildlife Service staff (pers. communication, K. Zeeman, PhD). With the exception of mercury, there are no state recommended guidelines for fish tissue at this time. In the Toxics TMDLs, USEPA determined fish tissue exceedances for Cr (1/10 UNB, 2/10 LNB), Hg (1/10 UNB), Zn (1/10 UNB) but did not promulgate TMDLs based on low exceedances in water and sediment data (USEPA 2002).

Table 4-13 Comparison of This Metals Impairment Assessment and USEPA's Assessment (modified from Table 4-2)*

Upper Newport Bay TMDLs	***USEPA Impairment Assessment and TMDL Actions***
Copper (Cu) (USEPA assessment)	*Water* many exceedances of CTR criteria *Tier 2* *Sediments* 17% (7/42) > ERL (34 µg/g) *Tier 2* *Tissue* no exceedances in last 5 yrs (prior to 2002) *USEPA promulgated a Cu TMDL for Upper Newport Bay in 2002*
RB assessment TMDL required*	*Water and Sediments: RB staff assessment found exceedances of the dissolved Cu CTR criterion in water, and toxicity* *Fish Tissue: No tissue exceedances* *Cu was LISTED for Upper Newport Bay in 2006 (state board evaluation)* *Recommendations: Do Not Delist, TMDL* *Based on this impairment assessment, a TMDL is required for Cu in the Upper Bay* *Actions: A revised TMDL, including an implementation plan and schedule, is needed for Cu based on exceedances of the water and sediment criteria;* *monitoring of Cu in water, sediment and fish/mussel tissue should continue*
Lead (Pb) (USEPA assessment)	*Sediments* 5% (2/42) >ERL (46.7µg/g) No water or tissue exceedances Potential threat to UNB based on sediment data, and impairment in Rhine Channel (exceedances of sediment ERM) *USEPA promulgated a Pb TMDL for Upper Newport Bay in 2002*
RB assessment DNL, no TMDL	*Water and Sediments: RB staff assessment found no exceedances of the dissolved Pb CTR criterion nor the sediment Pb ERM guideline* *Fish tissue: There were no exceedances of the Pb fish tissue guidelines* *Based on the state board assessment in 2006, Pb was determined to be Do Not List (DNL); Rhine Channel was dredged in 2006?? –there is no longer a potential threat of impairment from Rhine Channel* *Recommendations: DNL, no TMDL* *Based on this impairment assessment, no listing (DNL) or TMDL is recommended for Pb in the Upper Bay* *Actions: Monitoring of Pb in water, sediment and fish/mussel tissue should continue,* *USEPA should depromulgate Pb TMDL for Upper Newport Bay*
Zinc (Zn) (USEPA assessment)	*Water* many exceedances of CTR criteria *probably Tier 2* *Sediments* 17% (8/48) > ERL (150 µg/g) *Tier 2* *Tissue* 10% (1/10) > screening value *Tier 2* *USEPA promulgated a Zn TMDL for Upper Newport Bay in 2002*
RB assessment DNL, no TMDL	*Water and Sediments: RB staff assessment found no exceedances of the dissolved Zn CTR criterion nor the sediment Zn ERM guideline* *Fish tissue: There were a small number of exceedances of the Zn fish tissue guideline for wildlife (2/39 fish, 1/2 mussels)* *Based on the state board assessment in 2006, Zn was determined to be Do Not List (DNL)* *Recommendations: DNL, no TMDL* *Based on this impairment assessment, no listing (DNL) or TMDL is recommended for Zn in the Upper Bay* *Actions: Monitoring of Zn in water, sediment and fish/mussel tissue should continue,* *USEPA should depromulgate Zn TMDL for Upper Newport Bay*

Cadmium (Cd) (USEPA assessment)	**Sediments* 21% (8/42) > ERL (1.2 µg/g) *Tier 2* No water or tissue exceedances Potential threat to UNB based on sediment data, and evidence of impairment in San Diego Creek (exceedances of the CTR criteria, sediment guidelines) *TMDL needed based on adjacent water analyses (SD Creek)* *USEPA promulgated a Cd TMDL for Upper Newport Bay in 2002*
RB assessment DNL, no TMDL	*Water and Sediments: RB staff assessment found no exceedances of the dissolved Cd CTR criterion nor the sediment Cd ERM guideline* *Fish tissue: There were a small number of exceedances of the Cd fish tissue guideline for wildlife (0/39 fish, 2/2 mussels)* *Based on the state board assessment in 2006, Cd was determined to be Do Not List (DNL) for the Upper Bay* *Recommendations: DNL, no TMDL* *Based on this impairment assessment, no listing (DNL) or TMDL is recommended for Cd in the Upper Bay* *Actions: Monitoring of Cd in water, sediment and fish/mussel tissue (especially mussels) should continue,* *USEPA should depromulgate Cd TMDL for Upper Newport Bay*
Mercury (Hg) (USEPA assessment)	No water or sediment exceedances *Tissue* 10% (1/10) > screening value *Tier 2* *No TMDL*
RB assessment DNL, no TMDL	*Water and Sediments: RB staff assessment found no exceedances of the dissolved Hg CTR criterion nor the sediment Hg ERM guideline* *Fish tissue: There was 1/8 exceedance of the higher methyl Hg fish tissue guideline for wildlife* *Recommendations: DNL, no TMDL* *Based on this impairment assessment, no listing (DNL) or TMDL is recommended for Hg in the Upper Bay* *Actions: Monitoring of Hg in water, sediment and fish/mussel tissue should continue*
Arsenic (As) (USEPA assessment)	*Sediments* 12% (1/8) > ERL *Tier 2* No water or tissue exceedances *No TMDL*
RB assessment LIST, no TMDL Action Plan	*Water and Sediments: RB staff assessment found no exceedances of the dissolved As CTR criterion nor the sediment As ERM guideline* *Fish tissue: There were exceedances of the lower inorganic As fish tissue guideline for human health in all fish filets and mussels in a small data set* *Recommendations: LIST, no TMDL, Non-TMDL Action Plan* *Based on this impairment assessment, As should be LISTED for fish tissue exceedances in the Upper Bay; no TMDL is recommended as As does not exceed criteria/guidelines in water or sediment and sources to fish are not well-defined* *Actions: A Non-TMDL Action Plan, including a source analysis and continued monitoring, is recommended for As based on exceedances of the fish tissue guideline for human health; monitoring of As in water, sediment and fish/mussel tissue should continue*
Chromium (Cr) (USEPA assessment)	No water or sediment exceedances *Tissue* 10% (1/10) > screening value *Tier 2* *No TMDL*
RB assessment LIST, no TMDL	*Water and Sediments: RB staff assessment found no exceedances of the dissolved Cr CTR criterion nor the sediment Cr ERM guideline*

Action Plan	*Fish tissue: There were exceedances of the Cr fish tissue guideline for wildlife in a majority of fish samples* *Recommendations: LIST, no TMDL, Non-TMDL Action Plan* *Based on this impairment assessment, Cr should be LISTED for fish tissue exceedances in the Upper Bay; no TMDL is recommended as Cr does not exceed criteria/guidelines in water or sediment and sources to fish are not well-defined* *Actions: A Non-TMDL Action Plan, including a source analysis and continued monitoring, is needed for Cr based on exceedances of the fish tissue guideline for wildlife; monitoring of Cr in water, sediment and fish/mussel tissue should continue*
Lower Newport Bay TMDLs	***Data supporting a TMDL and TMDL actions***
Copper (Cu) (USEPA assessment)	*Water* many exceedances of CTR criteria *Sediments* 33% (9/27) > ERL (34 µg/g) *Tier 2* *Porewater* 5/10 with elevated Cu *Tier 2* *Tissue* no exceedances in last 5 yrs *USEPA promulgated a Cu TMDL for Lower Newport Bay in 2002*
RB assessment TMDL required	*Water and Sediments: RB staff assessment found exceedances of the dissolved Cu CTR criterion in water, and exceedances of the sediment Cu ERM guideline plus sediment toxicity in parts of the Lower Bay* *No tissue exceedances* *Cu was LISTED for Upper Newport Bay in 2006 (state board evaluation)* *Recommendations: Do Not Delist, LOE for sediment Cu; TMDL* *Based on this impairment assessment, a TMDL is required for Cu in the Lower Bay* *Actions: A revised TMDL, including an implementation plan and schedule, should be developed for Cu based on exceedances of the water and sediment criteria;* *a more extensive marina survey is needed to fully assess the extent of sediment Cu exceedances & sediment toxicity in marina and boatyard areas; monitoring of Cu in water, sediment and fish/mussel tissue should continue*
Lead (Pb) (USEPA assessment)	*Sediments* 12% (5/30) > ERL (46.7µg/g) *Tier 2* No water or tissue exceedances Potential threat to LNB based on sediment data, and adjacent water impairment in Rhine Channel (exceedances of sediment ERM) *USEPA promulgated a Pb TMDL for Lower Newport Bay in 2002*
RB assessment DNL, no TMDL	*Water and Sediments: RB staff assessment found no exceedances of the dissolved Pb CTR criterion nor the sediment Pb ERM guideline* *Fish tissue: There were no exceedances of the fish tissue guidelines* *Based on the state board assessment in 2006, Pb was determined to be Do Not List (DNL); Rhine Channel dredged in YR –no potential threat of impairment from Rhine Channel* *Recommendations: DNL, no TMDL* *Based on this impairment assessment, no listing (DNL) or TMDL is recommended for Pb in the Lower Bay* *Actions: Monitoring of Pb in water, sediment and fish/mussel tissue should continue,* *USEPA should depromulgate Pb TMDL for Lower Newport Bay*
Zinc (Zn) (USEPA	*Water* many exceedances of CTR criteria *probably Tier 2* *Sediments* 37% (14/48) > ERL (150 µg/g) *Tier 2*

assessment)	No tissue exceedances *USEPA promulgated a TMDL for Zn for Lower Newport Bay in 2002*
RB assessment *LIST, no TMDL* *Action Plan*	*Water: RB staff assessment found no exceedances of the dissolved Zn CTR criterion* *Sediments: RB staff assessment found exceedances of the sediment Zn ERM plus sediment toxicity in parts of the Lower Bay* *Fish tissue: There were exceedances of the Zn fish tissue guideline for wildlife (10/36 fish, 1/2 mussels)* *Based on the state board assessment in 2006, Zn was determined to be Do Not List (DNL)* *Recommendations: LIST, no TMDL, Non-TMDL Action Plan* *Based on this impairment assessment, Zn should be LISTED for sediment and fish tissue exceedances in parts of the Lower Bay;* *No TMDL is recommended for Zn as actions taken to remediate sediment Cu impairment should also remediate sediment Zn;* *In addition, USEPA's allocation for Zn in the Toxics TMDLs is an order of magnitude lower than Zn loads to Newport Bay* *Actions: A Non-TMDL Action Plan is needed for Zn based on exceedances of the sediment ERM and fish tissue guideline for wildlife in the Lower Bay and should include:* *--a source analysis;* *--a more extensive marina survey to fully assess the extent of sediment Zn exceedances & sediment toxicity in marina and boatyard areas;* *--monitoring of Zn in water, sediment and fish/mussel tissue especially the monitoring of sediments (in and near marinas and boatyards);* *--other actions such as an assessment of Zn loads from Zn anodes, and dredging to remediate sediment Zn impairment,* *USEPA should depromulgate Zn TMDL for Lower Newport Bay*
Cadmium (Cd) (USEPA assessment)	**Sediments* 30% (8/27) >low SQGs (ERL) (1.2 µg/g) *Tier 2* No water or tissue exceedances *No TMDL*
RB assessment *DNL, no TMDL*	*Water and Sediments: RB staff assessment found no exceedances of the dissolved Cd CTR criterion nor the sediment Cd ERM guideline* *Fish tissue: There were a small number of exceedances of the Cd fish tissue guideline for wildlife (0/36 fish, 2/2 mussels)* *Recommendations: DNL, no TMDL* *Based on this impairment assessment, no listing (DNL) or TMDL is recommended for Cd in the Lower Bay* *Actions: Monitoring of Cd in water, sediment and fish/mussel tissue (especially mussels) should continue*
Mercury (Hg) (USEPA assessment)	*Sediments* 36% (5/14) >ERL *Tier 2* No water or tissue exceedances *No TMDL*
RB assessment *LIST, no TMDL* *Action Plan*	*Water: RB staff assessment found no exceedances of the dissolved Hg CTR criterion* *Sediments: RB staff assessment found exceedances of the sediment Hg ERM plus sediment toxicity, especially in parts of the Lower Bay* *Fish tissue: There was one exceedance of the higher fish tissue guideline for methyl Hg for wildlife in a small data set* *Recommendations: LIST, no TMDL, Non-TMDL Action Plan* *Based on this impairment assessment, Hg should be LISTED for sediment exceedances in parts of the Lower Bay;* *No TMDL is needed for Hg/methyl Hg as actions taken to remediate*

	sediment Cu impairment should also remediate sediment Hg *Actions: A Non-TMDL Action Plan is needed for Hg based on exceedances of the sediment ERM and fish tissue guideline for wildlife in the Lower Bay and should include:* *--a source analysis;* *--a more extensive marina survey to fully assess the extent of sediment Hg exceedances & sediment toxicity in marina and boatyard areas;* *--monitoring of Hg in water, sediment and fish/mussel tissue s especially the monitoring of sediments (in and near marinas and boatyards);* *--other actions such as dredging to remediate sediment Hg impairment*
Arsenic (As) (USEPA assessment)	*Sediments* 68% (17/25) > ERL *Tier 2* No water or tissue exceedances *No TMDL*
RB assessment LIST, no TMDL Action Plan	*Water and Sediments: RB staff assessment found no exceedances of the dissolved As CTR criterion nor the sediment As ERM guideline* *Fish tissue: There were exceedances of the lower inorganic As fish tissue guideline for human health in mussels in a small data set* *Recommendations: LIST, no TMDL, Non-TMDL Action Plan* *Based on this impairment assessment, As should be LISTED for fish tissue exceedances in the Lower Bay; no TMDL is recommended as As does not exceed criteria/guidelines in water or sediment and sources to fish are not well-defined* *Actions: A Non-TMDL Action Plan, including a source analysis and continued monitoring, is recommended for As based on exceedances of the fish tissue guideline for human health; monitoring of As in water, sediment and fish/mussel tissue should continue*
Chromium (Cr) (USEPA assessment)	No water exceedances *Sediment* 4% (1/27) >ERL *Tissue* 20% (2/10) > screening value *Tier 2* *No TMDL*
RB assessment LIST, no TMDL Action Plan	*Water and Sediments: RB staff assessment found no exceedances of the dissolved Cr CTR criterion nor the sediment Cr ERM guideline* *Fish tissue: There were exceedances of the Cr fish tissue guideline for wildlife in a majority of fish samples* *No TMDL. Based on this impairment assessment, a TMDL is not needed for Cr* *Recommendations: LIST, no TMDL, Non-TMDL Action Plan* *Based on this impairment assessment, Cr should be LISTED for fish tissue exceedances in the Upper Bay; no TMDL is recommended as Cr does not exceed criteria/guidelines in water or sediment and sources to fish are not well-defined* *Actions: A Non-TMDL Action Plan, including a source analysis and continued monitoring, is needed for Cr based on exceedances of the fish tissue guideline for wildlife; monitoring of Cr in water, sediment and fish/mussel tissue should continue*

*Actual numbers of exceedances are shown in Tables 4-10, 4-11, 4-12 and Section 4.2.2

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Table 4-14 Summary of Recommendations for Metals in Upper and Lower Newport Bay for 303(d) list and TMDL actions

Upper Newport Bay	
Metals	***Recommended Actions***
Copper (Cu)	*Do Not Delist for dissolved Cu* *TMDL is required in the Upper Bay (exceedances in water)*
Lead (Pb)	*DNL, No TMDL (no exceedances in water, sediment, fish tissue)* *USEPA should depromulgate Pb TMDL in the Upper Bay*
Zinc (Zn)	*DNL, No TMDL (no exceedances in water, sediment;* *fish tissue exceedances insufficient to list)* *USEPA should depromulgate Zn TMDL in the Upper Bay*
Cadmium (Cd)	*DNL, No TMDL (no exceedances in water, sediment;* *fish tissue exceedances insufficient to list)* *USEPA should depromulgate Cd TMDL in the Upper Bay*
Mercury (Hg)	*DNL, No TMDL (no exceedances in water, sediment;* *fish tissue exceedances insufficient to list)*
55Summ *Arsenic (As)*	*LIST (fish tissue –human health)* *No TMDL (no exceedances in water, sediment; source analysis needed)* *Non-TMDL Action Plan*
Chromium (Cr)	*LIST (fish tissue -wildlife)* *No TMDL (no exceedances in water, sediment; source analysis needed)* *Non-TMDL Action Plan*
Lower Newport Bay	
Metals	***Recommended Actions***
Copper (Cu)	*Do Not Delist for dissolved Cu* *LIST for sediment Cu* *TMDL is required in the Lower Bay (exceedances in water)*
Lead (Pb)	*DNL, No TMDL (no exceedances in water, sediment, fish tissue)* *USEPA should depromulgate Pb TMDL in the Lower Bay*
Zinc (Zn)	*LIST (sediment, fish tissue)* *No TMDL (sediment Cu, Zn and Hg exceedances in same areas, the Cu TMDLs should also remediate sediment Zn and Hg;* *also USEPA Zn allocations are much higher than Zn inputs)* *Non-TMDL Action Plan USEPA should depromulgate Zn TMDL in the Lower Bay*
Mercury (Hg)	*LIST (sediment)* *No TMDL (sediment Cu, Zn and Hg exceedances in same areas, the Cu TMDLs should also remediate sediment Zn and Hg* *Non-TMDL Action Plan*
Arsenic (As)	*LIST (fish tissue –human health)* *No TMDL (no exceedances in water, sediment; source analysis needed)* *Non-TMDL Action Plan*
Cadmium (Cd)	*DNL, No TMDL (no exceedances in water, sediment;* *fish tissue exceedances insufficient to list)*
Chromium (Cr)	*LIST (fish tissue)* *No TMDL (no exceedances in water, sediment; source analysis needed)* *Non-TMDL Action Plan*
San Diego Creek	
Copper, Lead, Zinc, Cadmium	*Cu, Pb, Zn, Cd were delisted in 2010** *USEPA should depromulgate TMDLs for Cu, Pb, Zn, Cd in San Diego Creek*

**Based on the SB assessment, Reaches 1 and 2 were delisted for metals and no individual metals were listed in 2010. USEPA should depromulgate TMDLs for Cd, Cu, Pb, Zn in San Diego Creek. (see Section 3.3, 3.4)*

4.3 PROBLEM STATEMENT

Newport Bay is listed as an impaired water body for metals on USEPA's 2002 303(d) list based on water quality monitoring data and state mussel watch data; and 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. 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 copper (Cu) and zinc (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 (4.2.2.5)

In 2006, the State Board assessed individual metals in Newport Bay and listed the Upper and Lower Bay for Copper. No other individual metals were listed based on the State Board assessment, although USEPA's 2002 TMDLs are still in place.

This metals impairment assessment for Newport Bay is based on data collected after 2002, and will result in a revision of the metals TMDLs promulgated by USEPA in the Newport Bay Toxics TMDLs (2002) (Table 4-14). A summary of impairment is shown below and in Table 4-16.

Metals causing impairment in water.
Metals exceeding the dissolved metals CTR saltwater criteria include only dissolved copper (Cu) in both Upper and Lower Newport Bay (Table 4-10). This finding agrees with the 2008-2010 303(d) listing for Cu in both Upper and Lower Newport Bay. A TMDL is required for Cu.

Metals causing impairment in sediments.
Metals exceeding the ERM sediment quality guidelines (plus sediment toxicity), include Cu, Zn and mercury (Hg) in parts of Lower Newport Bay, particularly in the Turning Basin/South Lido Channel areas (Table 4-10). In addition, sediment toxicity is present in areas where Cu, Zn and Hg exceed the ERM guidelines. The Lower Bay should be listed for Zn and Hg for sediments.
A more extensive marina survey is needed to fully assess the extent of sediment Zn exceedances & sediment toxicity in marina and boatyard areas

Metals causing impairment in fish and/or mussel tissue.
Metals exceeding 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 (Table 4-11). As exceeded the lower human health guideline, while Cr and Zn exceeded the wildlife guidelines.

Cadmium (Cd) also exceeded the wildlife in a small data set of mussels in the Upper and Lower Bay but not in fish; and no listing is recommended at this time.

Human health
As exceeded the lower human health guideline (0.026 µg/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 µg/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) (Table 4-11). Cd exceeded the fish tissue guideline (0.1 µg/g ww) in 4/4 mussel samples in the Upper and Lower Bay, but not in fish.

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 topsmelt and mussels. Sources may include sediments for As, Cr and Zn in the Lower Bay, and algae for Cr and As (Allen 2008).

Table 4-15 shows an impairment summary and recommended actions by metal.
Actions include 303(d) listing (LIST) or do not list (DNL), source analysis, and monitoring and action recommendations. Based on this impairment assessment, Cu is the only metal that requires a TMDL. Non-TMDL Action Plans are recommended for Zn, Hg, As and Cr since these metals are recommended for 303(d) listing but not TMDLs at this time. The Non-TMDL Action Plans, , will address metals impairment by actions including monitoring, dredging or permit revision, but will not include waste load or load allocations nor a schedule to meet allocations. The Action Plans may include a schedule to meet recommended actions. Non-TMDL Action Plans to address Zn, Hg, As and Cr will be further discussed in the Non-TMDL Metals Section (6.0).

Zn and Hg require 303(d) listing due to sediment exceedances and sediment toxicity in parts of the Lower Bay; a TMDL is not recommended at this time because actions taken to remediate sediment Cu should also remediate sediment Zn and Hg. In addition, Zn should be listed for fish tissue exceedances in the Lower Bay, remediation of sediment may also remediate fish exceedances.

As and Cr require 303(d) listing due to fish tissue exceedances of the lower human health guideline (As) and the wildlife guideline (Cr). A TMDL is not recommended at this time since there are no As nor Cr exceedances of the water or sediment guidelines, and a source analysis is needed for both As and Cr.

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Table 4-15 Impairment Summary and Recommendations for metals in Newport Bay

	Upper Bay (UNB)			***Lower Bay (LNB)***			***ACTIONS Recommended***
Metal	***Water***	***Sediment***	***Fish/ Mussel Tissue***	***Water***	***Sediment***	***Fish/ Mussel Tissue***	
Copper (Cu)	**X**			**X**	**X**		***TMDL in UNB, LNB***
Zinc (Zn)					**X**	**X-wl**	***LIST in LNB Source Analysis Sediment and tissue monitoring in LNB Non-TMDL Action Plan in LNB***
Mercury (Hg)					**X**		***LIST in LNB Source Analysis Sediment and tissue monitoring in LNB Non-TMDL Action Plan in LNB***
Methyl Hg							***Hg & methyl Hg will be addressed together***
Arsenic (As)			**hh**			**hh***	***LIST in UNB &LNB Source Analysis Fish filet and mussel monitoring in UNB & LNB Non-TMDL Action Plan in UNB & LNB***
Chromium (Cr)			**hh wl-F**			**wl-F**	***LIST in UNB & LNB Source Analysis Fish monitoring in UNB and LNB Non-TMDL Action Plan in UNB & LNB***
Toxicity	**X**	**X**		**X**	**X**		***Continue monitoring in sediments***

X = Impairment, UNB =Upper Bay, LNB =Lower Bay, TB =Turning Basin in Lower Bay
Impairment for fish tissue: hh = human health exceedances, wl = wildlife exceedances,
wl-M =exceedances in mussels only, wl-F =exceedances in fish only
*human health exceedances for the Lower Bay for As based on mussels only
+wildlife exceedances in a small number of larger fish (avg. 100cm)
^wildlife exceedances for mussels only in a small data set
Summary table is based on data from Tables 4-10, 4-11.

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5.0 COPPER (Cu) TMDLs

Copper (Cu) impairment was found in water and sediments in Upper and Lower Newport Bay; therefore, TMDLs are required for Copper (Cu) in Upper and Lower Newport Bay (Sections 4.2.3 and 4.3). When approved, these Cu TMDLs will replace the Cu TMDLs promulgated by the U.S. Environmental Protection Agency (USEPA) in 2002 as part of the Toxics TMDL for San Diego Creek and Newport Bay. This TMDL only addresses Cu impairment in Newport Bay as San Diego Creek is no longer listed for Cu; however, San Diego Creek and the Santa Ana Delhi will both be addressed as sources of Cu to Newport Bay. These Cu TMDLs includes the required TMDL components 1) the Problem Statement, 2) Numeric Targets for Cu, 3) the Source Analysis, 4) the Loading Capacity and Linkage Analysis, 5) WLA and LA Load Allocations, Seasonal Variations and a Margin of Safety, 6) the Implementation Plan, and 7) the Monitoring Plan.

These Cu TMDLs will be phased TMDLs to allow time to implement the tasks, and will be achieved as soon as possible but no later than 15 years from the date of approval by EPA. This TMDL includes an implementation plan with a schedule to achieve compliance with this TMDL. A monitoring program will be included as part of the implementation plan to determine the progress of achieving this TMDL.

5.1 PROBLEM STATEMENT

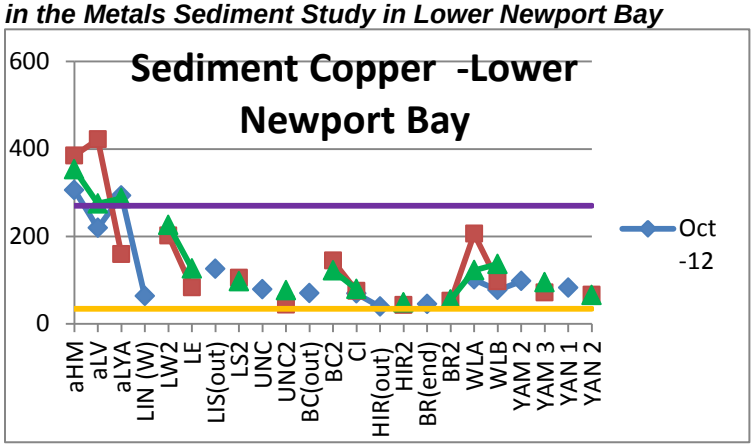
The Problem Statement is described in Section 4.3 and summarized below.

Copper (Cu) impairment was found in water and sediments in Upper and Lower Newport Bay (Table 4-10).
Water. Both Upper and Lower Newport Bay, including marinas, are impaired for Cu based on exceedances of the dissolved Cu CTR saltwater criteria.

Sediments. Sediment Cu exceeded the Cu ERM sediment guideline in surface sediments in the Lower Bay, particularly in the Turning Basin/South Lido Channel areas (Table 4-10, Figure 5-1). 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 (4.2.2.1), 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**.**

Recommendations to address Copper (Cu) impairment
303(d) Listing. Upper and Lower Newport Bay are both listed for dissolved copper (Cu).
Parts of the Lower Bay should be LISTED for sediment Cu.
TMDL. A Copper (Cu) TMDL is required for the both Upper and Lower Newport Bay. Revised Cu TMDLs for the Upper and Lower Bay are being developed by Regional Board staff and will include an implementation plan. The revised Cu TMDLs will replace the Cu TMDLs established by USEPA in 2002.
Actions. Monitoring of Cu should continue in both water and sediments.
Cu from antifouling paints (AFPs) on boats is the largest source of Cu to Newport Bay; therefore, boats must be converted from Cu to nontoxic AFPs to achieve the Cu TMDLs.
Recommendations will be further discussed in the Implementation Section of these Cu TMDLs (Section 5.6).

Figure 5-1 Sediment copper exceedances of ERM and ERL guidelines in the Metals Sediment Study in Lower Newport Bay



(Marina sites =aHM (Harbor Marina), aLV (Lido Village), aLYA (Lido Yacht Anchorage)

5.2 NUMERIC TARGETS FOR COPPER (Cu)

Numeric targets have been identified for water and sediment (Table 5-1). 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.

The dissolved copper (Cu) CTR saltwater criteria are the same criteria used in the State Listing Policy to identify Cu-impaired waters. For sediments, the ERL sediment guideline will be used as a numeric target, rather than the ERM guideline, as this is a conservative approach, and this approach has been used in other metals TMDLs in the state of California.

Table 5-1 Numeric Targets for Copper (Cu) in Water and Sediment in Newport Bay

Metal	**Water (CTR saltwater criteria, µg/L)**		**Sediment (ERL sediment guidelines, µg/g)**
	acute	**chronic**	**Effects Range Low**
Cu	4.8	3.1	34

5.3 SOURCE ANALYSIS FOR COPPER

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. The two largest sources of Cu to the Bay are Cu antifouling paints (AFPs) and runoff from the major tributaries. Cu in storm drain runoff may be important in localized areas near storm drains. Bay sediments may also be a source of Cu although their contribution was not quantified in this report or USEPA's Toxics TMDLs for metals as no studies have been conducted on Cu loads from Bay sediments (Table 5-2). In addition, algae and other vegetation may contain Cu; however, these sources have not been quantified.

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5.3.1 RECREATIONAL BOATS AND BOATYARDS

Dissolved Cu. According to the Toxics TMDL, copper antifouling paints (Cu AFPs) are the largest sources of Cu to Newport Bay, and they contribute over 50,000lbs of dissolved Cu per year to Newport harbor from both passive leaching and hull cleaning (Table 5-2) (USEPA 2002). Passive leaching occurs when a boat is docked in the water since Cu AFPs are designed to leach Cu into the water to reduce the fouling of boat bottoms with barnacles and algae. Cu is also discharged into the water when boat hulls are cleaned, usually by scrubbing with soft or abrasive pads by divers. This cleaning creates a plume of Cu, both dissolved and particulate, with more abrasive pads resulting in a higher discharge (BMPs vs nonBMPs). In addition, passive leaching of Cu increases for a time after hull cleaning until the hull becomes fouled.

The dissolved Cu loading from boats calculated by USEPA for passive leaching and hull cleaning was approximately 55 and 45% of the total Cu loading to the Bay, and the original calculations for these Cu TMDLs followed USEPA's equations (Appendix 6.1.2). A recently published study by the Navy, however, determined that the contribution of dissolved Cu from hull cleaning was much smaller than that shown in the Toxics TMDL (Earley et al, 2013). The Earley study measured Cu discharges from passive leaching and hull cleaning and determined a three year life cycle Cu load for both Cu epoxy and ablative Cu AFPs. Note, however, that while the Cu loading from a cleaning event is a small fraction of the total Cu loading, a cleaning event results in a fresh hull surface which then leaches Cu at a higher leach rate than when the hull is fouled. These Cu TMDLs will follow the calculations of the Earley study since this study uses the most up-to-date scientific methodology (Appendix 6.1.1).

Particulate Cu. Boat hulls are also a source of particulate Cu during hull cleaning; however, the loading of particulate Cu was not calculated for these Cu TMDLs since the CTR criteria are based on dissolved Cu. It is worthy to note, however, that particulate Cu may contribute to the dissolved Cu load when waters re-equilibrate. Particulate Cu also contributes to Cu loading in general, as particles settle to the sediments. This results in increased sediment Cu concentrations which may cause toxicity to aquatic and benthic organisms.

A study in Shelter Island Yacht Basin showed that estimates of particulate Cu compared to dissolved Cu discharged during hull cleaning events may be up to 6 times higher for modified epoxy paints, and up to 28 times higher for hard vinyl paints from hulls cleaned after one month of application (Brown and Schottle 2006). Particulate Cu discharges were even higher for hulls cleaned after 3 months compared to 1 month, and particulate Cu was estimated to be approximately 2 pounds per boat per year. The Earley *et al.* study, described above, showed that particulate Cu discharged from epoxy paints increased from 16 to 25% for BMPs compared to nonBMPs.

Passive leaching may be reduced by using slip liners or storing boats in dry dock; and discharges from hull cleaning may be reduced by divers using softer pads for cleaning boat hulls, by decreasing the frequency of cleaning or by cleaning boat hulls out of the water.

Boatyards. Boatyards are another potential source of Cu to Newport Bay since boat hulls are cleaned, scraped and sandblasted, and there is a potential for the discharge of particulates and runoff into the Bay; however, the discharge of these process wastes is prohibited under the State Board's Industrial General Permit. (This Permit specifies requirements to control pollutants in stormwater discharges from boatyards and other industrial facilities). Common metal containing products used in boat activities include AFPs, pesticides and wood preservatives. Cu can enter the Bay during uncontrolled pressure washing, painting, antifouling or fueling activities.

Table 5-2 Summary of Copper (Cu) Loads to Newport Bay*

	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	**~~40,054~~ 40,186**	**100%**	**58,002[7] (58,012)**

* Table 5-2 includes data from Table E-11 in Toxics TMDLs, Part E (USEPA 2002).
Numbers in italics are different from those estimated by USEPA in 2002 (Calculations in Appendix 6).
[1]Estimates of dissolved Cu loading from passive leaching and hull cleaning (Appendix 6.1 and USEPA Toxics TMDL).
[2]Dissolved Cu load in tributary runoff (freshwater) was estimated from total Cu in storm water samples from San Diego Creek and Santa Ana Delhi for the last 2 monitoring years (County of Orange data, 2009-10, 2010-11) (Table 6.2.1, Appendix 6.2). (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).
[3]Dissolved 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 (Appendix 6.3).
[4]Estimate for direct deposition of Cu to surface waters of Newport Bay (Toxics TMDLs, TSD sect. IV).
[5]Estimate of dissolved Cu loads from ocean based on local data (R. Gossett) x approximate ocean volume into Newport Bay (Toxics TMDLs, TSD sect. IV -Newport Bay "bathtub model").
[6]Cu 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.
[7]Total from Table E-11, Toxics TMDL (the total of 58,002 given in Table E-11is incorrect and should be 58,012.

5.3.2 TRIBUTARIES TO NEWPORT BAY (FRESHWATER))

Urban runoff enters the Bay via tributaries, storm drains or surface runoff. Metal loads to the Bay from storm water runoff can be significant in winter. In the Toxics TMDLs, urban runoff from the two largest tributaries (San Diego Creek and Santa Ana Delhi), was calculated to be the second largest source of dissolved Cu to Newport Bay (Table 5-2). In these Cu TMDLs, the dissolved Cu loads from San Diego Creek and Santa Ana Delhi were calculated from the total Cu loads using the County of Orange monitoring data for 2009-10 and 2010-11 (total Cu x 0.80), and tributary runoff was still the second largest source of dissolved Cu to Newport Bay (Table 5-2 and Appendix 6-2). Note that 2009-10 and 2010-11 were relatively wet years. Estimates for Cu loading from the tributaries are lower in drier years (Table 6.2.1, Appendix 6-2). Note also that the amount of dissolved Cu entering the Bay from tributaries is more than an order of magnitude lower than dissolved Cu discharged from boats (Table 5-2).

Calculations for this TMDL show that Cu loads from the tributaries have decreased somewhat compared to USEPA estimates in 2002 (Table 5-2). It is likely that these decreases are due to the decrease in sediment input to Newport Bay from these tributaries. Note that while the total Cu *loads* from San Diego Creek are several times larger than those from Santa Ana Delhi in storm discharges and most dry discharges for respective years, total Cu *concentrations* in most storm and dry discharges are higher in the Delhi compared to the Creek (Appendix 6-2).

Storm water data shows that significant amounts of metals enter the Bay with sediments, as well as in the dissolved form, but the fate and transport of metal-contaminated sediments carried in storm water and the movement of sediments within the Bay by tidal action is not well documented.

5.3.3 STORM DRAINS (FRESHWATER)

Urban runoff from over 200 storms drains, mostly in Lower Newport Bay, also empties directly into Newport Bay. Dissolved Cu loads from storm drains were measured and are low compared to Cu loads discharged from boat paints and tributary runoff (Table 5-2). Dissolved Cu loads from storm drains were approximately 90 and 252lbs for 2007 and 2008, respectively (Storm drain study, Appendix 6.3).

5.3.4 BAY SEDIMENTS

Cu in the water may adsorb to suspended particles and settle, form salt precipitates, or be flushed out of the Bay. Filter feeders, such as mollusks, may accumulate Cu from the water, while benthic organisms may ingest Cu in sediments. Cu may also cause toxicity in the sediments and/or pore water causing both lethal and sublethal reactions. Sediments serve as a sink for Cu and other metals, but may also be a source as they may be resuspended releasing Cu back into the water. Cu contributions to the water column from resuspended contaminated bay sediments are unknown, although a recent sediment study in the Lower Bay showed that dissolved Cu in bottom water samples did not exceed the CTR criterion in most samples (OCCK and Candelaria, 2014).

Parts of the Lower Bay (3 areas) were dredged in Fall 2003, and parts of the Upper Bay were dredged in 2006. In addition, the Army Corps of Engineers (Corps) dredged a number of areas in Lower Newport Bay in 2012 and early 2013. Pre-dredging analyses were conducted for Lower Bay sediments; however, the Corps analyzed only homogenized cores and there are no data on Cu concentrations at specific depths for the cores examined. Originally, dredging was scheduled to occur down to clean sediment, but due to limited funds the dredge elevations were reduced. The result of these reduced dredge areas is newly exposed sediments (now surface sediments) which may be contaminated with metals, in particular Cu and mercury (Hg). These surface sediments are the sediments that will resuspend and potentially contribute contaminants, such as Cu, to the water column. A post-dredging study, to determine sediment and bottom water metals concentrations, was recently completed in Lower Newport Bay. This study was conducted in 2012 through early 2014.

Other data reviewed for this TMDL include surface sediment data (Section 4.2.2); however, there are no data from Newport Bay that measured the desorption of Cu (or other metals) from resuspended sediments.

5.3.5 AIR DEPOSITION

Air deposition is also a source of Cu to Newport Bay, however, direct contributions to the Bay's surface are small (3.5lbs/yr, USEPA 2002). Deposition to the land surface that enters the Bay with runoff is likely to be larger; however, Cu loads from air deposition onto land surfaces enters the Bay in urban runoff from tributaries and storm drains and are included in the freshwater tributary loads (Table 5-2).

5.3.6 ALGAE AND OTHER VEGETATION

In Allen's Food Web Study (Allen 2008), it was demonstrated that some metals, including Cu, exceeded the fish tissue guidelines (for wildlife) in algae. Metal concentrations are not regularly

determined in algae and plants that are food for wildlife, and should be examined to determine whether algae and plants are a source of metals to wildlife.

5.4 LOADING CAPACITY AND LINKAGE ANALYSIS FOR COPPER

In the Newport Bay Toxics TMDLs, USEPA outlined two methods, concentration and mass loading approaches, to define the metal loading capacity and the total maximum daily load (TMDL). To calculate the mass loading capacities, USEPA multiplied the chronic numeric target (CTR chronic criterion) for each dissolved metal by the volume of water in the Bay, accounting for water exchange rates between the Bay and the ocean. The concentration based loading capacities are equivalent to the saltwater acute and chronic targets for dissolved metals.

Mass based load allocations are 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 are defined to prevent discharges of high pulses of metals in the short term so that water quality criteria are met on a regular basis.

The mass and concentration based loads for these Cu TMDLs are shown in Tables 5-3 and 5-4. Waste load allocations and load allocations were determined from the total mass based allocations (Table 5-5). These Cu TMDLs uses 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 & Appendix 7).

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 (Table 5-3 & Appendix 7). The *concentration loading* of dissolved Cu is equivalent to the saltwater acute and chronic targets for dissolved Cu (Table 5-4).

Total allowable Dissolved Cu by mass =Bay volume x Criteria (C_c)
=19,000,000m^3(1000L/m^3) x 3.1µg/L (g/1000 µg)
=58,900,000g x lb/453.6g
=129850.09lbs

Dissolved Cu Mass Loading Capacity =$Mass_{out}$ – $Mass_{in}$
=(Criteria *$Volume_{out}$) – $Mass_{in}$
$L_f + L_i$ = C_c* (Q_b + 1.25Av_sF_p) – Q_oC_o
= (3.1 µg/L *(g/1000ug) *(4980399.79 m^3/d*(1000 L/m^3))
- (4830917.9 m^3/d*(1000 L/m^3) *0.0002mg/L*(1000mg/g))
=14473.056 g/d *(lb/453.6g)*(365d/yr)
=11646.09 lbs/yr

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 µg/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 =0.00093mm/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

Table 5-3 Mass based loading capacity for Dissolved Copper (Cu) in Newport Bay

Dissolved Cu Loading Capacity (lbs/yr)	11,646

Table 5-4 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

5.5 LOAD ALLOCATIONS, SEASONAL VARIATIONS AND MARGIN OF SAFETY FOR COPPER

Sources of metal loads into Newport Bay include storm water and urban runoff, agricultural runoff, and recreational boats for copper (Cu) and possibly zinc (Zn). Metal loads are defined both as metal concentrations and as mass based loads. Mass loads for waste load allocations (WLAs) were estimated for urban runoff, CalTrans and other NPDES discharges (although the Toxics TMDLs noted that there were insufficient data to develop accurate estimates). Mass loads for load allocations (LAs) were based on boats, agricultural runoff, air deposition, and unidentified sources.

In the 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 (in particular, the Cu freshwater loads from the major tributaries). 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 TMDL (Appendix 7). 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 (Table 5-5). If new data were not available for designated sources for WLAs and LAs, the Cu allocations from the Toxics TMDLs were used (Tables E-10, E-11). 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 discharge, 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) (Appendix 6.2). (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 during 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 wet and dry rainfall years.) 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 there is no Cu data specific to open space runoff and Cu concentrations in open space runoff are likely to be low compared to urban runoff.

The dissolved Cu allocations were calculated as follows:

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

11,646 - 2329 = 3176 + 6141 (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.

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Table 5-5 Mass based Allocations for Copper (Cu) in Newport Bay

The Copper TMDLs				**USEPA's Copper TMDLs**	
Category	**Type**	**Dissolved Copper**		**Type**	**Copper^ (Toxics TMDLs)**
Tributary or Storm drain WLAs	MS4 permittees	2,501		Urban runoff	3,043
	CalTrans	348		CalTrans	423
	Other NPDES permittees	156		Other NPDES permittees	190
Tributary or Storm drain LAs	Agricultural runoff	171#			
	Open space runoff	(part of MS4 WLA)			
	Sub-total	**3176* lbs/yr**		**Sub-total**	**3,656 lbs/yr**
Boatyards WLAs	Boatyards	0		Boatyards	0
Boats and other LAs				Ag runoff	215
	Boats+	6060		Boats	4,542
	Air deposition	81#		Air deposition	101
				Undefined (open space)	803
	Sub-total	**6141 lbs/yr**		**Sub-total**	**5,661 lbs/yr**
MOS		**2,329 lbs/yr**			**2,329 lbs/yr**
Total TMDL		**11,646 lbs/yr**			**11,646 lbs/yr**

^Allocations from the Toxics TMDLs for comparison (Table 5-7a, USEPA 2002)
*Cu load from tributary (3005 lbs/yr) plus storm drain (171 lbs/yr) runoff (Table 5-2)
(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 Vessel General Permit (5.6.1.2,2). 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).

Table 5-6 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)

5.6 IMPLEMENTATION PLAN FOR THE COPPER TMDLS

5.6.0 INTRODUCTION AND SUMMARY

States are required by federal regulations to incorporate TMDLs into water quality management plans (40 CFR 130.6). In California, water quality management plans include Regional Water Quality Control Plans (Basin Plans) and statewide water quality control plans. Under state law, a TMDL incorporated into the Basin Plan must include an implementation plan. The implementation plan recommended for this copper (Cu) TMDL is presented in this section.

Sources of Copper (Cu)
As discussed in Section 5.3, the known sources of Cu include Cu antifouling paints (AFPs) on boats, tributary runoff, storm drains, air deposition and ambient seawater (Table 5.2). Potential sources not quantified include bay sediments, algae and other vegetation. Of the known sources, Cu loading from Cu AFPs on boats is the largest source of dissolved Cu to Newport Bay (approximately 36,000 lbs per year), and is larger than all other sources combined. The second largest source of Cu to the Bay is storm water and dry weather runoff from the major tributaries (San Diego Creek and Santa Ana Delhi) (Table 5-2). Smaller sources include storm drain runoff, which is low compared to the two largest sources, but which may have local impacts, and air deposition. In addition, Bay sediments, which are a sink for Cu, may also be a source of Cu during resuspension of sediments.

Implementation Strategy
Since Cu loading from boats is the largest source of Cu to Newport Bay, the highest priority of this 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 resulting from Cu in parts of Lower Newport Bay, and to sample areas where there are 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 exceed sediment guidelines (Section 4.2, Table 4-10). 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.

These recommended Cu TMDLs 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. The adoption of such objectives might affect findings of Cu impairment and the need for and nature of this TMDL. The compliance schedule TMDL approach allows for such investigation to proceed and for future revision of this TMDL if site-specific objectives are ultimately approved by the Regional Board and USEPA.
Implementation tasks and schedules are summarized below and described in Section 5.6.3 and Table 5-8.

1) Reduce Copper (Cu) loading from Cu antifouling paints (AFPs) on recreational and commercial boats (Section 5.6.3.1)
There are two possible strategies to reduce Cu discharges from Cu AFPs: 1) restrict the sale and use of Cu AFPs; and 2) reduce Cu discharges from Cu AFPs.

The California Department of Pesticide Regulation (DPR) and USEPA have the authority to /restrict the sale and use of Cu AFPs[4]. The USEPA and Regional Board have the authority to regulate the discharge of Cu into waters of the United States and the state of California, including discharges from Cu AFPs. The regulatory authorities of these agencies are described in greater detail in this implementation section.

This recommended implementation plan calls for actions related to both strategies:

1.1) Regional Board staff will continue to work with DPR and USEPA to seek restrictions on the sale and use of Cu AFPs to achieve the Cu load allocation for boats identified in the TMDL (Table 5-5).

1.2) Regional Board staff will make recommendations to the State Board and USEPA for certification conditions and requirements that should be included in NPDES permits issued by USEPA to reduce/eliminate Cu discharges from commercial vessels, and for the management practices/performance standards that apply to recreational vessels in Cu-impaired waters.

1.3) Per the proposed implementation plan, Regional Board staff recommend that the Regional Board employ a conditional waiver of waste discharge requirements to require the identification and implementation of one or more approved Cu AFP discharge management strategies by responsible parties. (Recommended strategies are included in Section 5.6.3.1.2 in this TMDL and outlined in Table 5-8.) The strategies must be designed to achieve the load allocation for boats assigned in this TMDL. Dischargers responsible for reducing and/or eliminating Cu discharges from Cu AFPs to meet the TMDL load allocation (LA) include the City of Newport Beach, the County of Orange, marina owner/operators, individual boat owners and underwater hull cleaners.

1.4) If the conditional waiver or actions implemented pursuant to that waiver prove insufficient to meet the TMDL, Regional Board staff will recommend that the Regional Board consider the adoption of a prohibition on the discharge of Cu from Cu AFPs on boat hulls. It is anticipated that any such prohibition would include a schedule for compliance to allow the transition to nontoxic and/or non-Cu AFPs over time.

2) Remediate areas of known sediment copper (Cu) impairment, and identify/remediate areas with no or limited Cu data (Section 5.6.3.2)

The recommended implementation plan calls for the development and implementation of an approved remediation plan(s) to eliminate sediment impairment due to Cu. Dischargers responsible for the remediation of sediment impairment include the City of Newport Beach, the County of Orange, boatyard owners/operators, marina owners/operators, individual boat owners and underwater hull cleaners. Implementation of the remediation plan(s) is expected to also address sediment impairment due to zinc (Zn) and mercury (Hg) (Section 6.0).

3) Meet Copper (Cu) allocations for tributary and evaluate Cu discharges from storm drain runoff (Sections 5.6.3.3, 5.6.3.4)

The second highest source of Cu to Newport Bay is tributary runoff. Cu loading from storm drains is small compared to boats and tributaries, but may be important locally. The Regional Board regulates storm water and dry weather discharges to surface waters tributary to Newport Bay under Waste Discharge Requirements and federal NPDES permits. These requirements will be revised as necessary to implement this TMDL, once it is approved. Dischargers responsible for meeting the

[4] DPR has registered 169 Cu AFPs for use in California. These Cu AFPs have a wide range of Cu leach rates.

allocations for Cu discharges from tributaries and storm drains include the City of Newport Beach, the County of Orange and other municipal separate storm sewer system (MS4) permittees in the drainage area, and CalTrans.

4) Continue monitoring and conduct special studies (Sections 5.6.3.5, 5.6.3.6)

Monitoring requirements are included in the implementation plan to: (1) assess progress towards achieving the numeric targets, allocations and TMDL; (2) identify areas of sediment impairment due to Cu (and other metals); and (3) evaluate the efficacy and success of BMPs and other measures implemented as part of approved management strategies/remediation plans. The recommended implementation plan also includes provisions related to special studies that may be necessary if the implementation of the tasks identified in this implementation plan prove insufficient to meet the TMDL and achieve water quality standards.

To facilitate review, an outline of the recommended implementation plan and related discussion is presented below.

5.6.1 REGULATORY AUTHORITY FOR TMDL IMPLEMENTATION
5.6.1.1 Authority to Regulate the Sale and Use of Copper Antifouling Paints (Cu AFPs) (DPR, USEPA)
United States Environmental Protection Agency (USEPA)
California Department of Pesticide Regulation (DPR)
5.6.1.2 Authority to Regulate Copper (Cu) Discharges from Boats (USEPA)
Recreational vessels –Clean Boating Act (USEPA)
Commercial (non-recreational, non-military) vessels –Vessel/Small Vessel General Permits (USEPA)
Revisions to Copper (Cu) Objectives: Water Effects Ratio and Marine Copper Biotic Ligand Model (Cu BLM)
5.6.1.3 Regional Board Authority to Regulate Copper (Cu) Discharges from Boats
5.6.1.3.1 Regulatory Options: Individual or General WDRs, Conditional Waiver of WDRs, Waste Discharge Prohibition, Cleanup and Abatement Orders
Issuance of Waste Discharge Requirements
Issuance of Conditional Waiver of Waste Discharge Requirements
Adoption of a Prohibition on the Discharge of Residual Copper (Cu) from Cu AFPs
Issuance of Cleanup and Abatement Orders
Conversion of Boats from Cu AFPs to Nontoxic Coatings
5.6.1.4 Regional Board Authority to Compel Action to Identify and Correct Sediment Impairment from Copper (Cu)
5.6.1.5 Regional Board Regulation of Copper (Cu) Discharges from Tributaries and Storm Drains

5.6.2 DISCHARGERS RESPONSIBLE TO ACHIEVE TMDL LOAD AND WASTE LOAD ALLOCATIONS AND TO CORRECT SEDIMENT IMPAIRMENT FROM COPPER (Cu)
5.6.2.1 Dischargers Responsible to Reduce Copper (Cu) Loads from Copper Antifouling Paints (Cu AFPs)
5.6.2.2 Dischargers Responsible to Correct Sediment Impairment from Copper (Cu)
5.6.2.3 Dischargers Responsible to Meet Copper (Cu) Allocations for Tributary Runoff and Storm Drains

5.6.3 RECOMMENDED IMPLEMENTATION PLAN
5.6.3.1 Reduce Copper Loads from Copper Antifouling Paints (Cu AFPs) on Recreational and Commercial Boats
5.6.3.1.1 Restrict the sale and use of Cu AFPs
5.6.3.1.2 Reduce Cu discharges from Cu AFPs

5.6.3.2 Remediate areas of known sediment Cu impairment, and identify/remediate sediment impairment in areas with no or limited sediment Cu data
5.6.3.3 Meet Copper (Cu) allocations for tributary runoff
5.6.3.4 Evaluate Copper (Cu) Discharges from Storm Drains for Local Impacts
5.6.3.5 Continue Monitoring
5.6.3.6 Conduct Special Studies
5.6.3.7 Submit an Updated TMDL Report, and Reevaluate and Revise the TMDL

5.6.1 REGULATORY AUTHORITY FOR TMDL IMPLEMENTATION

This section describes the legal authorities for the actions prescribed in this TMDL Implementation Plan. These include the regulatory agencies and laws governing the sale and use of copper antifouling paints (Cu AFPs) in California (DPR, USEPA, Section 5.6.1.1), and the authority to regulate 1) the discharge of Cu from legal Cu AFPs (USEPA-Section 5.6.1.2, Regional Board-Section 5.6.1.3), 2) the correction of sediment impairment (Regional Board-Section 5.6.1.4), and 3) the discharge of Cu in tributary runoff and storm drains (Regional Board-Section 5.6.1.5).

5.6.1.1 Authority to Regulate the Sale and Use of Copper Antifouling Paints (Cu AFPs) (DPR, USEPA)

Copper antifouling paints (Cu AFPs) are legal pesticides subject to registration and regulation by the USEPA pursuant to the Federal Insecticide, Fungicide, Rodenticide Act (FIFRA) (7 U.S.C. 136) and by the California Department of Pesticide Regulation (DPR) pursuant to Division 7, commencing with section 12500, of the California Food and Agriculture Code (CDFA). These agencies have the authority to take direct regulatory actions, including the imposition of restrictions on the sale and use of Cu AFPs in Newport Bay, and/or cancellation of particular uses or registration. Regulatory action was already taken to ban the sale and use of tributyltin AFPs (partial ban by USEPA 1988; this was followed by a global ban in 2008).

United States Environmental Protection Agency (USEPA)
USEPA is the federal agency responsible for registering pesticides for sale or distribution within the United States pursuant to FIFRA. A pesticide cannot be legally used in the United States if it has not been registered by USEPA's Office of Pesticide Programs. Pesticide registration is the process through which USEPA examines the ingredients of a pesticide; the site or crop on which it is to be used; the amount, frequency and timing of its use; and storage and disposal practices. Through the registration process, USEPA evaluates the pesticide to ensure that it will not have unreasonable adverse effects on humans, the environment, or non-target species when used in accordance with label specifications. Under FIFRA, USEPA also establishes a nationally uniform labeling system to regulate pesticide use. Pesticide label language is under the sole jurisdiction of USEPA.

USEPA is currently engaged in a review of the registration of Cu-based pesticides, which includes Cu AFPs. USEPA anticipates completing an updated risk assessment in 2016 followed by a public comment period. The schedule timing is then dependent on comment review and potential revisions.

California Department of Pesticide Regulation (DPR)
The California Department of Pesticide Regulation (DPR) is the lead state agency regulating the registration, sales, and use of pesticides in California. The legal authority for California's pesticide regulatory program is found primarily in the Food and Agricultural Code (FAC).

DPR is required by law to protect the environment, including surface waters, from environmentally harmful pesticides by prohibiting, regulating, or controlling the uses of such pesticides. This is

accomplished through a licensing process called "registration." As part of the pesticide registration process, DPR evaluates data submitted by registrants to ensure that a product used according to label instructions will cause no harm (or "adverse impacts") on non-target organisms that cannot be reduced (or "mitigated") with protective measures or use restrictions. Registrants are required to submit data on the effects of pesticides on target pests (efficacy) as well as non-target effects. Non-target effects include effects on plants (phytotoxicity), fish and wildlife (ecotoxicity), endangered species, and the environment; in addition to a pesticide's environmental fate, breakdown products, leachability and persistence. Pesticides that pass this scientific, legal, and administrative process are granted a license that permits their sale and use according to requirements set by DPR to protect human health and the environment in California.

Pesticides must be registered by both USEPA and DPR before distribution in California. Because USEPA has sole responsibility for label language, DPR cannot require a manufacturer to make changes to its labels but can request registrants to modify label language with USEPA approval. By refusing to allow registration, however, and hence the possession, sale and use of any pesticide not meeting California standards, DPR can place more restrictive requirements on pesticides above those required by USEPA. DPR can cancel the registration of a pesticide, or refuse to register a pesticide, if DPR finds that the pesticide "has demonstrated serious uncontrollable adverse effects either within or outside the agricultural environment." (FAC 12825[5]). DPR also has the authority to restrict the sale and use of pesticides, such as Cu AFPs, on a regional basis. (A statewide ban of Cu AFPs was pursued for the implementation of the Shelter Island Cu TMDL in the San Diego Region, but DPR declined to take this action. DPR staff has advised Santa Ana Regional Board staff that the agency is similarly disinclined to issue a regional ban on Cu AFPs in the Santa Ana Region or in southern California.)
http://www.waterboards.ca.gov/publications_forms/publications/general/docs/ca_pesticide_mgmt_planwq.pdf

DPR began a reevaluation of the registration of Cu AFPs in June 2010. DPR has been working on the development of mitigation strategies, including the development of Cu AFPs with lower leach rates, recommendations to registrants and USEPA for changes in label language, and restrictions on the sale and use of Cu AFPs with leach rates greater than 9.5 $\mu g/cm^2/d$ to reduce Cu discharges from Cu AFPs to surface waters.

As part of this reevaluation effort, DPR required paint manufacturers to determine the Cu loading from Cu AFPs, and the paint manufacturers funded a study by the U.S. Navy (Earley et al, 2013). This study measured the 3 year Cu loading for one epoxy and one ablative Cu AFP under different cleaning scenarios: no cleaning, cleaning with BMPs (i.e. using soft pads) and cleaning with non-BMPs (i.e., using abrasive pads). Cu leaching increased during a cleaning event and remained elevated after cleaning due to the "refreshed" surface. (A "refreshed" hull surface is a surface where the fouling has been removed, whether by hull cleaning or moving through the water.) As time passes, the leach rate decreases due to fouling growth on the hull surface. In addition, Cu loading was higher when non-BMPs were used for hull cleaning compared to BMPs.

While reevaluation efforts continued, a new law (AB425) was passed on October 4, 2013 that states that "No later than February 1, 2014, the Department of Pesticide Regulation (DPR) shall determine a leach rate for copper-based antifouling paint [Cu AFPs] used on recreational vessels and make recommendations for appropriate mitigation measures that may be implemented to address the protection of aquatic environments from the effects of exposure to that paint if it is registered as a pesticide".

[5] FAC 12825 specifies additional bases for cancellation/refusal to register by DPR.

After completion of the Earley *et al.* study, DPR conducted a modeling study (using the marine antifoulant model to predict environmental concentrations –(MAMPEC) to determine a maximum allowable leach rate for Cu AFPs used in California. The leach rates determined by the model for Cu AFPs were based on 5 marina scenarios (based on numbers of boats and other physical parameters) and a dissolved Cu target of 3.1µg/L (the California Toxics Rule (CTR) saltwater chronic criterion). (DPR acknowledged that the CTR Cu criteria are the applicable water quality objectives for dissolved Cu in most California waters. (Note that site-specific objectives for Cu that differ from the CTR saltwater criteria have been approved in some California waters). The leach rates determined by the model for the 5 marina scenarios were then adjusted by data from the Earley *et al.* study to account for the use of BMPs and reduced cleaning frequency. The maximum allowable leach rate was then chosen from scenario 2 of the adjusted model leach rates.

As of February 1, 2014, per the requirements of AB425, DPR issued a maximum allowable leach rate of 9.5 µg/cm^2/d for Cu AFPs and a set of mitigation recommendations for the use of Cu AFPs. Cu AFP registrants are required to reformulate Cu AFPs with leach rates above this maximum allowable leach rate. In addition, DPR recommends the following measures to be implemented by registrants and agencies other than DPR:

- require in-water hull cleaners to use BMPs;
- reduce the cleaning frequency to once per month;
- include hull cleaning information on product labels;
- develop hull maintenance brochures for boaters;
- increase boater awareness of alternatives to Cu AFPs;
- create incentive programs to convert boats with Cu AFPs to alternative AFPs; and
- consider site-specific objectives for some marinas/harbors.

DPR believes that the combination of limiting the leach rate to 9.5 µg/cm^2/d and implementation of these recommended mitigation measures should result in compliance with the CTR objectives in *most* marinas in California, except for the most impaired marinas (i.e. Marina del Rey, Shelter Island Yacht Basin, Newport Bay). DPR also recognizes that in the marinas most impaired for Cu from Cu AFPs, a large number of boats may need to be converted from Cu AFPs to nontoxic and/or non-Cu paints.

Section 13247 of the California Water Code requires state agencies to comply with water quality control plans (basin plans) “in carrying out activities which may affect water quality.” Under this provision, DPR has an obligation to ensure that the registration and use conditions for Cu antifouling paints (Cu AFPs) will not cause or contribute to the violation of applicable Cu water quality objectives nor to the violation of the Cu TMDLs for Newport Bay, once the TMDLsare incorporated into the Basin Plan. Since aquatic pesticides (or terrestrial pesticides that reach surface waters) may cause exceedances of water quality objectives, such as those specified in the California Toxics Rule (CTR) for dissolved Cu, and because such exceedances may cause or contribute to the impairment of beneficial uses, the State Water Board and DPR entered into a Management Agency Agreement (MAA) in 1997. The MAA acknowledges that both agencies “have responsibilities to protect water quality from the potential adverse effects of pesticides” and that “Both agencies concur that the State will benefit from a unified and cooperative program to protect water quality related to the use of pesticides.” The MAA also states as part of its purpose that the State Board and DPR will “Coordinate respective authorities to solve water quality problems related to pesticide use by promoting the development and use of preventive practices through both self-regulatory and regulatory efforts”; and that “the State Board and DPR mutually agree…To ensure that compliance with State and Regional Boards’ established numeric and narrative water quality objectives are achieved. Responsibility for interpretation of compliance with narrative water quality objectives will continue to rest with the State and Regional Boards” (task 3(g) in the MAA). The State Water Board and DPR also developed a management plan (California Pesticide Management Plan for Water Quality, February 1997) to implement the MAA

http://www.waterboards.ca.gov/publications_forms/publications/general/docs/ca_pesticide_mgmt_planwq.pdf

Consistent with this MAA and Management Plan, Regional Board staff have consulted with DPR staff with respect to the appropriate measures needed to address Cu AFPs in Newport Bay and other waters in the Region. In response to the findings of Cu impairment and TMDL requirements, as noted above, Board staff discussed with DPR the possibility of DPR issuing a regional ban for Cu AFPs in Newport Bay (and other waters in the Santa Ana Region) or in southern California (where the most impaired marinas due to Cu AFPs are found). DPR is not prepared to take this action, at least at the present time.

Further, Board staff have carefully reviewed DPR's maximum allowable leach rate and mitigation recommendations in response to AB425 and have provided detailed comments, in conjunction with Los Angeles Regional Board staff, who are also addressing state waters impaired by Cu AFPs. In a joint comment letter to DPR dated August 15, 2014, Santa Ana and Los Angeles Regional Board staff identified specific concerns with DPR's leach rate determination and recommended mitigation measures. While Regional Board staff support the establishment of a maximum allowable leach rate and mitigation recommendations, staff have concerns that implementation of these measures will not be sufficient to meet the water quality objective for dissolved Cu in the most impaired marinas in southern California waters, including Newport Bay.
http://www.waterboards.ca.gov/santaana/water_issues/programs/tmdl/tmdl_toxics.shtml)

Regional Board staff have demonstrated that the maximum allowable leach rate of 9.5 µg/cm^2/d will not meet the leach rates needed to meet the Cu allocation for boats in Cu TMDLs in southern California, even with the use of BMPs and reduced cleaning frequency (see calculations in Appendix 6.1.3 and Section 5.6.3.1.2). The joint letter also points out that the 9.5 µg/cm^2/d maximum leach rate set by DPR is higher than the leach rates of the Cu AFPs used in Earley et al's Cu loading study, even though these paints were chosen as representative of the Cu AFPs currently in use. The reduction in Cu loading achievable by implementing the 9.5 µg/cm^2/d leach rate is also highly dependent on the leach rates of the Cu AFPs currently in use (i.e., if most Cu AFPs currently in use have leach rates below the 9.5 µg/cm^2/d set by DPR, little reduction in Cu loading will be achieved as the result of implementing this maximum allowable leach rate).

Regional Board staff generally agree with DPR's recommended mitigation measures, including the use of BMPs by all hull cleaners, boater education, changes to product labels, the distribution of hull-cleaning brochures and incentive programs for the conversion of boats from Cu to nontoxic AFPs. DPR's recommendation of reduced cleaning frequency, however, is not practical to implement. Cleaning frequency is a matter of boater preference and the needs dictated by hull fouling conditions, which vary widely in waters where boats are moored, the length of time that boats are in the water, and boat usage. In general, boaters want to clean their boats when the hulls have light fouling so that the fouling does not become hard and require hard scrubbing. (Harder scrubbing releases more Cu during hull cleaning, and may cause indentations in the paint resulting in higher Cu discharges after hull cleaning and ultimately more frequent repainting.

In the joint letter to DPR, Regional Board staff also expressed serious concerns, that responsible dischargers might draw the inappropriate conclusion that implementation of the maximum allowable leach rate set by DPR and DPR's mitigation recommendations, including the use of BMPs and reduced cleaning frequency, will be sufficient to eliminate all Cu impairments caused by Cu AFPs. Such a conclusion could thwart the implementation of measures necessary to achieve Cu TMDLs and correct impairment in state waters, especially in waters of the most impaired marinas. These concerns were borne out by recent experience during consideration of the Cu TMDLs for Marina del Rey in the Los Angeles Region, and by concerns expressed by Newport Bay stakeholders during the development of this recommended TMDL. In short, the perceived conflict between DPR's

allowance of the use of Cu AFPs and Regional Board requirements to reduce Cu discharges from the use of Cu AFPs is confusing and difficult for stakeholders to understand and implement, and makes implementation of the TMDL requirements problematic. This difference in the authorities, approach and recommendations of DPR, and the State and Regional Water Boards, must be addressed through further communication and coordination with DPR, in accordance with the MAA, and by enhanced communication with the public by both DPR and the Regional Boards.

5.6.1.2 Authority to Regulate Copper (Cu) Discharges from Boats (USEPA)

5.6.1.2.1 Recreational Vessels – Clean Boating Act (USEPA)

Recreational boats that use Cu AFPs are considered to be nonpoint sources of Cu and are regulated pursuant to the federal Clean Boating Act (CBA), which was passed in 2008. This law, an amendment of the Clean Water Act (CWA), provides that recreational vessels shall not be subject to the requirement to obtain a CWA permit (NPDES) to authorize discharges incidental to their normal operation and regulates such discharges from recreational vessels.

The CBA states that "No permit shall be required under this Act...for the discharge that is incidental to the normal operation of a vessel, if the discharge is from a recreational vessel". The CBA creates a new section 402(r) of the CWA that excludes discharges incidental to the normal operation of recreational vessels from National Pollutant Discharge Elimination System permitting requirements. In addition, the CBA added a new section 312(o) to the CWA, directing USEPA to "determine the discharges incidental to the normal operation of a recreational vessel for which it is reasonable and practicable to develop management practices to mitigate adverse impacts on the waters of the United States...".

The CBA affects owners or operators of recreational vessels, from the smallest kayak to the largest yacht. Each such vessel owner/operator will be responsible for implementing the management practice or practices associated with each type of discharge that their vessel creates. Discharges incidental to the normal operation of a recreational vessel include those from antifouling and corrosion control agents, aquatic nuisance species, bilge water, cleaning and maintenance (such as oil fuel), fishing waste and graywater. The CBA does not address sewage because vessel sewage is currently regulated under the Clean Water Act.

The CBA applies to recreational vessels in all "waters of the United States," as defined in the CWA, and waters of the contiguous zone which extend to 12 miles from shore. This means that the CBA applies to recreational vessels using internal waters, coastal waters, and waters out to 12 nautical miles from shore.

The CBA includes 3 phases of implementation to develop regulations for recreational boaters.

> Phase 1. USEPA will determine the discharges incidental to the normal operation of recreational vessels for which it is "reasonable and practicable" to develop management practices and develop these practices.
>
> Phase 2. USEPA will enact regulations establishing performance standards for each management practice. This process will take 18-24 months to complete.
>
> Phase 3. The United States Coast Guard (USCG) has enforcement authority under the CBA. The USCG will enact regulations that specify the design, construction, installation or use of management practices to meet USEPA's performance standards.

After Phases 1 through 3 are completed, recreational boaters will be required to conduct the management practices developed by USEPA and the USCG. In addition, state and local governments may establish practices that are broader in scope and/or more stringent than those established under the CBA. Vessel owners must comply with the most stringent laws.
As of Spring 2016, implementation for the Clean Boating Act is considered to be a "long term action", and USEPA has not identified a time schedule for implementation. (pers. communication w/USEPA) and http://reginfo.gov/public
http://water.epa.gov/lawsregs/lawsguidance/cwa/vessel/CBA/about.cfm

5.6.1.2.2 Commercial (non-recreational, non-military) vessels –Vessel/Small Vessel General Permits (USEPA)

Commercial vessels are considered to be point sources of copper (Cu). USEPA currently regulates discharges incidental to the normal operation of commercial vessels greater than 79 feet in length, and operating as a means of transportation, primarily through the Vessel General Permit (VGP). The first VGP was issued in 2008 and was effective until December 19, 2013. On March 28, 2013, USEPA reissued the VGP for another five years. The reissued permit, the 2013 VGP, took effect December 19, 2013 and supersedes the 2008 VGP.
(http://cfpub.epa.gov/npdes/vessels/vgpermit.cfm#2008.)
The State Water Board provided Clean Water Act Section 401 certification of the VGP in California with specific conditions that USEPA attached to the VGP and that constitute enforceable conditions of the VGP.

For commercial fishing vessels and other commercial vessels less than 79 feet, except for ballast water discharges, NPDES permits are not required for any discharges incidental to normal operation (CWA section 502(25)). The moratorium from the requirement to obtain permit coverage for incidental discharges from these vessels expired December 18, 2014. In anticipation of the end of the moratorium, USEPA published a draft small Vessel General Permit (sVGP) in 2013 to provide for permit coverage for these incidental discharges. The small Vessel General Permit was finalized and published in the Federal Register on September 10, 2014.
http://cfpub.epa.gov/npdes/vessels/vgpermit.cfm (2013 draft small vessel general permit)

The 2013 VGP (and 2014 sVGP) include requirements pertaining to the use of Cu and other antifouling paints (AFPs) in VGP-Sections 2.2.4 (Anti-Fouling Hull Coatings/ Hull Coating Leachate) and 2.2.23 (Underwater Ship Husbandry and Hull Fouling Discharges). Broadly, these provisions require that owners/operators of vessels that spend considerable time (greater than 30 days per year) in Cu-impaired waters or that use these waters as their home port consider using antifouling coatings that rely on a rapidly biodegradable biocide or another alternative to Cu-based coatings. If after consideration of alternative biocides, vessel owners/operators in impaired waters continue to use Cu AFPs, they must document the rationale for this decision. (It may be noted that the VGP explicitly prohibits the use of any antifouling coating that contains tributyltin or any other organotin compound used as a biocide. This is consistent with the worldwide ban on tributyltin use.) The VGP specifies that vessel owners/operators must minimize the release of Cu AFPs during vessel cleaning operations and provides recommended BMPs. The hulls of vessels to which Cu AFPs are applied must not be cleaned in Cu-impaired waters within the first 365 days after paint application unless there is a significant visible indication of hull fouling by organisms.

The VGP also includes additional water quality-based effluent limits (VGP-Section 2.3), including limits on discharges to water quality impaired waters with and without an approved TMDL (VGP, Section 2.3.2). These provisions require, in part, that that discharges from the vessels be controlled as necessary to meet applicable water quality standards in the receiving waters impacted by the discharges. Where an applicable TMDL and wasteload allocation have been established, discharges from the vessel must be consistent with the assumptions and requirements of the

TMDL/WLA. In certifying the VGP, the State Water Board included the requirements that vessel discharges must comply with the applicable statewide and regional water quality control plans. The State Water Board also specified the condition that vessel discharges shall comply with the California State Lands Commission requirements for hull fouling and ballast water discharges to control and prevent the introduction of nonindigenous species.

5.6.1.3 Regional Board Authority to Regulate Copper (Cu) Discharges from Boats

The "discharge of copper (Cu)" refers to "residual Cu", which is defined as any Cu species that leaches, dissolves, ablates, or erodes from boat hull antifouling paints into receiving waters such as Newport Bay and does not reach a target fouling organism. This includes residual Cu that results from legally registered Cu antifouling paints (AFPs) used in accordance with label instructions in compliance with the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). Residual Cu is a waste subject to regulation by the Regional Board under the provisions of the California Water Code, including those provisions that implement applicable requirements of the federal Clean Water Act. As discussed in Section 5.3, residual Cu that results from Cu AFPs used on boats is the principal source of Cu impairment in Newport Bay.

Note that the 2002 USEPA Metals TMDLs (part of the Toxics TMDLs) included an independent impairment assessment that found that Newport Bay was impaired for Cu based on exceedances of the dissolved Cu CTR criteria for saltwater. USEPA also found that Cu AFPs were the principal source of the Cu exceedances. USEPA's load allocation for boats required a approximate 91% reduction of the Cu load from boats. These Cu TMDLs will supercede the existing Cu TMDLs promulgated by USEPA in 2002.

The regulatory options available to the Regional Board to address this source of impairment are discussed below.

5.6.1.3.1 Regulatory Options: Individual or General WDRs, Conditional Waiver of WDRs, Waste Discharge Prohibition, Cleanup and Abatement Orders

The Porter-Cologne Water Quality Control Act (California Water Code (CWC), Division 7. Water Quality) provides that "All discharges of waste into the waters of the State are privileges, not rights" (CWC 13263(g)). Furthermore, all discharges are subject to regulation under the Porter-Cologne Act, including both point and nonpoint source discharges (CWC 13260, 13376). In obligating the State Board and Regional Boards to address all discharges of waste that can affect water quality, the legislature provided the State Board and Regional Boards with authority in the form of waste discharge requirements (WDRs), waivers of WDRs, and Basin Plan waste discharge prohibitions to address ongoing and proposed waste discharges. All current and proposed waste discharges must be regulated under WDRs, waivers of WDRs, or a prohibition, or some combination of these regulatory tools.

Further, Section 13304 of the Water Code authorizes the Regional Board to issue a cleanup and abatement order to any person who has discharged or discharges waste into the waters of the state that creates or threatens to create a condition of pollution or nuisance. A cleanup and abatement order would require the discharger(s) to clean up the waste or abate the effects of the waste.

The discharge of Cu from Cu AFPs, including passive leaching and hull cleaning, and other sources, such as tributaries and storm drains, is a discharge of waste pursuant to CWC section 13050(d), and subject to Regional Board issuance of WDRs or a waiver of WDRs, adoption of a

waste discharge prohibition, or issuance of Cleanup and Abatement orders. The Board's regulatory options are described below.

5.6.1.3.1.1 Issuance of Waste Discharge Requirements

The Regional Board can issue individual or general WDRs requiring dischargers to meet the copper (Cu) reductions specified in the TMDL. The largest contributors of residual Cu from Cu AFPs in Newport Bay are vessels. Recreational vessels are currently considered to be non-point sources of pollutants and not subject to federal NPDES permits; however, the Regional Board is authorized to issue waste discharge requirements to address Cu discharges from recreational and commercial vessels into the state's waters. Such requirements may be issued to individual boat owners, marina owners/operators, agencies responsible for permitting/licensing marinas (City of Newport Beach, the County of Orange) and underwater hull cleaners[6] (Section 5.6.2). Alternately, the Regional Board could issue general waste discharge requirements to regulate Cu discharges resulting from Cu AFPs and require that all responsible parties enroll in and implement those general WDRs.

There are also a small number of commercial vessels greater than 79 ft. (approximately 15 vessels with an average length of 111 ft.) that spend greater than 30 days per year in Newport Bay or that use the Bay as their home port. These are considered to be point sources of pollutants and are subject to the requirements of the Vessel General NPDES permit issued by USEPA (Section 5.6.1.2). As previously discussed, this permit incorporates conditions regarding Cu AFPs that were identified by the State Water Board as part of CWA Sec. 401 certification of the VGP.

For both recreational and commercial vessels, the WDRs would include requirements to reduce residual Cu discharges from boat hulls to meet the load allocation specified in this TMDL. The load allocation for Cu discharges from Cu AFPs requires an 83% reduction from the current loads (Table 5-5). This reduction may be achieved by converting boats in sufficient numbers to nontoxic AFPs/coatings and by requiring underwater hull cleaners to employ BMPs that reduce Cu discharges. The conversion of boats from Cu AFPs to nontoxic AFPs/coatings (and low leach rate Cu AFPs) will require continued public education concerning the effects of Cu AFPs, the availability and cost-effectiveness of alternative AFPs, and the use of hull cleaning BMPs. Some reduction of Cu discharges may also occur from DPR's implementation of its maximum allowable leach rate (9.5 $\mu g/cm^2/d$), but *only if boats are currently using Cu AFPs with leach rates above this leach rate*.

While the issuance of individual WDRs and/or the enrollment of large numbers of dischargers (including all individual boat owners) in general WDRs are regulatory options, Board staff believe that these strategies would be too time consuming and inefficient for both the Regional Board and boat owners. Significant Regional Board resources would be required to first enroll all dischargers in the requirements, and then oversee implementation of the requirements, including potential enforcement actions. For these reasons, the issuance of individual WDRs is not a preferred option for this TMDL; however, this option may be considered if compliance with this TMDL is not achieved.

5.6.1.3.1.2 Issuance of Conditional Waiver of Waste Discharge Requirements

A second potential regulatory option is for the Regional Board to adopt a conditional waiver of waste discharge requirements for Cu discharges from Cu AFPs on boat hulls in Newport Bay. The

[6] Discharges from boatyard operations are regulated under the General Industrial Storm Water NPDES permit (Water Quality Order No. 97-03-DWQ, NPDES No. CAS000001). This Order requires the preparation of new, or the review and update of existing, Storm Water Pollution Prevention Plans (SWPPPs), and prohibits unauthorized non-storm water discharges to the facility's storm drain system. It should be noted that boatyard operations conducted in accordance with these requirements are not considered to be significant *ongoing* sources of Cu to Newport Bay. A zero discharge for boatyards is required in the permit; however, boatyards have contributed Cu and other metals, including mercury (Hg), to sediments in the Bay as a result of their historic activities.

Board would waive waste discharge requirements for individual boat owners, marina owners/operators, the City of Newport Beach and County of Orange and other responsible parties provided that these responsible parties, individually or collectively, develop and implement one or more Regional Board approved strategies designed to meet the Cu load allocation. These strategies are expected to include the conversion of some or all vessels from Cu AFPs to alternative, nontoxic AFPs, the implementation of BMPs to reduce Cu discharges during hull cleaning, and boater education. Monitoring to assess the efficacy of the implemented strategies and progress towards TMDL compliance would be required.

Regional Board staff recommend the issuance of a Conditional Waiver of Waste Discharge Requirements as the appropriate regulatory tool to implement the copper reduction strategies identified in this implementation plan (Section 5.6.3). Board staff envisions a strategy whereby the City of Newport Beach and the County of Orange will be the initial enrollees and play a lead role in the development and implementation of Cu reduction strategies on behalf of the boating community. If the lead agencies fail to identify and implement Cu reduction strategies, enrollment may be required for others, including individual boats owners and marina owner/operators,. This strategy is intended to avoid the resource consequences associated with the significant effort that would be necessary to enroll all responsible dischargers initially. If the Conditional Waiver does not result in sufficient copper reductions to meet the recommended TMDL, then an alternative regulatory strategy, including the adoption of a prohibition of the discharge of Cu from Cu AFPs, will need to be considered.

5.6.1.3.1.3 Adoption of a Prohibition on the Discharge of Residual Copper from Cu AFPs

A third regulatory option is for the Regional Board to consider the adoption of a prohibition on the discharge of residual Cu, as defined above, from commercial and recreational boat hulls in Newport Bay. Such a prohibition would require that boat hulls be painted with an alternative, nontoxic AFP. Board staff expect that such a prohibition would be phased in over time, in conjunction with the normal cycle of boat repainting, so that boat owners could repaint their boats(s) as needed. During the conversion of boats in Newport Bay from Cu AFPs to nontoxic AFPs/coatings, underwater hull cleaners will need to employ BMPs to minimize Cu discharges during hull cleaning. (Note that the requirement for the use of BMPs will be a part of any regulatory strategy to address Cu AFPs and other AFPs.)

Regional Board staff recognize that the cleaning and prevention of fouling on boat hulls is important to the maintenance, use and enjoyment of the vessels. Staff also recognize that the majority of boats in Newport Bay currently use Cu AFPs to control fouling and invasive species. Experience with Cu AFP issues in other regions, including the Los Angeles Region (e.g., recent updates to the Marina del Rey Cu TMDL), indicate that a prohibition of Cu discharges from Cu AFPs would be met with much opposition from the boating public.

We agree that it would be inadvisable to pursue a prohibition at the present time. This conclusion is based on two considerations. First, compliance with the TMDL load allocation for boats requires a significant (83%) reduction in Cu discharges from boats but not the complete elimination of such discharges. (Note: Board staff recognize that the only practical and equitable way to achieve the requisite reduction may ultimately be through a prohibition on Cu discharges from Cu AFPs and conversion to alternative paints on all boats in the Bay, if conversions pursuant to the implementation plan for this TMDL are not adequate to meet the TMDL allocations for vessels.) Second, neither DPR's recent determination of a maximum allowable leach rate for Cu AFPs and recommended mitigation measures, nor DPR's stated disinclination to adopt a regional ban on Cu AFPs in Newport Bay (or statewide in California) (Section 5.6.1.1) would be consistent with a prohibition at the present time.

As noted, Board staff's recommended regulatory strategy is to adopt the conditional waiver of waste discharge requirements to ensure compliance with the load allocation. If this recommended strategy is approved and implemented but proves unsuccessful, then Board staff will recommend that the Regional Board adopt a prohibition of Cu discharges from Cu AFPs.

5.6.1.3.1.4 Issuance of Cleanup and Abatement Orders

A fourth regulatory option is the issuance of Cleanup and Abatement Orders (CAOs) pursuant to Section 13304 of the Water Code. Impairment of Newport Bay waters by Cu from Cu AFPs constitutes a condition of pollution, for which CAOs may be issued by the Regional Board, or the Regional Board's Executive Officer. CAOs could be issued to those parties responsible for Cu discharges that cause or contribute to this pollution, including individual boat owners, the City of Newport Beach, the County of Orange, marina owners/operators and other responsible parties.

This approach is fraught with the same resource considerations as the issuance of individual waste discharge requirements. Moreover, and more importantly, it would be improper to issue an enforcement order to parties who are and have been using Cu AFPs in accordance with applicable laws and regulations. Changes in this established practice (the use of Cu AFPs) will be necessary to achieve this TMDL (and would also be necessary to achieve the 2002 TMDL promulgated by USEPA), but it is appropriate to effectuate the new practices by establishing new regulatory requirements, such as waste discharge requirements or a conditional waiver, that are consistent with and necessary to implement this TMDL. The issuance of Cleanup and Abatement Orders remains an option for the Regional Board should compliance with the TMDL not be achieved via these other regulatory tools.

5.6.1.3.1.5 Conversion of Boats from Cu AFPs to Nontoxic Coatings

Whatever regulatory option is selected by the Regional Board, a large number of boats will need to be converted from Cu AFPs to nontoxic coatings to meet the TMDL load allocation. This conversion depends on the availability, efficacy and cost of nontoxic AFPs/coatings. It also relies on the education of the boating public and the boatyards regarding the use of nontoxic AFPs.

Several studies on alternative paints have demonstrated that nontoxic AFPs/coatings are available and cost effective compared to traditional Cu AFPs. These studies demonstrate that the conversion from Cu AFP to a nontoxic alternative is economically reasonable and that nontoxic paints are effective. (These results would support a prohibition on Cu AFPs, should the Regional Board elect to pursue one). A key consideration of such conversions is the higher initial cost of the application of a nontoxic AFP due to the required stripping of the old Cu AFP before the application of a nontoxic AFP, and the required spraying-on of some nontoxic AFPs, compared to rolling on of Cu AFPs. Both the stripping and spraying-on of nontoxic AFPs are additional costs compared to the cost of applying a Cu AFP. Paint manufacturers are addressing these additional costs by developing nontoxic formulas that can be rolled on rather than sprayed on, and/or applied over old Cu AFPs.

The studies on alternative paints include: An Alternative Antifouling Paint Study by the Port of San Diego; continued work with paint manufacturers by Katy Wolf PhD after the conclusion of the Port study, and the Carson study. In addition, a 319(h) project was already conducted in Newport Bay to convert boats from Cu to nontoxic AFPs/coatings.

Port of San Diego Study

A study completed by the Port of San Diego examined both the efficacy and economics of nontoxic and non-Cu AFPs to determine viable alternatives to Cu AFPs (San Diego Unified Port District 2011). (Non-Cu AFPs include paints that do not contain Cu but do contain other toxins such as zinc and/or organic biocides; nontoxic AFPs are paints that do not contain any biocides/toxins.) The Port study examined the performance, longevity and cost of alternative paints, and concluded that

viable alternatives to Cu AFPs do exist on the market today. The report details the evaluation of the AFPs tested and provides a list of alternative AFPs that both performed well and are cost effective. The report also includes a matrix to assist boaters in selecting a non-Cu AFP (SDUPD 2011, Section 7).

Katy Wolf, PhD, IRTA
In addition to the Port Study, Katy Wolf, PhD (one of the principal investigators for the Port study and director of Institute for Research and Technical Assistance (IRTA)) has continued to work with paint manufacturers to develop nontoxic paints that can be rolled on rather than sprayed on and also nontoxic paints that can be applied over old Cu AFPs. These new developments for nontoxic paints will bring down the cost of nontoxic paints to costs closer to the cost for repainting with Cu AFPs.

Carson study
An earlier report from the University of California (Carson *et al.* 2002) examined the viability of transitioning from Cu to non-metal AFPs in San Diego Bay, with the following conclusions:

- Hard epoxy paints were determined to be an adequate substitute for traditional Cu AFPs, and silicone paints were determined to be well suited for specialized uses, such as racing boats;
- With respect to cost, Cu AFPs are more cost effective over the short term, but nontoxic epoxy AFPs are more cost effective over the long term life of the boat;
- Converting all boats in San Diego Bay, which contains approximately 8000 boat slips, from Cu to nontoxic AFPs in 15 years is possible without substantial economic hardship to the boating community,
  (The 15 year period allows boats to be converted from Cu to nontoxic AFPs when a boat typically needs repainting, and requires that all new boats be coated with nontoxic AFPs);
- Based on boater input, a future ban on Cu AFPs with a specific compliance date is necessary to achieve substantial Cu reduction; and
- Boater education and commercial demonstrations are also necessary to achieve the conversion of boats from Cu to nontoxic AFPs.

In addition, the study found that *low level Cu AFPs failed to achieve a substantial reduction of Cu*; these AFPs lose similar amounts of Cu to the water as traditional Cu AFPs over time since low level Cu AFPs require more initial coats of paint and/or these AFPs last a shorter period of time, which requires more frequent repainting.

Based on the above studies, a transition to nontoxic AFPs or coatings in San Diego Bay may be accomplished in 15 years without substantial economic hardship because nontoxic AFPs are available and more cost-effective than Cu AFPs over the long term.

Historically, and during the Port study, the cost to reapply Cu AFPs to boat hulls was less expensive than the application of nontoxic AFPs or coatings due to the stripping costs associated with the conversion from Cu to nontoxic AFPs, including the spraying cost required to apply some nontoxic AFPs. The nontoxic AFPs, however, last longer than Cu AFPs and some paint manufacturers are developing nontoxic AFPs that can be rolled on rather than sprayed on and/or applied over Cu AFPs. Both of these developments have reduced the costs of nontoxic AFPs to costs that are more comparable to the cost of Cu AFPs. In addition, nontoxic AFPs should last 5 to 7 years, while Cu AFPs last 2 to 3 years.

319 Copper Reduction Study –Lower Newport Bay (2009 -2013)
In addition to studies on Cu and nontoxic AFPs, a Copper (Cu) Reduction Study (319(h)), conducted in Lower Newport Bay in 2009 through 2013, was completed in 2013 with results that are less than encouraging. The study's tasks were 1) to convert boats from Cu to nontoxic AFPs with a 50% conversion in a target marina and a 10% conversion baywide), 2) to implement a financial

incentive program in a target marina to assist boaters in the conversion from Cu to nontoxic AFPs, 3) to educate boaters on water quality problems caused by Cu in Newport Bay and on the available nontoxic AFPs, and 4) to pass a city resolution encouraging the use of nontoxic AFPs.

A City resolution was passed encouraging the conversion from Cu to nontoxic or non-Cu AFPs. Boater education was a strong component of this 319(h) project and was somewhat successful as a number of boaters were interested in converting to nontoxic AFPs; however, despite multiple meetings around Newport Bay, letters to boaters and dock-walking education programs, a total of only ten boats were converted from Cu to nontoxic AFPs or coatings.
(Note that in the first two years of the project, cooperation by the boatyards was minimal and only three boats were converted; however, when the boatyard in the target marina finally came "on board" in the fall of 2012, seven boats were converted to nontoxic coatings in December 2012 and January 2013. Additional boats could not be converted after January 2013 due to the grant agreement end date in March 2013.) This study demonstrates that a regulatory approach is necessary to accomplish conversions from Cu AFPs to nontoxic AFPs/coatings to meet this TMDL and that voluntary compliance in Newport Bay is difficult without a compliance schedule in place as this study did not yield enough conversions to result in a decrease in the Cu concentrations in the target marina. Also, boatyard cooperation and participation is *critical* for the success of boat conversions from Cu to nontoxic AFPs.

5.6.1.4 Regional Board Authority to Compel Action to Identify and Correct Sediment Impairment from Copper (Cu)

As described above, Section 13304 of the Water Code authorizes the Regional Board to issue a cleanup and abatement order to any person who has discharged or discharges waste into the waters of the state that creates or threatens to create a condition of pollution or nuisance. A cleanup and abatement order would require the discharger(s) to clean up the waste or abate the effects of the waste.

Impairment of sediment due to Cu constitutes such a condition of pollution. The Regional Board could issue such a cleanup and abatement order to those parties responsible for Cu deposited in the sediment in Newport Bay, resulting in sediment impairment. Per the proposed implementation plan, the Regional Board will use this authority, if necessary, to require that responsible parties, including the City of Newport Beach, the County of Orange, other marina owners/operators, boatyard owners/operators, and individual boat owners (Section5.6.2), develop and implement one or more approved plans to remediate known areas of sediment impairment. These plans are expected to include dredging of impaired areas. Further, the Regional Board will use the authority provided by Section 13267 of the Water Code to require responsible parties to investigate sediment impairment in areas of Newport Bay with limited or no current sediment Cu data. A voluntary remediation approach (dredging), which has been implemented in the past by the City of Newport Beach, would be preferable and will be sought. Implementation of the approved remediation plan(s) for sediment Cu, such as dredging, is expected to also remediate known sediment impairment due to zinc (Zn) and mercury (Hg) (Section 4.3.1).

5.6.1.5 Regional Board Regulation of Copper (Cu) Discharges from Tributaries and Storm Drains

Storm water and dry weather discharges from urban areas to Newport Bay via surface water tributaries and storm drains are currently regulated under the municipal separate storm sewer (MS4) NPDES permit issued by the Regional Board to the County of Orange, Orange County Flood Control District and the incorporated cites of Orange County within the Santa Ana Region (Order No. R8-2009-0030, NPDES CAS618030, as amended by Order No. R8-2010-0062). These storm water and dry weather discharges may combine with other types of discharges, including

discharges from dewatering, groundwater cleanup activities, agriculture and open space lands in the watershed. Existing NPDES permits and waste discharge requirements issued by the Regional Board to regulate these types of discharges are listed in Table 5-7. These permits will be revised to incorporate relevant requirements of these Cu TMDLs, when appropriate, based on the potential of these discharges to contribute Cu to Newport Bay (Section 5.6.3.2).

Table 5-7 Existing Orders and Permits Regulating Discharges in the Newport Bay Watershed

Permit Title	Order No.	NPDES No.
Waste Discharge Requirements for the County of Orange, Orange County Flood Control District and the Incorporated Cities of Orange County within the Santa Ana Region - Area-wide Urban Storm Water Runoff - Orange County	R8-2009-0030 as amended by R8-2010-0062	CAS618030
General Waste Discharge Requirements for Discharges to Surface Waters that Pose an Insignificant (De Minimus) Threat to Water Quality	R8-2015-0004	CAG998001
General Discharge Permit for Discharges to Surface Waters of Groundwater Resulting from Groundwater Dewatering Operations and/or Groundwater Cleanup Activities at Sites Within the San Diego Creek/Newport Bay Watershed Polluted by Petroleum Hydrocarbons, Solvents, Metals and/or Salts	R8-2007-0041, as amended by R8-2009-0045	CAG918002
Waste Discharge Requirements for City of Irvine, Groundwater Dewatering Facilities, Irvine, Orange County	R8-2005-0079	CA8000406
Waste Discharge Requirements for Nakase Bros. Wholesale Nursery, Orange County	R8-2005-0006	N/A
Statewide Storm Water Permit for State of California Department of Transportation	State Water Board Water Quality Order No. 2012-0011-DWQ	CAS000003
Statewide Waste Discharge Requirements for Discharges of Storm Water Associated with Industrial Activities Excluding Construction Activities NPDES General Permit for Storm Water Discharges Associated with Industrial Activities	State Water Board Water Quality Order No. 97-03-DWQ(expires June 30, 2015) State Water Board Order No. 2014-0057-DWQ (effective July 1,, 2015)	CAS000001
Statewide NPDES General Permit for Stormwater Discharges Associated with Construction and Land Disturbance Activities	State Board Water Order No. 2009-0009-DWQ, as amended by Orders No. 2010-0014-DWQ and 2012-0006-DWQ	CAS000002

5.6.2 DISCHARGERS RESPONSIBLE TO ACHIEVE TMDL LOAD AND WASTE LOAD ALLOCATIONS AND TO CORRECT SEDIMENT IMPAIRMENT FROM COPPER (Cu)

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

As described in the Problem Statement/Watershed Description, Cu antifouling paints (AFPs) are the largest source of Cu to Newport Bay (approximately 36,000 lbs/yr). There are approximately 10,000 vessel slips in Newport Bay, mostly in the Lower Bay. These slips are congregated largely in 73 marinas or moored at offshore and onshore moorings, residential docks and public docks. In addition, there are approximately 15 large commercial vessels (greater than 79 ft) and numerous smaller commercial vessels (approximately 50). There are 5 major boatyard facilities currently operating in the Bay and numerous smaller land based boatyards near the Bay. Many of the boatyard facilities have been in operation for decades. Boatyards provide for repair and maintenance of the vessels in the Bay, including boat hull cleaning and repainting.

Marinas, docks, moorings, boatyards and onshore facilities are located on tidelands held in trust by the State Lands Commissions and are overseen, on behalf of the state, by the City of Newport Beach and the County of Orange. The owners and operators of these vessels and facilities, the City of Newport Beach and the County of Orange are all considered responsible dischargers for the purposes of this TMDL.

The majority of the boats in Newport Bay use Cu AFPs on their hulls to prevent fouling. The high density of boats, especially in the Lower Bay, has resulted in Cu concentrations in Newport Bay that exceed the chronic and acute dissolved Cu water quality criteria and sediment Cu guidelines. Furthermore, because recreational boats are moored in marinas most of the time, the majority of Cu from Cu AFPs is discharged within the marinas. As discussed in Section 5.3, a reduction in Cu discharges of approximately 83% is needed to achieve the Cu load allocation for boats.

The dischargers, including the City of Newport Beach, the County of Orange, marina owners/operators and individual boat owners, in Newport Bay have been made aware of the Cu problem in Newport Bay:

- Cu issues have been discussed in various conferences, workshops, studies and outreach efforts related to Cu AFPs, including an intense outreach effort as part of a 319(h) project conducted by Orange County Coastkeeper to educate and assist boaters in the conversion of boats from Cu to nontoxic AFPs or coatings
- Regional Board staff have discussed the proposed TMDL with the City of Newport Beach and the County of Orange and have sought input regarding the proposed implementation plan.
- Articles have also appeared in local newspapers regarding Cu water quality issues due to Cu AFPs.

(1) City of Newport Beach
(2) County of Orange
(3) Marina owner/operators
(4) Individual recreational boat owners
(5) Commercial vessel owners/operators
(6) Underwater hull cleaners
(7) Boatyards
(8) Others using/mooring vessels on a transient basis
(Ownership/management agency maps are provided (Appendices 8A, 8B))

(1) and (2) City of Newport Beach, County of Orange

The Regional Board has the discretion to hold persons accountable for discharges of waste that occur or occurred on their property based on ownership of the land on which an activity occurs that results or resulted in a discharge of waste, and the ability to control the activity.[7]

(1) City of Newport Beach, and (2) the County of Orange
In 1919, the State initially granted the City of Newport Beach the management of the trust of Newport Bay, including the tidelands and submerged lands located within its municipality. Subsequent statutory changes were made, but reaffirmed the grant to the City with all of the rights, title and interest of the State of California held by the state by virtue of its sovereignty to tidelands and submerged lands within the corporate limits of the City in 1919. At the same time, the State also granted the County of Orange a trust to manage "that portion of tidelands and submerged lands bordering upon and under Newport Bay outside the corporate limits of the City of Newport Beach". This grant was most recently renewed in 1975. The City of Newport Beach and the County of Orange thereby assumed the duties of the State for the management of these lands. The City works with the County in managing these lands and uses through the Harbor Patrol and the County Parks Department. Projects that may affect the management and use of these lands are subject to review by the State Lands Commission to ensure that they are consistent with the public trust.

Boatyards, marinas, docks, piers and offshore moorings, as well as onshore facilities, are located upon tidelands/submerged lands that are managed by the City and County in Lower Newport Bay and the lower portion of Upper Newport Bay. Discharges of Cu from Cu AFPs on vessels moored and/or maintained in these facilities have occurred and continue to occur, affecting both water column and sediment concentrations of Cu.

The City and County exercise their land use authority through permits and/or leases for all commercial and noncommercial uses upon these tidelands/submerged lands. Lessees and permittees are required to ensure compliance with all applicable laws, which include the California Environmental Quality Act (CEQA), and "any other Federal, State or local statute, law, ordinance, resolution, code, rule, regulation, order or decree as any of the same now exist or may hereafter be adopted or amended"[8]. Commercial uses of tidelands/submerged lands also require business licenses. This management authority enables the City and County to impose controls on the nature of the activities and practices at commercial and noncommercial facilities. Accordingly, the City and County can be held accountable for discharges of residual Cu from Cu AFPs to Newport Bay and are thus considered responsible parties for the purpose of these Cu TMDLs.

(3) Marina Owners/Operators
The Regional Board has the discretion to hold Newport Bay marina owners/operators accountable for discharges of waste that occur or occurred within the marina leasehold. This authority is based on their status as owners or operators of the marina facility in which an activity occurs that results or resulted in a discharge of waste, and the marina owner/operators' ability to control the activity.

[7] These principles on the issue of landowner liability under both waste discharge requirements and enforcement orders were established in a series of orders adopted by the State Water Resources Control Board (State Board) and in memoranda issued by the State Board Office of Chief Counsel. (See e.g., State Board Orders No. WQ 87-6, 87-5, 86-18, 86-16, 86-15, 86-11, 84-6, 90-03; Memorandum dated May 8, 1987 from William R. Atwater to Regional Board Executive Officers entitled "Inclusion of Landowners in Waste Discharge Requirements and Enforcement Orders".)

[8] Excerpt of definition of "Applicable Laws" contained in "Final Commercial Pier Template", January 29, 2013, City of Newport Beach.

Marina owners/operators own or operate the Newport Bay marina facilities where vessels are congregated and moored. Discharges of residual Cu occur and have occurred from Cu AFPs used on the hulls of these vessels. Marina owners/operators could exercise control over these discharges by placing appropriate conditions in lease/rental agreements with the individual boat owners who utilize their facilities. The conditions written into these contract agreements are the key to the marina's legal authority to exercise control over residual Cu discharges from boat hulls within the marina leasehold. By way of these conditions, marina owners/operators can control the number of moored boats, the types of boats allowed (including the types of AFPs used) and hull cleaning activities allowed within the marina. Marina owners/operators can also require the use of best management practices (BMPs) by boat owners and hull cleaners, and require boat owners to provide proof of hull coating composition. These facts establish that the Regional Board can hold marina owners/operators accountable for discharges of Cu waste from Cu AFPs to Newport Bay; therefore, marina owners/operators are considered responsible parties for the purpose of this TMDL.

(4) Individual Recreational Boat Owners

Persons who own recreational boats that are painted with a Cu AFP and moored in Newport Bay are responsible for Cu discharges from Cu AFPs which is continuously generated whenever such a vessel hull is exposed to water. Individual boat owners also engage in underwater cleaning of boat hulls, or hire underwater hull cleaners to clean boat hulls, and these activities result in the additional release of dissolved and particulate Cu from Cu AFPs into the surrounding waters. The Regional Board can therefore hold each individual who owns a boat moored in Newport Bay as a responsible discharger for the purpose of this TMDL.

(5) Commercial Vessel Owners/Operators

Commercial vessels greater than 79 ft. are considered to be point discharges and are regulated as such under the USEPA's Vessel General Permit (VGP) (Section 5.6.1.2). Smaller commercial vessels (less than 79 ft.) are regulated by the small VGP as of December 19, 2014. Persons who own commercial boats that are painted with a Cu AFP and moored in Newport Bay are responsible for Cu discharges from Cu AFPs, including passive leaching and hull cleaning.

(6) Underwater Hull cleaners

Underwater hull cleaners who clean boat hulls coated with Cu AFPs in Newport Bay are also responsible for discharges of Cu waste. Underwater hull cleaning is performed by divers using various manual and mechanical means to remove fouling on hulls. The physical process of underwater hull cleaning of fouling from vessel hulls painted with Cu AFPs results in the release of dissolved and particulate Cu into surrounding Newport Bay waters. The Regional Board can therefore hold underwater hull cleaners as responsible dischargers for the purpose of this TMDL.

(7) Boatyards

Recreational and commercial vessel hulls using Cu AFPs must be repainted on a periodic basis, typically, about once every 2 to 3 years, as the integrity and efficacy of the paint declines over time. Approximately once every 5 to 7 years, the hull surface must also be stripped before the application of a new Cu AFP.

Currently, there are approximately 7 boatyards in Lower Newport Bay. Many of these facilities have been in operation for decades, though ownership and/or operation of the facilities have changed over time. The Regional Board has regulated boatyard operations since the 1970's. The early permits required the implementation of approved Water Pollution Control Plans to prevent the discharge of process wastewater (generated during boat cleaning and painting operations) to the Bay. In 1994, the Regional Board issued a general boatyard permit that, in part, prohibited the discharge of process wastewater to the Bay. Subsequently, all the boatyard operations have enrolled in the State Water Board's General Industrial Storm Water Permit (Water Quality Order No.

97-03-DWQ, NPDES No. CAS000001), which prohibits the discharge of unauthorized non-storm water discharges, such as process wastewater, to storm drain systems that discharge to surface waters. This permit requires that BMPs be employed to reduce or eliminate pollutants in stormwater discharges.

Boatyard owners/operators who are in compliance with these requirements are not considered directly responsible to meet the Cu load reduction necessary to achieve the Cu load allocation for boats specified in this TMDL; however, boatyard owners/operators may be responsible for sediment impairment as the result of historic operations and/or noncompliance with permit requirements. The Regional Board can therefore hold any such boatyard owners/operators as responsible dischargers for the remediation of known sediment impairment and for the investigation of sediment quality in the areas of their operations.

(8) *Others using/mooring vessels on a transient basis*
Recreational and commercial vessels that are not permanently moored in Newport Bay may enter/moor in the Bay on a transient basis. If the hulls of these vessels are painted with one of many Cu AFPs, which are commonly used, discharges of residual Cu to the waters of the Bay will occur. The magnitude of Cu discharges resulting from this type of use is unknown, but it is expected to be small relative to the large number of vessels used and permanently moored in the Bay.

Control of such transient discharges would be difficult and impractical. It would likely require that a program be developed and implemented by the Harbor Patrol to check boats entering the Bay to confirm whether or not a Cu AFP is used on the boat. If so, restrictions on entrance and/or the length of the vessel's stay in the Bay may be necessary. Enforcement of such restrictions by the Harbor Patrol would be onerous, and counter to local economic and recreational interests.

As a practical matter, the control of these discharges will likely ultimately depend on a complete or regional ban on the use of Cu AFPs by DPR. As discussed, a key element of this recommended implementation plan is Regional Board staff's ongoing interaction with DPR (likely in coordination with the Los Angeles and San Diego Regional Boards) and USEPA to seek appropriate controls on Cu AFPs in Cu-impaired waters, such as Newport Bay, where Cu AFPs are the largest source of Cu to the Bay.

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

(1) City of Newport Beach
(2) County of Orange
(3) Marina owner/operators
(4) Individual recreational boat owners
(5) Commercial vessel owners/operators
(6) Underwater hull cleaners
(7) Boatyards
(8) Others using/mooring vessels on a transient basis

The dischargers responsible to correct sediment impairment in Newport Bay are the same dischargers identified in section 5.6.2.1. The correction of sediment impairment due to Cu includes the remediation of known areas of impairment in the Bay, and the identification and remediation of sediment impairment in areas with limited or no current data.

Per the proposed implementation plan, the Regional Board will use the authorities in Section 5.6.1.4, if necessary, to require that responsible parties, including the City of Newport Beach, the

County of Orange, other marina owners/operators, boatyard owners/operators and individual boat owners (Section 5.6.2), develop and implement one or more approved plans to remediate areas of known sediment impairment due to Cu, and to investigate sediment impairment in areas of the Bay with limited or no current sediment Cu data. A voluntary remediation approach, which has been implemented in the past by the City of Newport Beach, would be preferable and will be sought. Implementation of the approved remediation plan(s) for sediment Cu is expected to address sediment impairment due to zinc (Zn) and mercury (Hg) (Section5.6.3.2).

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

(1) County of Orange and other MS4 permittees, including the City of Newport Beach
(2) CalTrans
(3) Agricultural dischargers
(4) Other NPDES permittees

Tributary runoff includes urban, agricultural and open space runoff, and permitted waste discharges resulting from groundwater dewatering and cleanup activities. The source analysis showed that tributary runoff is the second largest source of Cu to Newport Bay (approximately 3005 lbs/yr). Because tributary runoff is a source of dissolved and particulate Cu to the Bay, the above dischargers are responsible for Cu discharges from the major tributaries and storm water conveyance system into the Bay. A summary of existing waste discharge requirements under which these discharges are currently regulated is provided in Table 5-7, above, including NPDES Order No. 2009-0030, as amended Waste Discharge Requirements for the County of Orange, Orange County Flood Control District and the Incorporated Cities of Orange County within the Santa Ana Region -Area-wide Urban Storm Water Runoff -Orange County, (MS4 permit). These requirements will be modified if, and as appropriate, to incorporate relevant requirements of this TMDL, including water quality based effluent limits that are consistent with the requirements of the wasteload allocations specified in this TMDL.

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5.6.3 RECOMMENDED IMPLEMENTATION PLAN

The recommended TMDL implementation plan detailed below has three principal components: 1) the control and reduction of Cu to Newport Bay from Cu antifouling paints (AFPs) (Section 5.6.3.1); 2) the remediation of known sediment Cu impairment in the Lower Bay, and the identification and remediation of sediment impairment in areas with limited or no current data (Section 5.6.3.2); and 3) the control and reduction of Cu in tributary runoff (Section 5.6.3.3). In addition, pursuant to this implementation plan, the local impacts of Cu discharges from storm drains will be evaluated and follow-up actions may be required (Section 5.6.3.4). Cu discharges from Bay sediments, algae and other vegetation may also be sources of Cu to Bay waters but have not yet been quantified. Cu discharges from direct air deposition to Newport Bay waters are small compared to other sources and reductions are not required in this TMDL. (Cu discharges from air deposition to the Bay watershed are accounted for in tributary runoff.)

TMDL implementation over a specified compliance period is recommended, with final compliance to be achieved as soon as possible but no later than 15 years from the date of approval of the TMDL by USEPA. This approach allows for the implementation of prioritized tasks over time, evaluation of their efficacy, and adaptive management of control/remediation strategies to ensure that the TMDL is implemented effectively, efficiently and fairly. The maximum 15-year time frame is considered to be sufficient to allow boats to be repainted with nontoxic AFPs/coatings as part of the routine maintenance of vessels (Section 5.6.3.1.2). This compliance schedule approach also allows for the consideration of site-specific Cu objectives for Newport Bay using the Water Effects Ratio, as provided in the California Toxics Rule, or the Marine Cu Biotic Ligand Model (Cu BLM)[9] . If such site-specific objectives are approved, then reconsideration of the need for and nature of this TMDL will be appropriate.

The Implementation Plan tasks and schedules are described below and summarized in Table 5-8.

5.6.3.1 Reduce Copper Loads from Copper Antifouling Paints (Cu AFPs) on Recreational and Commercial Boats (Task 1, Table 5-8)
5.6.3.1.1 Restrict the sale and use of Cu AFPs (Task 1.1, Table 5-8)
5.6.3.1.2 Reduce Cu discharges from Cu AFPs (Task 1.2, Table 5-8)
5.6.3.1.2.1 Recommended Regulatory Action to Reduce Cu Discharges from Cu AFPs
5.6.3.1.2.2 Implementation Tasks to reduce Cu discharges from Cu AFPs
5.6.3.2 Remediate areas of known sediment Cu impairment, and identify/remediate sediment impairment in areas with no or limited sediment Cu data
5.6.3.3 Meet Copper (Cu) allocations for tributary runoff
5.6.3.4 Evaluate Copper (Cu) Discharges from Storm Drains for Local Impacts
5.6.3.5 Continue Monitoring (Task 5, Table 5-8)
5.6.3.6 Conduct Special Studies (Task 6, Table 5-8)
5.6.3.7 Submit Updated TMDL Report, and Reevaluate and Revise the TMDL (Task 7, Table 5-8)

5.6.3.1 Reduce Copper (Cu) loads from Cu antifouling paints (Cu AFPs) on recreational and commercial boats (Task 1, Table 5-8)

Copper (Cu) loading from Cu AFPs is the largest source of dissolved Cu to Newport Bay, and must be reduced to meet this TMDL. There are two possible strategies to reduce Cu discharges from Cu AFPs: 1) Work with DPR and USEPA to further restrict the sale and use of Cu AFPs (DPR, USEPA authority); and 2) reduce Cu discharges from Cu AFPs (Regional Board, USEPA authority). Pursuant to this recommended Implementation Plan, both strategies will be implemented

[9] USEPA's Draft Marine Cu Biotic Ligand Model (BLM) was released in July 2016, and will be reviewed by Board Staff.

concurrently so that Cu discharges from Cu AFPs may be reduced and the TMDL allocation for boats achieved as soon as possible.

5.6.3.1.1 Restrict the sale and use of Cu AFPs (Task 1.1, Table 5-8)

As discussed above, the authority for the sale and use of Cu AFPs rests with DPR and USEPA; therefore, it is appropriate for Regional Board staff to continue to work with these agencies to identify and implement appropriate and effective restrictions on the sale and use of Cu AFPs. Parties responsible to achieve reductions in Cu discharges from Cu AFPs should also be engaged in these efforts as part of their implementation strategies.

The maximum allowable leach rate set by DPR in 2014 may help to reduce Cu loading to the Bay only if Cu AFPs currently used have leach rates higher than 9.5 µg/cm^2/d. If this is the case, then some reduction will be achieved over time as boats undergo routine maintenance and are repainted with Cu AFPs having leach rates below 9.5 µg/cm^2/d. Board staff's calculations, however, indicate that a leach rate of less than 3 µg/cm^2/d is required to meet the TMDL allocation for boats in Newport Bay (and other impaired marinas in southern California) even with the use of BMPs by all divers (Appendix 6.1.3). The reduction in Cu loading from DPR's maximum allowable leach rate is, therefore, not expected to be sufficient to meet the TMDL vessel allocation even with the use of BMPs for hull cleaning.

Dischargers should work with Regional Board staff and DPR to further restrict the sale and use of Cu AFPs which may include reducing the maximum allowable leach rate of 9.5 µg/cm^2/d for Cu AFPs (set on February 1, 2014), or instituting a regional ban on the use of Cu AFPs in Newport Bay or in southern California where the marinas most impaired for Cu are located (Section 5.6.3.1.1).

DPR

On February 1, 2014, DPR set a maximum allowable leach rate of 9.5 µg/cm^2/d for Cu AFPs. Regional Board staff will continue to coordinate with DPR and State Board staff, pursuant to the 1997 Management Agency Agreement (MAA) with DPR, to identify and implement appropriate restrictions that may include a *reduced* maximum allowable leach rate or a regional ban on the use of Cu AFPs. Board staff will also coordinate efforts with Los Angeles (LA) and San Diego (SD) Regional Boards staff and Port of San Diego staff (agencies engaged in efforts to correct Cu AFP impairment in Marina del Rey (LA) and Shelter Island Yacht Basin (SD)). Restrictions, including a regional ban, may be sought on a southern California bight-wide basis.

The development of strategies for the reduction of Cu discharges from Cu AFPs by responsible dischargers, and the implementation of those strategies upon approval by the Regional Board, is a key part of the recommended implementation plan. As a part of these strategies, responsible dischargers should engage DPR (and USEPA) to identify/implement appropriate restrictions for Cu AFPs. Those efforts should be coordinated with Regional Board staff actions.

USEPA

USEPA Region IX acknowledged the significance of Cu AFPs in causing Cu impairment in Newport Bay in their 2002 Toxics TMDLs. Since USEPA's promulgation of the Toxics TMDLs, additional data have shown that Cu AFPs continue to be the largest source of Cu to the Bay (Section 5.3.1, Table 5-2). USEPA is currently conducting a nationwide registration review for all Cu pesticides, including Cu AFPs. The review began in 2010 and will likely finish in 2016. (USEPA reviews each pesticide group every 15 years.) Regional Board staff will work with USEPA to restrict the sale and use of Cu AFPs in water bodies impaired by Cu, including Newport Bay, and on the development and implementation of Clean Boating Act requirements (in development). Potential actions that USEPA may consider include amendments to label language, cancellation of uses, and/or cancellation of registration. Once again, the Cu reduction strategies proposed by responsible

dischargers should include efforts to engage USEPA to restrict Cu AFPs, and those efforts should coordinated be with those of Board staff.

As a requirement of the Clean Boating Act, USEPA is required to determine normal discharges from recreational vessels and to identify appropriate management practices for those discharges. Regional Board staff will provide input to USEPA as USEPA develops a list of normal discharges and management practices for recreational vessels in response to the Clean Boating Act (CBA) requirements (Section 5.6.1.2.1). When the list of normal discharges and related management practices is established, regulations pertaining to those management practices will be developed. The development of the CBA regulations will take some time and the resulting regulations may or may not include restrictions on Cu AFPs.
As of Spring 2016, implementation for the Clean Boating Act is considered to be a "long term action", and USEPA has not identified a time schedule for implementation. (pers. communication w/USEPA) and http://reginfo.gov/public
http://water.epa.gov/lawsregs/lawsguidance/cwa/vessel/CBA/about.cfm
In the interim, the recommended TMDL implementation plan requires that responsible dischargers take action to reduce Cu discharges from Cu AFPs.

5.6.3.1.2 Reduce Cu discharges from Cu AFPs (Task 1.2, Table 5-8)

To achieve the TMDL allocation assigned to boats (Table 5-5), a reduction in Cu discharges from Cu AFPs of approximately 83% must be achieved. The main strategy to accomplish this Cu reduction from boats is the conversion of boats from Cu AFPs to nontoxic AFPs/coatings. In addition, while boats are being converted to nontoxic AFPs/coatings, all divers must be required to use BMPs for underwater hull cleaning including the use of soft cloths or hull cleaning containment methods. As described below, compliance with the TMDL boat allocation will likely require a combination of these strategies, implemented over time.

1) Convert boats from Cu AFPs to nontoxic AFPs. The attainment of these Cu TMDLs will require the conversion of boats from Cu to nontoxic AFPs/coatings, in addition to the use of BMPs by in-water hull cleaners during the conversion period. The successful conversion from Cu to nontoxic AFPs depends on the availability and cost of nontoxic alternative paints. This conversion is both reasonable and possible since several studies on alternative paints have demonstrated that nontoxic AFPs or coatings are available and cost effective compared to traditional Cu AFPs (Section 5.6.1.3.1.5). As discussed previously, the higher initial cost of the application of a nontoxic AFP is due to the cost of stripping the old Cu AFP prior to the application of a nontoxic AFP, and the required spraying-on of the nontoxic AFP (compared to rolling on of Cu AFPs). Note that paint manufacturers are developing nontoxic formulas that can be rolled on rather than sprayed on, and/or applied over old Cu AFPs which will reduce the cost of the initial application of a nontoxic paint. It will take time to convert from Cu to nontoxic AFPs, and conversions should occur during normal routine repainting of boats. In the interim, boats may convert from Cu to non-Cu AFPs, or Cu AFPs with leach rates at or below DPR's maximum allowable leach rate of 9.5µg/cm^2/d.

Time will be needed to implement the conversion from Cu to nontoxic AFPs and to evaluate and implement other measures to reduce Cu discharges from vessels, such as the use of BMPs by *all* hull cleaners. Accordingly, a phased schedule of Cu reductions from vessels is proposed, as shown, below and in Table 5-8.

> An 83% reduction in Cu discharges from boats to be achieved as soon as possible but no later than (*15 years from the date of USEPA approval of the TMDL Basin Plan amendment (BPA*)), with the following interim schedule :
>
> - By (*3 years from the date of approval of the BPA),*

20% reduction shall be achieved

- By (*7 years from the date of approval of the BPA),*

50% reduction shall be achieved

- By (*11 years* I*the date of approval of the BPA),*

70% reduction shall be achieved

- By (*15 years from the date of approval of the BPA),*

83% reduction shall be achieved

It is anticipated that most of the 83% reduction will be accomplished by boat conversions from Cu to nontoxic AFPs. The phased schedule for reductions will allow for the transition to nontoxic AFPs as boats are due for routine maintenance and repainting. It is expected that all vessels in the Bay will be repainted over a 15 year period as part of routine maintenance. Accordingly, a maximum 15 year schedule to achieve the requisite 83% reduction in Cu discharges from Cu AFPs is proposed. In the interim, some reduction of Cu discharges may be achieved by the use of BMPs by all divers and the use of lower leach rate Cu AFPs. Public education and outreach will be a critical component of this effort to ensure that boaters are aware of TMDL requirements, schedules and methods of compliance, including the availability of cost-effective nontoxic AFPs.

According to one boatyard owner, the most common Cu hull paints in use in Newport Bay are Interlux Ultracoat, Petit Trinidad and ZSpar-the Protector (pers. communication w/boatyard in the Bay). Except for Petit Trinidad gold, these paints have leach rates greater than the 9.5 *µg/*cm^2/d recommended by DPR. Eventually, Cu paints with leach rates greater than 9.5 *µg/*cm^2/d will be reformulated or phased out; however, this could take years. In the meantime to meet these Cu TMDLs, boats must convert from Cu to non-Cu paints and use BMPs that reduce Cu discharges from hull paints.

2) Require BMPs for hull cleaning including soft cloths or hull cleaning container/filter methods. In the interim as boats are converted to nontoxic AFPs, all underwater hull cleaners should use BMPs for hull cleaning. Based on the Earley *et al.* study (2013), that calculated Cu loading for a 3 year paint cycle for two Cu AFPs, Cu loading was 28% higher when non-BMPs were used compared to BMPs. (Non-BMPs use abrasive pads to clean boat hulls, while BMPs use soft pads.) If it is assumed that no BMPs are currently being used, then 28% is the maximum percentage that Cu loading can be reduced if all divers switch to BMPs and if the Cu AFPs in use have leach rates similar to Earley et al's test paints. (Earley *et al.* measured Cu loading for only two Cu AFPs. If the Cu AFPs currently in use in Newport Bay have leach rates different from the test paints, it cannot be assumed that Cu loading for BMPs and non-BMPs will be the same as the loading for the test Cu AFPs.) In addition, it is unlikely that no BMPs are used in any marina in the Bay; therefore, the Cu TMDLs established in southern California estimate that the use of BMPs and non-BMPs is 50%/50%. This assumption is also employed in these Cu TMDLs. With a BMP/non-BMP usage of 50/50, the maximum reduction achievable by the elimination of non-BMPs would then be 14% (again if Cu AFPs in use have similar leach rates to the test paints). The conversion from non-BMPs to BMPs, therefore, will reduce Cu loading to some degree, but will not be sufficient by itself to meet these Cu TMDLs. (There are no data in Earley et aI to determine Cu loading for Cu AFPs with leach rates higher (or lower) than the test paints.)
The conversion of the use of non-BMPs to BMPs will result in some reduction to Cu loading, as shown in San Diego (K. Holman, pers. communication), and while the conversion to BMPs will not be sufficient by itself to achieve these Cu TMDLs, it is reasonable and appropriate to require the consistent use of BMPs throughout the Bay to minimize the discharge of Cu to surface waters. BMP training and requirements for BMP use are expected to be part of any strategy proposed by responsible parties to achieve the requisite Cu reductions from Cu AFPs.

In addition, a new BMP strategy for cleaning hulls consists of a containment strategy where a boat is cleaned inside a slip liner specifically made for hull-cleaning, and after cleaning the water is filtered multiple times to remove pollutants before being returned to the Bay. In addition, the particulates and fouling that settle to the bottom of the container are removed, dried and taken to an appropriate landfill. This cleaning method has the advantage over in-water hull cleaning with a soft cloth in that the particulates and fouling, that would normally settle to the sediments, are removed from the water body. This results in a cleaner environment.

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5.6.3.1.2.1 Recommended Regulatory Action to Reduce Cu Discharges from Cu AFPs

As described above, the Regional Board has a number of regulatory options to compel compliance with this phased approach to reduce Cu from Cu AFPs. These include: adoption and enforcement of Waste Discharge Requirements; issuance and enforcement of a Conditional Waiver of Waste Discharge Requirements; adoption and enforcement of a waste discharge prohibition; and issuance and enforcement of Cleanup and Abatement orders. For reasons previously discussed (Section 5.6.1.3.1), a conditional waiver of waste discharge requirements is the initial recommended approach. If this approach should prove to be ineffective, it is expected that Board staff will recommend the adoption of a waste discharge prohibition for Cu discharges from Cu AFPs.

Regional Board staff expect that the Conditional Waiver of Waste Discharge Requirements recommended for adoption by the Regional Board will include the conditions listed below at a minimum. These expected conditions are reflected in Task 1.2, Table 5-8. In brief, the responsible dischargers will be required to prepare and implement, upon Regional Board approval, one or more strategies whereby the TMDL allocation for boats will be achieved in accordance with the schedule shown above and in Task1, Table 5-8).

These strategies are expected to include:
1) working with DPR and USEPA to identify and implement appropriate restrictions on Cu AFPs;
2) development of a plan(s) and schedule(s) for the reduction of Cu from Cu AFPs including: the conversion of boats from Cu to nontoxic AFPs; implementation and adaptive management of BMPs, including training programs; boater education; and monitoring.
These tasks are designed to assess the efficacy of the implemented approved strategies and their effects on receiving waters. These and other anticipated conditions are discussed in more detail below.

Dischargers responsible for Cu discharges from Cu AFPs are identified above (Section 5.6.2.1) and include the City of Newport Beach, the County of Orange, marina owners/operators, individual boat owners and underwater hull cleaners. It is strongly recommended that the City and County assume a leadership role in developing and implementing the Cu reduction strategies and monitoring proposal(s) on behalf of all responsible parties, given their knowledge of and responsibility for the oversight of tidelands/submerged lands and activities/facilities operated on those lands (Section 5.6.2.1). Such a coordinated, collective approach would facilitate the identification and implementation of appropriate measures by the responsible parties, more clearly define the roles and responsibilities of each of the dischargers, and allow for better and more timely adaptive management of control measures. In short, the coordinated, collective approach will enhance TMDL implementation leading to more timely achievement of the TMDL. It is expected that the conditional waiver will provide for this collaborative action but will also allow each responsible discharger to act independently to implement TMDL requirements. Independent implementation would likely be a far more costly and less effective approach to ensure timely compliance with the TMDL. Again, the coordinated collective approach is strongly recommended.

The recommended Conditional Waiver would identify the expectations for an approvable implementation plan(s) and schedule(s) proposed by the dischargers to achieve the requisite Cu discharge reductions from Cu AFPs. Board staff recommend that, at a minimum, the proposed implementation plan(s) should consider the recommended implementation tasks described in Section 5.6.3.1.2.2 and Table 5-8.

5.6.3.1.2.2 Implementation Tasks to reduce Cu discharges from Cu AFPs

The proposed implementation plan(s) and schedule(s), not to exceed 15 years, shall include, at a minimum, strategies to
(1) Transition from Cu AFPs to nontoxic AFPs and require new boats to use nontoxic AFPs (In the interim, boats may convert from Cu to non-Cu AFPs, or Cu AFPs with leach rates at or below DPR's maximum allowable leach rate of 9.5µg/cm^2/d.)
(2) Require all underwater hull cleaners to use BMPs that may include soft cloths or hull cleaning container/filter methods, and a diver certification program
(3) Continue Monitoring in the Bay, including marinas and channels
(4) Conduct Education Program(s) for Boaters, Boatyards and Marinas
(5) Document resources to implement the plans and strategies
(6) Coordinate with Regional Board staff on work with DPR and USEPA

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 (Task 1.2.2, Table 5-8).

Recommended implementation tasks:

(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 or coatings on recreational and commercial boats moored in Newport Bay permanently or intermittently for more than 30 consecutive days; to require new boats to use nontoxic AFPs; and to determine the current usage and types of Cu AFPs in the Bay. (In the interim, boats may convert from Cu to non-Cu AFPs, or Cu AFPs with leach rates at or below DPR's maximum allowable leach rate of 9.5µg/cm^2/d.) (Task 1.2.2.1, Table 5-8)

As previously discussed, the City of Newport Beach and the County of Orange have the authority to oversee the activities, facilities and operations that are located or take place on state tidelands and submerged lands. These facilities includes marinas, public and private docks, offshore and onshore moorings, which are designed and used by recreational and commercial boats. The City and County exercise this authority, on behalf of the State Lands Commission, through ordinances and permits, licenses and/or lease agreements issued to individuals, organizations and businesses. The City and County thereby have the ability to exert control over Cu discharges from Cu AFPs due to passive leaching from boat hulls and/or hull cleaning activities. These controls may include: restrictions on the number of boats using Cu AFPs that are moored in marinas; requirements that all new boats that utilize facilities or services located on tidelands/submerged lands use nontoxic AFPs or coatings; requirements that boats be converted to nontoxic AFPs/coatings during routine cleaning and/or stripping; proof of hull paint composition; and restrictions on hull cleaning, including a diver certification program and the requisite use of BMPs (e.g. soft cloths or hull cleaning containment methods) .

The City and County might also employ financial incentives to facilitate the transition to nontoxic AFPs. These may include lower lease fees for Newport Bay marina owners/operators and onshore/offshore mooring lessees who restrict the use of Cu AFPs; lower slip fees for boat owners of boats using nontoxic AFPs or higher slip fees for boats using Cu AFPs; or a "Cu fee" charged to marinas and/or boat owners that use Cu AFPs.

The proposed schedule to accomplish the requisite 83% reduction in Cu discharges from boats should be designed to accomplish the transition to nontoxic AFPs in as short a period as possible, taking into account typical repainting needs and schedules. In no case should the transition schedule exceed 15 years.

(2) Require all underwater hull cleaners to use BMPs that may include soft cloths or hull cleaning container/filter methods, and develop a diver certification program
A plan and schedule to identify, implement, and enforce the use of BMPs by all underwater hull cleaners by a permit, licensing or certifications system that includes education, training and certification of all underwater hull cleaners. BMPs may include the use of soft cloths, hull cleaning containment methods and/or dry dock storage. (Task 1.2.2.2, Table 5-8)

It is reasonable and appropriate to require that BMPs be employed at all times to reduce pollutant loads to the Bay as the result of underwater boat hull cleaning. This is true for all biocide hull coatings, but is particularly important for Cu AFPs.

Strategies may include:

- *Permitting, certification or licensing of all underwater hull cleaners that include a requirement to use BMPs for boat hull cleaning*
- *The use of less abrasive hull cleaning materials and methods on boats with Cu AFPs*
- *The use of containment methods, such as slip liners, during hull cleaning*
- *Alternative boat storage options such as dry storage (e.g., hoists, lifts) or landside boat storage facilities for smaller boats*

(3) Continue monitoring in marinas, channels and Bay waters
Marinas, channels and open water sites in Newport Bay shall be monitored for dissolved and total Cu concentrations in water and sediment, and water and sediment toxicity; and the data evaluated to determine Cu load reduction and the effects of the reduced Cu load from Cu AFPs on Cu concentrations and Cu loading in marina and channel waters and sediments. Monitoring shall include dissolved and total Cu concentrations in water and sediment; water and sediment toxicity testing; water quality parameters including dissolved organic carbon (DOC), pH, salinity, temperature, total suspended solids (TSS), total organic carbon (TOC); and benthic testing (if necessary). (Task 1.2.2.4, Table 5-8)

(4) Continue Education Programs for boaters, and boatyard and marina owner/operators and staff. (Task 1.2.2.4, Table 5-8)
Identify and evaluate existing boater and boat related education program(s) in the Bay, and revise those programs as necessary to include the following at a minimum:
(4.1) Cu water quality issues and TMDL requirements,
(4.2) Information on 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; including hull cleaning costs; and conversion to non-Cu AFPs or Cu AFPs with leach rates at or below DPR's maximum allowable leach rate of 9.5µg/cm^2/d.
(4.3) Nontoxic AFP use requirements including recommended BMPs for hull cleaning and frequency of cleaning;
(4.4) BMP requirements for all underwater hull cleaners including soft cloths or hull cleaning container/filter methods, and BMP requirements for boatyards[10].
(4.5) Conditions and requirements instituted by 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); and
(4.6) Potential boat storage options, such as dry dock and/or slip liners.

[10] As noted above, boatyard operations are regulated under the State Board's General Industrial Storm Water Permit, which requires the development and implementation of Storm Water Pollution Prevention Plans and prohibits the discharge of unauthorized non-storm water discharges (zero discharge), such as process wastewater generated at boatyards. In short, BMPs are already required at boatyard facilities.

As part of the proposed Cu discharge reduction strategy, the City, the County and other dischargers should develop programs to educate boaters on the need and rationale for the transition from toxic Cu to nontoxic AFPs or coatings. The education programs should inform the Newport Bay boating community about water quality problems associated with Cu discharges from Cu AFPs; the required transition from Cu to nontoxic AFPs; the availability, maintenance and economics of nontoxic AFPs, including BMPs for hull cleaning of nontoxic AFPs; and BMPs to reduce discharges from Cu AFPs in the interim during boat conversions to nontoxic paints (including soft cloths and hull cleaning containment methods). This program should also include work with boatyard staff and paint manufacturers to ensure that boatyards are using the correct equipment and methods to apply and maintain nontoxic AFPs for successful use of these paints.

The Port of San Diego conducted an alternative paint study to determine the efficacy *and* economics of non-Cu AFPs, which included nontoxic AFPs. The final study report includes a boater guide to help boaters choose a nontoxic or non-Cu AFP (SDUPD 2011). Dr. Katy Wolf (IRTA), one of the principal investigators for the Port study, has continued to work with paint manufacturers to develop nontoxic AFPs that can be applied over Cu AFPs and/or rolled on rather than sprayed on. These modifications will result in lower costs to the individual boater.

In addition, Orange County Coastkeeper was awarded a 319(h) grant in 2009 for Cu reduction work in Newport Bay that included a financial incentive program to convert boats from Cu to nontoxic AFPs in a target marina and baywide. This grant also included a program to educate boaters on Cu-related water quality issues and the use of nontoxic AFPs, and a requirement to pass a City resolution to encourage the use of non-Cu and nontoxic AFPs. The education program was conducted primarily for the target marina, but included workshops in other parts of the Bay. The education program included literature, mailouts, dock walking, and multiple meetings baywide. In spite of these efforts, only ten boats baywide were converted from Cu to nontoxic AFPs. This grant ended in March 2013; therefore, this or a comparable education program should continue as part of the Cu TMDLs implementation strategy.

(5) Documentation of resources to implement the plans and strategies (Task 1.2.2.5, Table 5-8)
Resources will need to be committed by the dischargers to ensure that Cu reduction strategies) can and will be implemented in an effective and timely manner once approved by the Regional Board. The proposed strategies must include documentation of the resources expected to be required and demonstration that those resources will be committed to implement the proposed strategies.

(6) Coordination with Regional Board staff on work with DPR and USEPA
Dischargers will coordinate with Regional Board staff on work with DPR and USEPA to institute appropriate restrictions on Cu AFPs to achieve this TMDL. (Task 1.2.2.6, Table 5-8)

(6.1) Dischargers will work with Regional Board staff, DPR and the State Board to regionally restrict Cu AFPs in Newport Bay and throughout the Santa Ana Region.

(6.2) Dischargers will work with Regional Board staff and USEPA to restrict Cu AFPs in water bodies impaired by Cu, including Newport Bay, and on the requirements and implementation of the Clean Boating Act requirements.

5.6.3.2 Remediate areas of known sediment Cu impairment, and identify/remediate sediment impairment in areas with no or limited sediment Cu data (Task 2, Table 5-8)

The second priority of the implementation plan for the proposed Cu TMDLs is to address areas of known sediment impairment resulting from Cu (mostly in the Lower Bay), and to evaluate areas where no or limited data exists, especially in marina areas, to determine whether and to what extent

impairment exists in additional areas of the Bay. A more extensive marina survey is indicated to fully assess the extent of sediment Cu exceedances and sediment toxicity in marina and boatyard areas in the Bay. Corrective actions to address Cu sediment impairment, such as dredging, are expected to also address sediment impairment due to zinc (Zn) and mercury (Hg) (Section 4.2.3, Table 4-10).

The proposed TMDL implementation plan requires dischargers, including the City of Newport Beach, the County of Orange, marina and boatyard owners/operators, underwater hull cleaners and individual boat owners to prepare and submit one or more proposed implementation plans and schedules to address known areas of sediment impairment, and to determine sediment impairment in areas of the Bay with no or limited sediment data. The plan(s) would be implemented upon approval by the Regional Board. The dischargers are encouraged to work collaboratively to develop a comprehensive plan(s) as a matter of resource efficiency, effectiveness and timeliness. The City of Newport Beach and County of Orange are encouraged to take a leadership role in the preparation and implementation of these plans.

5.6.3.3 Meet Copper (Cu) allocations for tributary runoff (Task 3, Table 5-8)

The third priority of this plan is to meet the Cu allocations for tributary runoff. The source analysis shows that discharges of Cu from major tributaries (storm and dry weather runoff) are the second largest source of Cu to Newport Bay (Table 5-2). While San Diego Creek is no longer 303(d) listed for metals, including Cu, the Creek and Santa Ana Delhi are sources of Cu to Newport Bay, which exceeds the CTR saltwater criteria for dissolved Cu in both the Upper and Lower Bay (Table 4-10). Cu discharges from tributaries must therefore be addressed in this TMDL. (The chronic CTR criteria for dissolved Cu are 3.1 µg/L for saltwater, but 50 µg//L for freshwater.)

Older monitoring by the County of Orange (2006-2009) showed that dissolved Cu exceedances throughout the upper Upper Bay are less extensive than exceedances in the Lower Bay; however, more recent monitoring data (2009-2011) shows exceedances of approximately 70% and 65% in the Upper and Lower Bay, respectively (Table 4-5).

The Cu allocations in Table 5-5 are based on the loads to Newport Bay for tributary and storm drain runoff (3005 and 171 pounds of dissolved Cu per year, respectively) (Table 5-2); therefore, Cu load reductions in tributary and storm drain runoff will be required if Cu loads increase beyond the 3005 and 171 pounds of dissolved Cu per year. The Regional Board will need to modify the Orange County MS4 and CalTrans NPDES permits, and recommend revisions to the Industrial General Permit (IGP), to include the new Cu allocations, once approved and effective, since permit allocations are currently based on allocations in USEPA's Metals TMDLs (part of the Toxics TMDLs). The dischargers will be required to continue monitoring to ensure that Cu loads from tributary runoff remain at or below the Cu allocations in this TMDL.

Note that in 2010, a Brake Pad Bill (SB 346) was signed by the Governor. This bill will phase out the use of various heavy metals and other toxic substances in motor vehicle brake pads. This bill prohibits 1) the sale of motor vehicle brake pads that contain cadmium, chromium VI, lead, mercury and asbestiform fibers beginning January 1, 2014; 2) the sale of all brake pads that contain more than 5 percent copper by January 1, 2021; and 3) the sale of all brake pads that contain more than 0.5 percent copper by January 1, 2025. This bill should help to reduce Cu loads in freshwater runoff from tributaries.

5.6.3.4 Evaluate Copper (Cu) discharges from storm drains for local impacts (Task 4, Table 5-8)

The source analysis showed that discharges of Cu from storm drains are low compared to the largest sources of Cu (Cu AFPs on boat hulls and tributary runoff) (Table 5-2). While the overall Cu input from storm drains may be small compared to other sources, Cu loads may have local impacts in receiving waters near the larger storm drains, such as the Arches drains (Appendix 6, Figure 6-1).

Pursuant to this proposed TMDL implementation plan, the City of Newport Beach and the County of Orange are required to develop and implement upon Regional Board approval a plan and schedule to determine the significance of localized Cu loads in runoff from storm drains that directly enter Upper and Lower Newport Bay. The intent is to assess the effects of Cu in storm drain runoff on local receiving waters and sediment quality and beneficial uses. Requirements for this investigation and for the development and implementation of a corrective action plan, where found to be necessary, will be incorporated in the revised MS4 permit. Corrective action to reduce Cu discharges and eliminate Cu impairment will be required where the data demonstrate impairment based on the criteria identified in the State Water Board's 303(d) Listing Policy (*Water Quality Control Policy for developing California's Clean Water Act Section 303(d) List).*

5.6.3.5 Continue Monitoring (Task 5, Table 5-8)

Monitoring is necessary to assess the effects of the strategies implemented in response to this TMDL and to determine progress towards achieving water quality standards; therefore, it is a key element of this TMDL implementation plan.

Monitoring for copper (Cu) and other metals in the Bay and its tributaries is conducted by the dischargers on a routine basis, largely in response to the requirements of the MS4 permit. The proposed implementation plan requires the dischargers to develop and implement, upon Regional Board approval, a monitoring plan to address the needs of this TMDL. This plan should include the monitoring of Cu in water and sediments, toxicity in water and sediments, and benthic testing in sediments if sediment Cu exceeds guidelines and toxicity is present . The proposed plan should include sampling of the following:

- Bay waters and sediments, including open bay, marina and channel sites
- Tributary runoff including San Diego Creek, Santa Ana Delhi and Big Canyon Wash
- Storm drain runoff

The proposed monitoring plan should be integrated with ongoing monitoring, to the extent feasible. Monitoring of storm drains that empty directly into the Bay should be coordinated with monitoring of marinas, channels, open water sites and tributaries.

The monitoring plan shall include the following analyses at a minimum:

Bay monitoring in Upper and Lower Newport Bay.

- *Bay waters.* Monitoring of dissolved and total copper (Cu) in water, and standard water quality parameters including pH, salinity, temperature, total suspended solids (TSS), dissolved organic carbon (DOC), total organic carbon (TOC); and toxicity testing.
- *Bay sediments.* Monitoring of total Cu in sediments; pH and total organic carbon (TOC); and toxicity testing. If sediment toxicity is high, benthic monitoring should be conducted.
- Bay monitoring shall include marina sites, as well as channel sites for both water and sediment testing as described above.

Tributary monitoring in San Diego Creek, Santa Ana Delhi, Big Canyon Wash.

- *Tributary waters.* Monitoring of dissolved and total Cu in water, and standard water quality parameters including pH, salinity, temperature, total suspended solids (TSS), dissolved organic carbon (DOC), total organic carbon (TOC); and toxicity testing in runoff from the major tributaries, San Diego Creek and Santa Ana Delhi and Big Canyon Wash.

Storm drain monitoring.

- Runoff from storm drains in Lower Newport Bay, including storm drains that empty into marinas, should also be monitored for dissolved and total Cu in water, and standard water quality parameters including pH, salinity, temperature, total suspended solids (TSS), dissolved organic carbon (DOC) and total organic carbon (TOC).

Fish/Shellfish tissue monitoring.

- Monitoring of Cu shall continue in fish and mussel tissue, especially since State Mussel Watch data shows an increasing trend in Cu concentrations in mussels over the last ten years (Stillway *et al.* 2012, SWAMP Report).

In addition, the proposed monitoring program must include a plan to assess the efficacy of the measures implemented to achieve the Cu source reductions required by this TMDL. The results of this monitoring are expected to support adaptive management of control strategies to ensure efficient and effective implementation of this TMDL.

5.6.3.6 Conduct Special Studies (Task 6, Table 5-8)

Special studies are supplemental to the core, routine components of the Monitoring Program. These studies are intended to answer discrete questions and are not intended to be part of the routine monitoring program. These studies can address and fill data gaps that support refinement and/or revisions to this TMDL.

If the implementation tasks above are not sufficient to achieve the TMDL, then Cu loading from additional sources should be evaluated. These may include the evaluation of the contribution of Cu from in-Bay sediments, and algae and other vegetation. The Regional Board may identify the need for special studies during the implementation of these TMDLs. Where warranted, the Regional Board may issue an investigation order pursuant to California Water Code Section 13267, requiring one or more responsible parties to implement specific special studies. Potential studies identified by Regional Board staff are described briefly below.

5.6.3.6.1 Determine the Cu Load to Newport Bay from Bay Sediments in Marinas and Baywide

Bay sediments may be both sinks and sources for metals, including Cu; however, the load of Cu, and other metals, released from sediments annually in Newport Bay is unknown. Metals adsorbed to sediments are transported from tributaries in storm flow and sediments are deposited in the Upper and Lower Bay; however, the Cu load released from resuspended sediments has not been quantified in the Bay. In addition to tributary input, Cu is released during hull cleaning as both dissolved and particulate Cu. Some of the particulate Cu settles to the surface sediments, and dissolved Cu may bond with ligands to form salts and/or particulates, including organics and/or suspended sediments, that settle onto the surface sediments. A Cu-metals marina study in Newport Bay showed that surface sediments in marinas are enriched with Cu and other metals compared to channel sediments outside the marinas (OCCK & Candelaria 2007); therefore, sediments are both a potential sink and source of Cu and other metals to the Bay.

5.6.3.6.2 Determine the Cu Load to Newport Bay from Algae and Other Vegetation (Task 6.2, Table 5-8)

Algae and vegetation may accumulate Cu, thereby becoming a source of Cu to fish and other aquatic organisms. Currently, there are limited data on Cu concentrations in algae. It may be appropriate to require Cu analyses in algae, and possibly other vegetation, if it appears that Cu reductions from other sources, especially from boat AFPs, are not sufficient to achieve the TMDL.

5.6.3.6.3 Additional studies as deemed necessary by the Regional Board and/or Dischargers

Studies may be added if they are deemed necessary to the attainment of these Cu TMDLs.

5.6.3.6.4 Studies/Actions Completed or In Progress A number of studies actions have been completed or in progress and are included below for information purposes.

Completed

1) Cu reduction 319(h) grant in Newport Bay to convert boats from Cu to nontoxic AFPs, including an education program by Orange County Coastkeeper (OC Coastkeeper & Candelaria 2013)
2) Port of San Diego study on alternative AFPs (SDUPD 2011)
3) U.C.Seagrant studies on alternative AFPs (Carson *et al.* 2002)
4) Navy study for DPR examining the leach rates and 3 year Cu loading for two representative Cu AFPs (Earley *et al.* 2013)
5) DPR determination of a maximum allowable leach rate for Cu AFPs (February 2014).

In progress

1) Copper reduction 319(h) grant in San Diego to convert boats from Cu to nontoxic AFPs (Port of San Diego website)
2) DPR reevaluation of the registration of Cu AFPs, including implementation of a maximum allowable leach rate for Cu AFPs (Section 5.6.1.1)
3) USEPA Office of Pesticide Programs reevaluation of Cu pesticides including Cu AFPs
4) research at IRTA on alternative AFPs

Future studies might include

1) An extensive Marina Study to fully assess the extent of sediment Cu (and Zn, Hg) exceedances and sediment toxicity in marina and boatyard areas
2) A Boat Fouling Study to determine the amount of Cu in boat fouling. This could be conducted as a hull cleaning study that determines the release of both dissolved *and* total Cu during hull cleaning. This study could potentially be paired with hull cleaning containment methods.

5.6.3.7 Submit Updated TMDL Report, and Reevaluate and Revise the TMDL (Task 7, Table 5-8)

Within six months of completion of tasks 1 through 5 (Table 5-8) , the dischargers shall submit a TMDL Evaluation Report that evaluates the efficacy of the implementation of the requisite plans, and provide recommendations for (1) changes to these plans to address identified deficiencies, and (2) revisions to the TMDL.

This TMDL will be reevaluated 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 TMDL Evaluation Report.

Table 5-8 Recommended Implementation Tasks and Schedule for Copper (Cu) TMDLs

Implementation Task	***Schedule and Dischargers/Responsible Parties***
1 Reduce Copper (Cu) loading from Cu antifouling paints (Cu AFPs) on recreational and commercial boats (Section 5.6.3.1)	*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:* *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* *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* *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* *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*
1.1 Restrict the sale and use of Cu AFPs (Section 5.6.3.1.1)	
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 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.	*Ongoing by Regional Board staff*
1.2 Reduce Cu discharges from Cu AFPs (Section 5.6.3.1.2)	
1.2.1 Implementation Plan and Schedule to reduce Cu discharges from Cu AFPs *1.2.1 (1) 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).* *1.2.1 (2) The dischargers shall implement their plan(s) and schedule(s)*	*<u>Dischargers/Responsible Parties</u>* *City of Newport Beach (City)* *County of Orange (County)* *Marina owners/operators* *Individual boat owners* *Underwater hull cleaners (during phase-out of Cu paints)* *1.2.1 (1) As soon as possible but no later than (3 months from date of USEPA approval of BPA)* *1.2.1 (2) Upon Regional Board approval*
1.2.2 Implementation Tasks to reduce Cu discharges from Cu AFPs *The proposed implementation plan(s) and schedule(s), not to exceed 15 years, shall include strategies listed below at a minimum.* *(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.)* *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. (It will take time to convert from Cu to nontoxic AFPs, and conversions should occur during normal routine repainting of boats. In the interim, boats may convert from Cu to non-Cu AFPs, or Cu AFPs with leach rates at or below DPR's maximum allowable leach rate of 9.5µg/cm^2/d.) *1.2.2.2 Require all underwater hull cleaners to use BMPs including soft cloths or hull cleaning container/filter methods methods, and develop a diver certification program* 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. Additional BMPs that include hull cleaning in slip liners or dry dock storage may also be included. *1.2.2.3 Continue Monitoring in the Bay, including marinas,channels and Bay waters* 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). *1.2.2.4 Continue Education Program(s) for Boaters, Boatyards and Marinas* 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: (1) Cu water quality issues and TMDL requirements; (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, including hull cleaning costs; and conversion to non-Cu AFPs or Cu AFPs with leach rates at or below DPR's maximum allowable leach rate of 9.5µg/cm^2/d. (3) Nontoxic AFP use requirements including recommended BMPs for hull cleaning and frequency of cleaning; (4) BMPs requirements for all underwater hull cleaners; (5) Conditions and requirements instituted by 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); (6) Potential boat storage options, and containment systems for boat cleaning and/or storage (e.g. slip liners). *1.2.2.5 Coordinate with Regional Board staff on work with DPR and USEPA* Coordinatie with Regional Board staff on work with DPR and USEPA to institute appropriate restrictions on Cu AFPs to achieve the TMDL	

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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) (Section 5.6.3.2)	*Dischargers/Responsible Parties* *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*
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 *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 (section 5.6.3.2).* *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).* *2.1 (2) The dischargers shall implement their plan(s) and schedule(s)*	*Dischargers/Responsible Parties* *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* *2.1 (1) As soon as possible but no later than (3 months from date of USEPA approval of BPA)* *2.1 (2) Upon Regional Board approval*
3) Meet Copper (Cu) allocations for tributary runoff (Section 5.6.3.3)	
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.*	*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)* *New permits: as new permits are established*
3.2 (1) The dischargers shall conduct monitoring for Cu loading from tributary runoff to determine whether Cu wasteload and load allocations (WLAs, LAs) are consistently achieved. *(Existing monitoring for MS4 systems may be utilized for this task.)* *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.* *3.2 (3) The dischargers shall implement their plan(s) and schedule(s)*	*Dischargers/Responsible Parties* *County of Orange, City of Newport Beach and other MS4 permittees* *CalTrans* *Agricultural dischargers* *Other NPDES permittees* *3.2 (1) As soon as possible but no later than (3 months from date of USEPA approval of BPA)* *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* *3.2 (3) Upon Executive Officer approval*

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4) Evaluate Copper (Cu) discharges from storm drains for local impacts (Section 5.6.3.4)	
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. *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.* *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.* *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.*	*4.1 (1) As soon as possible but no later than (3 months from date of USEPA approval of BPA)* *4.1 (2) Upon Executive Officer approval.* *4.1 (3) As soon as possible but no later than 3 months from the findings of negative impacts to an area* *4.1 (4) Upon Executive Officer approval.* *Dischargers/Responsible Parties* *County of Orange, City of Newport Beach and other MS4 permittees* *CalTrans* *Agricultural dischargers* *Other NPDES permittees*
5) Continue Monitoring (Section 5.6.3.5) *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* *--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.* *5 (2) The dischargers shall implement the plan and schedule for the monitoring of Cu described in 5 (1).*	*5 (1) As soon as possible but no later than (3 months from date of USEPA approval of BPA)* *5 (2) Upon Regional Board approval* *<u>Dischargers/Responsible Parties</u>* *County of Orange and other MS4 permittees* *City of Newport Beach* *CalTrans* *Agricultural dischargers* *Other NPDES permittees*
6) Conduct Special Studies (Section 5.6.3.6) *Special studies may be necessary to refine theTMDL and/or the TMDL implementation plan, particularly if implementation of the preceding tasks proves insufficient to achieve the TMDL. These studies may include:* *6.1) Determine the Cu loading from In-Bay Sediments* *Cu discharges from Bay sediments have not yet been quantified.* *6.2) Determine the Cu loading from Algae & Other Vegetation* *Cu loading from algae and other vegetation has not yet been quantified.*	*Special studies shall be implemented by the dischargers in accordance with direction from the Regional Board Executive Officer per Water Code Section 13267.* *<u>Dischargers/Responsible Parties</u>* *County of Orange and other MS4 permittees* *City of Newport Beach* *CalTrans* *Agricultural dischargers Other NPDES permittees*

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7) Submit Updated TMDL Report, and Reevaluate and Revise the TMDL (Section 5.6.3.7)	*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 these Cu TMDLs.* *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.*

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6.0 NON-TMDL ACTION PLANS (ACTION PLANS) FOR ZINC (Zn), MERCURY (Hg), ARSENIC (As), CHROMIUM (Cr)

While both Upper and Lower Newport Bay are impaired for copper (Cu), and the highest priority in addressing Cu impairment is to reduce Cu loads from boats, Newport Bay is also impaired for other metals. Sediment zinc (Zn) and mercury (Hg), along with sediment Cu, exceeded sediment guidelines in parts of Lower Newport Bay; and arsenic (As) and chromium (Cr) exceeded fish/mussel tissue guidelines in the Upper and Lower Bay. Zn also exceeded fish/mussel tissue guidelines in the Lower Bay only (Sections 4.2.3 and 4.3). In addition, cadmium (Cd) exceeded the fish tissue guideline for wildlife in mussels (but not fish) in the Upper and Lower Bay, and additional metals exceeded the ERL sediment guidelines; therefore, continued monitoring for metals is necessary.

Non-TMDL Action Plans (Action Plans), rather than TMDLs, are recommended for Zn, Hg, As and Cr based on the results of the Metals Impairment Assessment (Section 4.2.3). Action Plans are plans/strategies to address impairment without requiring total maximum daily loads (TMDLs). This approach is consistent with the USEPA's new vision for implementing the CWA Section 303(d) program[11]. The Action Plan documents include: a Problem Statement and Recommendations; Justification for an Action Plan rather than a TMDL; Numeric Targets; Source Analysis (if available); Regional Board Requirements to Develop/Implement the Action Plan(s); Dischargers Responsible to Develop/Implement the Action Plan(s) to Correct Impairment; and, Recommended Action Plan Tasks to Address Impairment.

Impairment due to Zn, Hg, As and Cr and recommendations to address these impairments are summarized in the sections below, along with justification for addressing impairment by Action Plans rather than TMDLs, and the recommended Action Plans. For each non-TMDL metal, numeric targets and a preliminary source analysis are also given.

6.1 PROBLEM STATEMENT AND RECOMMENDATIONS FOR Zn, Hg, As AND Cr
6.1.1 Zn AND Hg IMPAIRMENT IN LOWER NEWPORT BAY
6.1.2 As AND Cr IMPAIRMENT IN UPPER AND LOWER NEWPORT BAY
6.2 JUSTIFICATION FOR NON-TMDL ACTION PLANS (ACTION PLANS) FOR Zn, Hg, As AND Cr
6.3 NUMERIC TARGETS
6.4 PRELIMINARY SOURCE ANALYSIS
6.5 IMPLEMENTATION OF ZINC (Zn), MERCURY (Hg), ARSENIC (As) AND CHROMIUM (Cr) ACTION PLANS
6.5.1 REGIONAL BOARD REQUIREMENTS FOR THE DEVELOPMENT AND IMPLEMENTATION OF Zn, Hg, As and Cr ACTION PLANS
6.5.2 DISCHARGERS RESPONSIBLE FOR THE DEVELOPMENT AND IMPLEMENTATION OF ACTION PLANS TO CORRECT IMPAIRMENT FROM Zn, Hg, As AND Cr
6.5.2.1 Dischargers responsible to Correct Sediment Impairment from Zn and Hg
6.5.2.2 Dischargers responsible to Correct Fish/Mussel Tissue Impairment from As and Cr
6.5.3 RECOMMENDED ACTION PLAN TASKS TO ADDRESS Zn, Hg, As AND Cr IMPAIRMENT
6.5.3.1 Zn and Hg Non-TMDL Action Plans (Action Plans)
6.5.3.2 As and Cr Non-TMDL Action Plans (Action Plans)
6.6 RELATED ACTIONS FOR ALL METALS

[11] https://www.epa.gov/tmdl/new-vision-cwa-303d-program-updated-framework-implementing-cwa-303d-program-responsibilities

6.1 PROBLEM STATEMENT AND RECOMMENDATIONS FOR Zn, Hg, As AND Cr

The Problem Statement for metals (other than copper (Cu)) causing impairment in Newport Bay is described in Section 4.3 and summarized below. Metals causing impairment include zinc (Zn), mercury (Hg), arsenic (As) and chromium (Cr).

Metals are known to be toxic to fish and other aquatic organisms. Metals in the water (dissolved and total) may adsorb to suspended particles and settle, form salt precipitates, or be flushed out of the Bay. Filter feeders, such as mollusks, accumulate metals from the water, while benthic organisms ingest metals in sediments. Sediments serve as a sink for metals, but may also be a source when sediments are resuspended and release metals back into the water. Metals may also cause toxicity in the water or sediments resulting in both lethal and sublethal effects. Relevant monitoring studies may be found in Section 4.2.2 & Appendix 4.

Implementation Recommendations are based on the conclusions from the Metals Impairment Assessment (4.3)

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Table 4-15 Impairment Summary and Recommendations for metals in Newport Bay
(Table from Section 4.3)

	Upper Bay (UNB)			***Lower Bay (LNB)***			***ACTIONS Recommended***
Metal	***Water***	***Sediment***	***Fish/ Mussel Tissue***	***Water***	***Sediment***	***Fish/ Mussel Tissue***	
Zinc (Zn)					**X**	**X-wl**	***LIST in LNB Source Analysis Sediment and tissue monitoring in LNB including marinas Non-TMDL Action Plan in LNB***
Mercury (Hg)					**X**		***LIST in LNB Source Analysis Sediment and tissue monitoring in LNB including marinas Non-TMDL Action Plan in LNB***
Methyl Hg							***Hg & methyl Hg will be addressed together***
Arsenic (As)			**hh**			**hh***	***LIST in UNB &LNB Source Analysis Sediment and fish filet and mussel monitoring in UNB & LNB Non-TMDL Action Plan in UNB & LNB***
Chromium (Cr)			**hh wl-F**			**wl-F**	***LIST in UNB & LNB Source Analysis Sediment and fish monitoring in UNB and LNB Non-TMDL Action Plan in UNB & LNB***
Toxicity	**X**	**X**		**X**	**X**		***Continue monitoring in sediments***

X = Impairment, UNB =Upper Bay, LNB =Lower Bay, TB =Turning Basin in Lower Bay
Impairment for fish tissue: hh = human health exceedances, wl = wildlife exceedances,
wl-M =exceedances in mussels only, wl-F =exceedances in fish only
*human health exceedances for the Lower Bay for As based on mussels only
+wildlife exceedances in a small number of larger fish (avg. 100cm)
^wildlife exceedances for mussels only in a small data set
Summary table is based on data from Tables 4-10, 4-11.

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6.1.1 Zn AND Hg IMPAIRMENT IN LOWER NEWPORT BAY

Zinc (Zn)
Zn impairment was found in sediments in parts of Lower Newport Bay based on exceedances of the ERM sediment guideline and the presence of sediment toxicity (Table 4-10).
Zn impairment was also found in fish tissue in the Lower Bay based on exceedances of the fish tissue guideline for wildlife (Table 4-11).

Water. There were no exceedances of the dissolved Zn CTR saltwater criteria.

Sediments. Sediment Zn exceeded the Zn ERM sediment guideline in surface sediments in the Lower Bay, particularly in the Turning Basin and S. Lido Channel areas. Sediment toxicity was found in the Upper and Lower Bay in multiple studies. Sediment Zn also exceeded the ERL guideline in both the Upper and Lower Bay (Table 4-12).

Fish Tissue. Zn exceeded the fish tissue guideline for wildlife in fish and mussels from the Lower Bay and in a small number of fish and mussels in the Upper Bay. Zn only exceeded the fish tissue guideline for wildlife in topsmelt and mussels.

Recommendations to address Zn impairment: LIST, Non-TMDL Action Plan
303(d) Listing. Zn should be LISTED for sediment and fish tissue exceedances in parts of the Lower Bay.
TMDL. No TMDL is recommended for Zn since actions taken to remediate sediment Cu impairment should also remediate sediment Zn. In addition, USEPA's allocation for Zn in the Toxics TMDLs is an order of magnitude higher than Zn loads to Newport Bay.

Action Plan. A source analysis and continued monitoring is needed for Zn, particularly in Lower Newport Bay. Monitoring of Zn should continue in sediments (in and near marinas and boatyards), and in fish and mussel tissue. A more extensive marina survey is needed to fully assess the extent of sediment Zn exceedances and sediment toxicity in *all* marina and boatyard areas in Newport Bay***.*** Sediment Zn impairment will likely be remediated when areas of Cu impairment are dredged (since sediment Cu, Zn and Hg exceed the criteria mostly in the same marinas); however, marinas not previously evaluated must also be tested so that the extent of impairment in *all* marinas can be determined. Additional actions may include an assessment of Zn loads from Zn anodes, MS4 and Caltrans permit revisions, and dredging to remediate sediment Zn impairment.

Mercury (Hg)/methyl mercury (methyl Hg)
Hg/methyl Hg impairment was found in sediments in parts of Lower Newport Bay based on exceedances of the ERM sediment guideline and the presence of sediment toxicity (Table 4-10). There were a small number of exceedances of the methyl Hg wildlife guideline in fish tissue in both the Upper and Lower Bay but not enough to make a finding of impairment (Table 4-11).

Water. There were no exceedances of the dissolved Hg CTR saltwater criteria.

Sediments. Sediment Hg exceeded the Hg ERM sediment guideline in surface sediments in the Lower Bay, particularly in the Turning Basin and S. Lido Channel areas. (Hg in homogenized core sediments also exceeded the ERM guideline in Lower Newport Bay, although core data are not used for 303(d) listing purposes.) Sediment toxicity was found in the Upper and Lower Bay in multiple studies. Sediment Hg also exceeded the ERL guideline mostly in the Lower Bay in all or the majority of samples (Table 4-12).

Fish tissue. There was one exceedance of the higher fish tissue guideline for methyl Hg for wildlife in a small data set.

Recommendations to address Hg impairment: LIST, Non-TMDL Action Plan
303(d) Listing. Parts of the Lower Bay should be LISTED for Hg based on sediment exceedances and toxicity.
TMDL. No TMDL is recommended for Hg since actions taken to remediate sediment impairment due to Cu should also decrease sediment Hg.
Action Plan. A source analysis and continued monitoring is needed for Hg, particularly in Lower Newport Bay. Monitoring of Hg should continue in sediments (in and near marinas and boatyards), and in fish and mussel tissue. A more extensive marina survey is needed to fully assess the extent of sediment Hg exceedances and sediment toxicity in *all* marina and boatyard areas in Newport Bay. Sediment Hg impairment will likely be remediated when areas of Cu impairment are dredged (since sediment Cu, Zn and Hg exceed the criteria mostly in the same marinas); however, marinas not previously evaluated must also be tested so that the extent of impairment in *all* marinas can be determined.

6.1.2 As AND Cr IMPAIRMENT IN UPPER AND LOWER NEWPORT BAY

Arsenic (As)
Arsenic (As) impairment was found in fish and mussel tissue in Upper Newport Bay based on exceedances of the lower human health guidelines (Table 4-11). There were also exceedances in a limited data set of mussels in Lower Newport Bay.

Water. There were no exceedances of the dissolved As CTR saltwater criteria.

Sediments. Sediment As did not exceed the ERM guideline, but exceeded the ERL guideline in the Lower Bay (Tables 4-10, 4-12).

Fish tissue. There were exceedances of the lower inorganic As fish tissue guideline for human health in all fish filets and mussels in a small data set. Only mussels were collected in the Lower Bay.

Recommendations to address As impairment: LIST, Non-TMDL Action Plan
303(d) Listing. The Upper and Lower Bay should be LISTED for As based on fish tissue exceedances. Filets are needed to assess As in fish tissue in the Lower Bay.
TMDL. No TMDL is recommended for As since As does not exceed criteria/guidelines in water or sediment, and sources of As in fish are not well-defined.

Action Plan. A source analysis and continued monitoring is needed for As in Upper and Lower Newport Bay. Monitoring of fish filets and mussels should continue for As.

Chromium (Cr)
Cr impairment was found in fish tissue but not mussels in Upper and Lower Newport Bay based on exceedances of the wildlife guidelines (Table 4-11).

Water. There were no exceedances of the dissolved Cr CTR saltwater criteria.

Sediments. Sediment Cr did not exceed the ERM guidelines, but exceeded the ERL guideline in the Lower Bay particularly in marina sites (Tables 4-10, 4-12).

Fish Tissue. There were exceedances of the fish tissue guideline for wildlife in a majority of fish samples but not in mussels. Fish tissue exceedances were found in both resident and open water fish collected in Newport Bay.

Recommendations to address Cr impairment: LIST, Non-TMDL Action Plan
303(d) Listing. The Upper and Lower Bay should be LISTED for Cr based on fish tissue exceedances.
TMDL. No TMDL is recommended for Cr since Cr does not exceed criteria/guidelines in water or sediment and sources of Cr in fish are not well-defined.

Action Plan. A source analysis and continued monitoring is needed for Cr in Upper and Lower Newport Bay. Monitoring of fish and mussels should continue for Cr.

6.2 JUSTIFICATION FOR NON-TMDL ACTION PLANS (ACTION PLANS) for Zn, Hg, As and Cr

Zn and Hg Impairment
Sediment exceedances of the ERM sediment guidelines included Zn and Hg in parts of the Lower Bay (Turning Basin area), along with exceedances of sediment Cu. There were no exceedances of the dissolved Zn CTR saltwater criteria. Impairment due to sediment Cu will be addressed in the Cu TMDLs; therefore, any action to remediate impairment due to sediment Cu (such as dredging) should also remediate sediment Zn and Hg.

Zn also exceeded the wildlife guidelines in fish tissue from the Lower Bay, but not the Upper Bay. These exceedances may be due to sediment Zn impairment in the Lower Bay. If the remediation of sediment Cu (which should also remediate sediment Zn and Hg), does not result in a decrease in Zn concentrations in fish tissue, then further actions should be developed in the Zn Action Plan.

Regional Board staff therefore recommend the Non-TMDL Action Plans approach for Zn and Hg, rather than TMDLs, to address impairment due to sediment Zn and Hg, and Zn in fish tissue. The Board's Non-TMDL Action Plan approach for these metals is to require the responsible dischargers to develop and propose Action Plans and schedules to address impairment due to these metals. These proposed Action Plans and schedules would be required to be implemented upon Regional Board approval. Tasks expected to be considered for inclusion in the proposed Action Plans are described in Section 6.7 below. The requirement to develop and submit the proposed Action Plans could be included in the Conditional Waiver of Waste Discharge Requirements or other directive issued by the Regional Board to implement the proposed Copper (Cu) TMDL (Section 5.6.1.3.1.2) if approved. Again, this Action Plan approach is in line with USEPA's initiative to address impairment by actions other than TMDLs.

As and Cr Impairment
As and Cr exceeded fish tissue guidelines but neither metal exceeded the dissolved metals CTR saltwater criteria or ERM sediment guidelines. Sources of As and Cr have not been identified norquantified at this time. .

Regional Board staff therefore recommend the Non-TMDL Action approach for As and Cr, rather than TMDLs, to address impairment due to As and Cr in fish tissue. These proposed Action Plans and schedules would be required to be implemented upon Regional Board approval. Tasks expected to be considered for inclusion in the proposed Action Plans are described in Section 6.7 below. The requirement to develop and submit the proposed Action Plans could be included in the Conditional Waiver of Waste Discharge Requirements or other directive issued by the Regional Board to implement the proposed Copper (Cu) TMDL (Section 5.6.1.3.1.2) if approved. Again, this Action Plan approach is in line with USEPA's initiative to address impairment by actions other than TMDLs.

6.3 NUMERIC TARGETS

Since impairment was found in sediments for zinc (Zn) and mercury (Hg), and in fish tissue for Zn, arsenic (As) and chromium (Cr), numeric targets for water, sediment and fish tissue are proposed for these metals (Table 6-1).

The targets 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.

The dissolved metals CTR saltwater criteria are the same as those criteria used to identify impaired waters in the State Listing Policy. For sediments, ERL sediment guidelines will be 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, OEHHA and USEPA guidelines are used for human health, and USFWS guidelines are used for wildlife.

Table 6-1 Numeric Targets for non-TMDL Metals

Metal	**Water (CTR saltwater criteria, µg//L)** [1]		**Sediment (ERL sediment guidelines, µg/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
	Fish Tissue Human Health (µg/g ww)		**Fish Tissue Wildlife (µg/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
[1]Dissolved metals saltwater criteria are from the California Toxics Rule (CTR) (USEPA 2000)
[2]Sediment guidelines are from Long *et al.* 1995 (ERL =effects range low)
[3]Zn human health target from Median International Standards (MIS), Nauen 1983
[4]Zn wildlife target from Eisler 1993
[5]Total Hg human health target from Johnson & Looker 2004, San Francisco Bay Mercury TMDL
[6]Methyl Hg human health target from Klasing & Brodberg 2008 (OEHHA)
[7]Methyl 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)
[8]Inorganic As human health target (carcinogen target) from USEPA 2000a Fish consumption guidance Volume 1 (Table 5-3)
[9]Total As wildlife target from Stanley 1994 (wet wt. conversion from dry wt. screening value-(assumes fish contain 75% moisture)
[10]Cr human health target from Median International Standards (MIS), Nauen 1983
[11]Cr wildlife target from Eisler 1998

6.4 PRELIMINARY SOURCE ANALYSIS

Known and potential sources of most metals include urban runoff from tributaries and storm drains (freshwater), recreational boats (Cu, Zn) and boat repair yards (Cu, Zn, Hg), in-bay sediments, air deposition and ambient seawater. Table 6-2 shows metal load estimates from various sources and is a revision of Table E-11 from the 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 (OC Coastkeeper and Candelaria, 2007-08 data). Zn loads from air deposition and ambient seawater were quantified in the Toxics TMDLs (USEPA, 2002). Other sources of metals shown in Table 6-2 have not yet been measured and quantified. Sources common to Zn, Hg, As and Cr are discussed in Section 6.4.1, sources specific to Hg, Zn, As and Cr are discussed in Section 6.4.2.

6.4.1 SOURCES COMMON TO METALS

Urban runoff

Urban runoff enters the Bay via tributaries, storm drains or surface runoff. Metal loads to the Bay from storm water runoff can be significant in winter. The largest tributaries to Newport Bay are San Diego Creek and the Santa Ana Delhi Channel which typically account for the largest metal loads to the Bay, with the exception of Cu which largely comes from boat hulls (Table 6-2). Urban runoff also enters the Bay from over 200 storms drains (mostly in Lower Newport Bay); however, metal loads from storm drains are low compared to tributary runoff (OC Coastkeeper and Candelaria 2010) (Table 6-2).

Sediments

Soil particles enter the Bay in urban runoff from the major tributaries and storm drains, and may be contaminated with pollutants including metals such as Zn, As, Cr and Cu. As tributary runoff flows through the Bay, these soil particles are deposited in the Bay, with the heavier particles being deposited first in the Upper Bay and the fines being deposited down-flow in the Lower Bay. The deposition patterns of sands and fines ultimately depends on the flow rate and volume of the runoff from the tributaries (i.e. more sediment is carried further down the Bay with larger and faster volumes of water). Metals adsorbed to the soil particles, in particular the fines (silts and clays), are deposited with the sediments. Runoff from tributaries and/or tidal action may then resuspend bottom sediments containing metals which may be released back into the water. Therefore, bay sediments serve as both a sink and a source for metals.

Recreational boats and boatyards

Antifouling paints (AFPs) on recreational boats are the largest source of Cu to Newport Bay; however, Zn is also discharged from Zn antifouling paints and Zn anodes. Zn loads from recreational boats have not yet been quantified.

Hg, Zn, As and Cr, also have many functions in boat operation, maintenance, and repair. Common metal products used in boat activities include AFPs, pesticides, and wood preservatives. Metals can enter the Bay during uncontrolled pressure washing, painting, antifouling or fueling activities.

Algae

In Allen's Food Web Study (2008), it was demonstrated that As, Cr and Zn concentrations in algae were high compared to fish tissue guidelines for wildlife. Metal concentrations in vegetation that is food for wildlife are not regularly monitored, and should be examined to determine if vegetation is a source of metals to wildlife.

Air deposition

Metals deposited from the air can be divided into two categories: metals deposited on land surfaces, and metals deposited directly onto the surface of the Bay (direct deposition). Metals deposited onto the land may be washed off by rainfall and runoff and are included in the metal loads calculated for urban runoff. Only metals that are directly deposited onto the surface of the Bay are included under the "Air deposition" category in Table 6-2.

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Table 6-2 Revised Summary of Metal Loads to Newport Bay (lbs/yr)

	Zn	**As**	**Cr**	**Hg**[7]
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			

[1] Dissolved metal loads are the mean annual loads estimated from 2009-13 data (OCPFRD)
(Metal loads by monitoring year are shown in Table 6-3 below)
*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 (OC Coastkeeper and Candelaria) 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 µg/L)
[9] NL =not likely

Table 6-3 Total Loads from Tributaries –San Diego Creek, Santa Ana Delhi and Costa Mesa Channel (data from 2009-13)

			As	Cr	Cu	Hg	Zn
Flow (cfs)			lbs	lbs	lbs	lbs	lbs
25338.014		2009-10	400.184	67.628	1793.829	6.833	466.693
*36708.154		2010-11	695.850	115.662	1314.169	9.900	1339.198
10933.288		2011-12	210.940	25.806	409.769	2.442	1319.585
7680.570		2012-13	132.775	22.299	311.271	2.071	193.271
mean flow (cfs)							
20165.007		*mean lbs*	*359.937*	*57.849*	*957.260*	*5.312*	*829.687*

*****highlighted data = highest flow and metal loads

6.4.2 SOURCES OF SPECIFIC METALS

Sources of Zinc (Zn)

Zn concentrations exceeded ERM sediment guidelines in parts of Lower Newport Bay; however, dissolved Zn concentrations did not exceed the CTR water quality criteria. Zn also exceeded the fish tissue guideline for wildlife in some Lower Bay samples.

Zn has a number of current sources. Known sources of Zn include: 1) major tributaries, 2) recreational boats (not quantified), 3) Lower Bay storm drains, in particular Arches East and Arches West storm drains, 4) boatyards, and 5) air deposition (Table 6-2). Additional potential sources of Zn include resuspended bay sediments.

Zn concentrations in storm water runoff from tributaries are routinely monitored and Zn loads were estimated from Orange County monitoring data (2009-13) (Tables 6-2 and 6-3). The mean annual Zn load from tributaries was 830 lbs (range of 193 to 1340 lbs, approximately). Zn loads from Lower Bay storm drains were estimated from data from the Newport Bay Stormdrain Metals Study and were small compared to tributary loads (OC Coastkeeper and Candelaria, 2007). Zn loads from recreational boats (Zn anodes and Zn paints) have not been quantified. Boatyards are another potential source of Zn when Zn boat paints are applied or removed. The discharge of these process wastes is prohibited under the State Board's Industrial General Permit, but discharges of these wastes may occur during rain events. (The Industrial General Permit specifies requirements to control pollutants in stormwater discharges from boatyards and other industrial facilities, but does not prohibit stormwater discharges). Bay sediments may also be a source of Zn when sediments are resuspended. Zn loads to Bay waters from resuspended sediments have not been quantified, although Zn concentrations exceeded the ERM sediment guideline in parts of the Lower Bay, in particular the Turning Basin and S. Lido Channel areas. Air deposition of Zn is small compared to tributary runoff.

Sources of Mercury (Hg)

Hg concentrations exceeded ERM sediment guidelines in parts of Lower Newport Bay; however, dissolved Hg concentrations did not exceed the CTR saltwater criteria.

Hg in Newport Bay is mainly a legacy contaminant found in bay sediments. Current loads of Hg to the Bay are thought to be small as Hg concentrations in storm water samples are mostly non-detects. Known sources of Hg include: 1) legacy contamination in Bay sediments, 2) a small amount from major tributaries, and 3) a small amount from Lower Bay storm drains, in particular Arches East and Arches West storm drains. Hg concentrations in storm water runoff from tributaries are routinely monitored and Hg loads were estimated from Orange County monitoring data (2009-13) (Tables 6-2 and 6-3). The mean annual Hg load from tributaries was only 5.3 lbs (range of 2.1 to 10 lbs, approximately). Hg was not consistently analyzed in stormdrain runoff in the Newport Bay Stormdrain Metals Study (OC Coastkeeper and Candelaria, 2007). Bay sediments may also be a source of Hg when sediments are resuspended. Hg loads to Bay waters from resuspended sediments have not been quantified, although Hg concentrations exceeded the ERM sediment guideline in parts of the Lower Bay, in particular the Turning Basin and S. Lido Channel areas. Air deposition of Hg has not been quantified.

Sources of Arsenic (As)

Arsenic (As) concentrations did not exceed the ERM sediment guidelines or the CTR water quality criteria. As concentrations exceeded ERL sediment guidelines in Lower Newport Bay. As concentrations exceeded the lower human health guideline in fish tissue in both Upper and Lower Bay samples. As has a number of potential sources, although most have not been quantified.

Known sources of As include 1) major tributaries, and 2) a small amount from Lower Bay storm drains, in particular Arches East and Arches West storm drains. As is used in wood preservatives, paint pigments and pesticides and boatyards may be a source of As. Additional potential sources of As include dock pilings in the Bay and in-bay sediments.

As concentrations in storm water runoff from tributaries are routinely monitored and As loads were estimated from Orange County monitoring data (2009-13) (Tables 6-2 and 6-3). The mean annual As load from tributaries was 360 lbs (range of 133 to 696 lbs, approximately). As loads from Lower Bay storm drains were estimated from data from the Newport Bay Stormdrain Metals Study and were small compared to tributary loads (OC Coastkeeper and Candelaria, 2007). Bay sediments may also be a source of As when sediments are resuspended, although As concentrations in sediments did not exceed the ERM sediment guideline. Air deposition of As has not been quantified.

Sources of Chromium (Cr)

Cr concentrations exceeded the wildlife guideline in fish tissue in both Upper and Lower Bay samples; however, Cr concentrations did not exceed the CTR water quality criteria or sediment guidelines. Cr has a number of potential sources, although most have not been quantified.

Known sources of Cr include 1) major tributaries, 2) a small amount from Lower Bay storm drains, in particular Arches East and Arches West storm drains, and 3) algae (Allen 2008). Additional potential sources of Cr may include in-bay sediments.

Cr concentrations in storm water runoff from tributaries are routinely monitored and Cr loads were estimated from Orange County monitoring data (Tables 6-2 and 6-3). The mean annual Cr load from tributaries was 58 lbs (range of 22 to 116 lbs, approximately). Cr loads from Lower Bay storm drains were estimated from data from the Newport Bay Stormdrain Metals Study and were smaller than tributary loads (OC Coastkeeper and Candelaria, 2007). Bay sediments may also be a source of Cr when sediments are resuspended, although Cr concentrations in sediments did not exceed the ERM sediment guideline. Air deposition of Cr has not been quantified.

Since As and Cr exceeded the fish tissue guideline in both resident and open water fish, it is likely that there are source(s) of As and Cr within Newport Bay. These may include tributary runoff, sediments and algae for As, and algae for Cr. (Note that neither As nor Cr exceed the CTR saltwater criteria or the ERM guidelines in sediments; however, As and Cr exceed the ERL sediment guidelines in the Lower Bay (Table 4-12).)

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6.5 IMPLEMENTATION OF ZINC (Zn), MERCURY (Hg), ARSENIC (As) AND CHROMIUM (Cr) ACTION PLANS

6.5.1 REGIONAL BOARD REQUIREMENTS FOR THE DEVELOPMENT AND IMPLEMENTATION OF Zn, Hg, As and Cr ACTION PLANS

As discussed above, Regional Board staff recommends that impairment due to Zn, Hg, As and Cr be addressed by Non-TMDL Action Plans (Action Plans), rather than by TMDLs. This approach entails the following:

1) Regional Board requirements for responsible dischargers (identified in Section 6.6) to prepare and submit proposed Action Plans and schedules to address impairment due to these metals. Specific tasks that are expected to be considered for inclusion in these proposed action plans are identified in Section 6.7 below;

2) The requirements for the development/implementation of these Action Plans would be implemented through an order issued by the Regional Board to the responsible dischargers. It is expected that these requirements would be coordinated with and included in the order of the Board issued to implement the Cu TMDLs. As previously discussed (Section 5.61.3.1.2), a Conditional Waiver of Waste Discharge Requirements is the recommended regulatory tool to implement the requirements of the Cu TMDLs.

3) The dischargers' proposed Action Plans and schedules would be required to be implemented upon their approval by the Regional Board.

4) Short- and long-term monitoring would be a requisite part of any approvable proposed Action Plans.

5) Where the discharger proposed Action Plan(s) include tasks and schedules that extend beyond 3 years, the proposed Action Plan(s) should include a reevaluation and adaptive management process to determine whether the Action Plan(s) need revisions. In these circumstances, the proposed Action Plan(s) must include the requirement of an evaluation report within 3 years of the initial implementation of the Action Plan(s). This evaluation report must assess the efficacy of the actions taken pursuant to the approved Action Plan(s) and identify specific recommendations for revisions, including the rationale for those revisions. The revised Action Plan(s) will be required to be implemented upon Regional Board approval.

6) Data and information gathered from the implementation of the Action Plan(s) and evaluation reports will also be used to determine whether a TMDL or alternative restoration approach, rather than an Action Plan(s), should be used to address impairment from the metals described above. The need for and nature of future Regional Board action to require the responsible parties to take appropriate actions will be determined based on the results of implementation of the Action Plan(s), the evaluation of those Action Plan(s) and continued monitoring.

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6.5.2 DISCHARGERS RESPONSIBLE FOR THE DEVELOPMENT AND IMPLEMENTATION OF ACTION PLANS TO CORRECT IMPAIRMENT FROM Zn, Hg, As AND Cr

6.5.2.1 Dischargers responsible to Correct Sediment Impairment from Zn and Hg

(1) City of Newport Beach
(2) County of Orange
(3) Marina owner/operators
(4) Individual recreational boat owners
(5) Commercial vessel owners/operators
(6) Underwater hull cleaners
(7) Boatyards
(8) Others using/mooring vessels on a transient basis

The dischargers responsible to correct sediment Zn and Hg impairment in Newport Bay are the same dischargers identified in the Cu TMDLs (Section 5.6.2.2). The correction of sediment impairment due to Cu includes the remediation of known areas of impairment in the Bay, and the identification and remediation of sediment impairment in areas with limited or no current data. The remediation of sediment impairment due to Cu should also remediate sediment Zn and Hg since known sediment impairment of Cu, Zn and Hg occurs mostly in the same areas (marinas and the Turning Basin areas). In addition, marinas not previously tested for metals should be tested for sediment Cu, Zn and Hg and sediment toxicity.

The Regional Board will use the authorities in Section 5.6.1.4, if necessary, to require that responsible parties, including the City of Newport Beach, the County of Orange, other marina owners/operators, boatyard owners/operators and individual boat owners (Section 5.6.2), develop and implement one or more approved plans to remediate areas of known sediment impairment due to Cu, Zn and Hg, and to investigate sediment impairment in areas of the Bay with limited or no current sediment Cu, Zn and Hg data. A voluntary remediation approach, which has been implemented in the past by the City of Newport Beach, would be preferable and will be sought. Implementation of the approved remediation plan(s) for sediment Cu should also remediate sediment Zn and Hg, and investigations of sediment Cu in additional areas in the Lower Bay should include monitoring for Zn and Hg (Section 6.7).). If voluntary actions to address Zn and Hg sediment impairment are not taken, the Regional Board will likely employ a Conditional Waiver of Waste Discharge Requirements to compel the responsible dischargers to take appropriate actions.

It is strongly recommended that the City and County assume a leadership role in developing and implementing the Zn, Hg, As and Cr Action Plans (as well as the Cu TMDLs), including monitoring proposal(s), on behalf of all responsible parties, given their knowledge of and responsibility for the oversight of tidelands/submerged lands and activities/facilities operated on those lands (Section 5.6.2). Such a coordinated, collective approach would facilitate the identification and implementation of appropriate measures by the responsible parties, more clearly define the roles and responsibilities of each of the dischargers, and allow for better and more timely adaptive management of control measures. In short, the coordinated, collective approach will enhance implementation and achievement of the Cu TMDLs and Non-TMDL Action Plan(s) tasks. It is expected that a conditional waiver, for both the Cu TMDLs and the Zn, Hg, As and Cr Action Plans, will provide for this collaborative approach but will also allow each responsible discharger to act independently to implement TMDL and Non-TMDL Action Plan requirements. Independent implementation would likely be a far more costly and less effective approach to ensure timely compliance; therefore, the coordinated collective approach is strongly recommended.

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

(1) County of Orange and other MS4 permittees, including the City of Newport Beach
(2) CalTrans
(3) Agricultural dischargers
(4) Boatyards
(4) Other NPDES permittees

The dischargers responsible to correct fish/mussel tissue impairment in Newport Bay are shown above. The correction of fish/mussel tissue impairment due to As and Cr must first include a source analysis to determine the sources of As and Cr to the Bay. From that analysis, remediation tasks can be developed. Metal loads from some sources have been quantified, while others have not yet been determined (Table 6-2).

The Regional Board will use the authorities in Section 5.6.1.4, if necessary, to require that responsible parties, including those listed above, to develop and implement one or more approved plans to address known fish/mussel tissue impairment due to As and Cr in the Upper and Lower Bay. A voluntary remediation approach, which has been implemented in the past by the City of Newport Beach, would be preferable and will be sought. If voluntary actions to address As and Cr impairment are not taken, the Regional Board will likely employ a Conditional Waiver of Waste Discharge Requirements to compel the responsible dischargers to take appropriate actions.

As described in Section 6.6.1, to facilitate the correction of impairment due to As and Cr, it is strongly recommended that the City and County assume a leadership role in developing and implementing the As and Cr Action Plans, including monitoring proposal(s), on behalf of all responsible parties, given their knowledge of and responsibility for the oversight of tidelands/submerged lands and activities/facilities operated on those lands (Section 5.6.2).

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6.5.3 RECOMMENDED ACTION PLAN TASKS TO ADDRESS Zn, Hg, As AND Cr IMPAIRMENT

6.5.3.1 Zn and Hg Non-TMDL Action Plans (Action Plans)

The Action Plans for Zinc (Zn) and Mercury (Hg) proposed by the dischargers should include the following:
Continued Monitoring

- Monitoring of Zn, Hg (and Cu) should continue in both water and sediments (especially in the Lower Bay marinasand the Turning Basin/S. Lido Channel areas), and tributary runoff, and Zn and Hg loads should be determined annually from tributary runoff.
- Monitoring of Zn should continue in fish and mussels in the Lower Bay.

Characterization studies

- A more extensive marina survey is needed to fully assess the extent of sediment Zn and Hg exceedances and sediment toxicity in marina and boatyard areas in Newport Bay**.** (Marina sediments from a subset of marinas exceeded sediment Zn, Hg (and Cu) ERM guidelines in the Cu-Metals Marina Study (4.2.2.1), and still exceeded the Zn, Hg (and Cu) guidelines when resampled in the Post-dredging Metals Sediment Study in Lower Newport Bay (4.2.2.10))**.**
- The Metals Sediment Study in the Lower Bay also determined concentrations of Zn, Hg (and Cu) in post-dredge surface sediments. Further work is needed to determine the extent of Zn, Hg (and Cu) in surface sediments throughout all of the Lower Newport Bay.
- Sediments near boatyards should be tested to determine whether Zn, Hg (and Cu) exceed the ERM sediment guidelines and sediment toxicity is present. (This can be combined with marina study described above.)
- A study to quantify the contribution of Zn discharges from Zn anodes and Zn boat paints should be conducted. (This should include the quantification of Zn released from Zn anodes (dissolved and particulate), and a determination of the dissolution rates of Zn from Zn anodes.)
- Total Zn and Hg data from the Storm Drain Study should be analyzed to determine total Zn loads from storm drains in the Turning Basin area (dissolved loads were calculated for the study report).
- A hydrodynamic flow model should be reviewed to determine whether loads from the tributaries impact the Turning Basin.

Remediation Strategies

- Based on the monitoring and characterization studies identified above, the proposed Action Plan must identify appropriate remediation strategies, such as dredging. Strategies should be included for the Turning Basin area in Lower Newport Bay, including marinas, to remediate sediment Zn, Hg (and Cu). Additional areas of the Bay, including marinas, may also need dredging pending results from the more extensive marina sediment study.

6.5.3.2 As and Cr Non-TMDL Action Plans (Action Plans)

The Action Plans for Arsenic (As) and Chromium (Cr) proposed by the dischargers should include the following:
Continued Monitoring

- Monitoring of As and Cr should continue in both water and sediments, in both the Upper and Lower Bay, <u>and</u> tributary runoff, and Zn and Hg loads should be determined annually from tributary runoff.
- Monitoring of As and Cr should continue in fish and mussels in the Upper and Lower Bay.

Characterization studies

- A source identification study is needed to determine the source(s) of As and Cr. This study should include sampling of surface sediments throughout Lower Newport Bay, including marina sediments, to determine whether As and Cr exceed the ERM sediment guidelines and sediment toxicity is present.
- Sediments near boatyards should be tested to determine whether As and Cr exceed the ERM sediment guidelines and sediment toxicity is present.
- Total As and Cr from the Storm Drain Study should also be analyzed to determine total As and Cr loads from storm drains in the Turning Basin area (dissolved loads were calculated for study report).
- Vegetation and algae studies may also be warranted as algae was shown to contain As and Cr.

Remediation Strategies

- Remediation strategies are not proposed at this time since all sources of As and Cr have not been quantified. Of the sources that have been quantified, mean annual As and Cr loads from storm drains are small, along with the Cr load from tributaries. The mean annual As load from tributaries is higher and may be evaluated for possible source reduction.

7.0 RELATED ACTIONS FOR ALL METALS

The general category of “Metals” is still listed in Upper Newport Bay. Based on the results of the impairment assessment (Section 4.2.3), the general category of “Metals” should be DELISTED from Upper Newport Bay as explained in Section 3.3.

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Table 6-4 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***
1) In coordination with sediment Cu remediation (Cu TMDLs, Task 2, Table 5-8), 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)	*Dischargers/Responsible Parties* *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*
1.1 Develop a Zn and Hg 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. Implement the Zn and Hg Action Plan and Schedule. *1.1 (1) The dischargers shall submit a Zn and Hg 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.* *The proposed Zn and Hg Action 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 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).* *The proposed Zn and Hg 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 Zn and Hg Action Plan should also include continued monitoring of Zn in fish and mussel tissue (especially in the Lower Bay).* *1.1(2) The dischargers shall implement the Zn and Hg Action Plan and Schedule*	*Dischargers/Responsible Parties* *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* *1.1 (1) The Zn and Hg Action Plan and Schedule should be completed, as soon as possible but no later than (3 months from date of USEPA approval of BPA)* *1.1 (2) The Zn and Hg Action Plan and Schedule should be implemented upon Regional Board approval*
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	*Dischargers/Responsible Parties* *City of Newport Beach (City)* *County of Orange (County)*
2.1 Develop an As and Cr 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. Implement the Action Plan and Schedule. *2.1 (1) The dischargers shall submit an As and Cr Action Plan and schedule to conduct source analysis studies for As and Cr,*	*2.1 (1) The As and Cr Action Plan and Schedule should be completed, as soon as possible but no later than (3 months from date of USEPA approval of BPA)* *2.1 (2) The As and Cr Action Plan and Schedule should be implemented upon Regional Board approval*

and to remediate those sources of As and Cr. *The proposed As and Cr 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.* *The proposed As and Cr 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 As and Cr Action Plan should also include continued monitoring of As and Cr in fish and mussel tissue (in both the Upper and Lower Bay).* *2.1 (2) The dischargers shall implement the As and Cr Action Plan and Schedule*	
3) Consider Revisions to the Zn and Hg Action Plan and As and Cr Action Plan when Tasks 1 and 2 are Completed	*Within six months of the completion of implementation 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.*
4) The general category of "Metals" should be DELISTED from Upper Newport Bay as explained in Section 3.3	*In the next listing cycle.*

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8.0 CEQA ANALYSIS, ANTIDEGRADATION AND ECONOMICS

8.1 CEQA ANALYSIS

Pursuant to the California Environmental Quality Act (CEQA) and implementing regulations, including those established by the State Water Board, environmental analyses were conducted on the potential effects of the proposed amendments on a variety of environmental factors. These analyses are presented in "Substitute Environmental Document for Proposed Basin Plan Amendments for Copper (Cu) TMDLs and Action Plans for Zinc, Mercury, Arsenic and Chromium in Newport Bay", August 30, 2016 (SED) (Attachment to this Staff Report).

Section 1.1 of the SED describes the requirements pertaining to this analysis. In brief, the Secretary for Resources has certified the basin planning program as exempt from the requirement to prepare an Environmental Impact Report (EIR), Negative Declaration (ND) or Initial Study; however, an environmental analysis is to be presented in a substitute environmental document (SED). The SED must include: 1) a brief description of the proposed amendments (the proposed project); 2) identification of any significant or potentially significant adverse environmental impacts of the proposed amendments; 3) an analysis of reasonable alternatives to the proposed amendments, where the potential for any significant adverse environmental impact(s) is found, and mitigation measures to minimize those impacts; and, 4) an environmental analysis of the reasonably foreseeable methods of compliance, reasonably foreseeable significant adverse environmental impacts associated with those reasonably foreseeable methods of compliance, and reasonably foreseeable mitigation measures. In preparing the environmental analysis of reasonably foreseeable methods of compliance, the Regional Board is required to take into account a reasonable range of environmental, economic and technical factors, population and geographic areas and specific sites. However, the Regional Board is not required or encouraged to engage in speculation or conjecture, nor is the Board required to conduct a site-specific project level analysis of the methods of compliance.

Since the Regional Board is prohibited from specifying the design, location, type of construction, or particular manner of compliance with waste discharge requirements or other orders issued by the Board (Water Code Section 13360), those entities subject to the proposed Basin Plan amendments and orders of the Board, that may be derived therefrom, are required to conduct project-level CEQA analysis of compliance projects. Accordingly, the SED analyzes the potential environmental effects of implementing reasonably foreseeable methods of compliance on a programmatic level.

Based on the analyses presented in the SED, Regional Board staff has made the preliminary determination that the proposed amendments would not have a significant adverse effect on the environment, and therefore, no alternatives or mitigation measures are proposed. The SED evaluates environmental impacts that may occur from reasonably foreseeable methods of compliance with the metals numeric targets for Cu, Zn, Hg, As and Cr, and implementation of the Cu TMDLs and Zn, Hg, As and Cr Action Plans. The SED also evaluates environmental impacts that may occur for alternatives to the numeric targets and implementation of TMDLs and Action Plans and potential mitigation measures. The SED is intended to provide a high-level regulatory framework within which BMPs can be implemented in coordination with the TMDLs Implementation Plans or the Action Plans.

The evaluation in the SED finds that the proposed BPAs based on the recommended numeric targets for the Cu TMDLs and Zn, Hg, As and Cr Action Plans, including the saltwater CTR criteria for dissolved metals, the ERL sediment guidelines and the fish tissue guidelines, is the most environmentally feasible alternative and has the least associated significant adverse impacts than the other options. BMPs for the Cu TMDLs include methods to decrease Cu discharges from Cu hull paints on boats, including the conversion from Cu to nontoxic paints, the use of BMPs for hull

cleaning, and, in the short-term, the conversion to Cu hull paints with leach rates at or below DPR's maximum allowable leach rate of 9.5 µg/cm^2/d. BMPs for the remediation of sediment Cu (mostly in the Lower Bay marinas and the Turning Basin areas) will likely include dredging (during which there will likely be short-term impacts); however, dredging will remove sediments from the impaired areas and the Bay will be cleaner in the long run. In addition, dredging should remove sediment Zn and Hg (and other contaminants adsorbed to the sediments) along with sediment Cu.

In addition, the conversion of boats from Cu to nontoxic paints will decrease the discharges of both dissolved and total Cu, and Cu particulates, discharged from boat paints especially during hull cleaning, which will keep Bay waters and sediments cleaner after dredging.

With respect to fish tissue impairment by As and Cr, a source analysis needs to be conducted, after which a remediation plan will be developed; therefore, initially, there will be no environmental impacts.

8.2 ANTIDEGRADATION

ANTIDEGRADATION REQUIREMENTS

When considering adoption of the recommended Cu TMDLs and Zn, Hg, As and Cr Action Plans, the Regional Board must ensure conformance with both federal and state antidegradation policies (40 CFR 131.12 and State Board Resolution No. 68-16, respectively[12]). Specifically, the Regional Board must determine whether the implementation of the approved TMDLs would result in a lowering of water quality as defined in these policies. If there will be no lowering of water quality, then antidegradation requirements will be satisfied and no further analysis is required. Where the implementation of the TMDLs would result in a lowering of water quality, then adoption of the TMDLs must be accompanied by demonstrations that:

1) Beneficial uses will not be unreasonably affected;
2) Best practicable treatment and control of discharges will be provided to prevent pollution and nuisance; and
3) Water quality consistent with maximum benefit to the people of the State will be maintained.

In addition, the State Board has provided guidance to the Regional Boards regarding implementation, in permitting and other contexts, of both federal and state antidegradation policies.[13] Consistent with this guidance, the Regional Board may conduct a simplified antidegradation analysis where it finds that the lowering of water quality that would result from a proposed action would be insignificant in terms of magnitude, spatial extent and/or duration.

ANTIDEGRADATION ANALYSIS

The proposed Cu TMDLs identify numeric targets for water and sediments, and specify waste load allocations (WLAs) and load allocations (LAs) to meet the TMDLs (Tables 5-2 and 5-5). The proposed Zn, Hg, As and Cr Action Plans identify numeric targets for water, sediments and fish tissue (for the protection of human health and wildlife), but do not specify allocations since there are insufficient data on the sources of these metals (Table 6-1). Recommended implementation tasks and schedules for the Cu TMDLs and Zn, Hg, As and Cr Action Plans have also been detailed and require actions by the Regional Board and regulated parties. The intent of these actions is to

[12] The State Board has interpreted Resolution No. 68-16 to incorporate the federal antidegradation policy in situations, such as the surface waters of Newport Bay and its watershed, where the federal policy applies.

[13] Administrative Procedures Update (APU) 90-004 "Antidegradation Policy Implementation for NPDES Permitting"; Appendix I-4 to APU 90-004 – Memorandum re "Federal Antidegradation Policy" from William R. Atwater , Chief Counsel, to Regional Board Executive Officers, James W. Baetge and Ray Walsh, October 7, 1987; Questions and Answers, State Water Resources Control Board Resolution No. 68-16, February 16, 1995.

reduce discharges of these metals to the Bay to achieve the numeric targets and allocations in the TMDLs and Action Plans, and ultimately to improve water quality and correct impairment of beneficial uses.

A large decrease in dissolved Cu discharges from boats (83%) is required by the Cu TMDLs. This is expected to be achieved largely by the conversion of boats from Cu to nontoxic or non-Cu hull paints since Cu hull paints, and thereby Cu discharges, would be permanently removed from the Bay. In the interim while boats are converted from Cu to nontoxic or non-Cu paints, other BMPs should be implemented to reduce Cu discharges to the Bay. These include the use of BMPs for hull cleaning, and the conversion to Cu hull paints with leach rates at or below 9.5µg/cm^2/d. The hull cleaning BMPs may also include a container/filter hull cleaning that would prevent *all discharges from hull cleaning,* thereby reducing the amount of dissolved and total Cu and particulate Cu discharged into the Bay. This method would decrease Cu loads to the Bay and likely decrease Cu in both the water and sediments.

As discussed in the SED (attached), the conversion to nontoxic (and non-Cu) paints and use of BMPs are not expected to result in the lowering of water quality.

The remediation of sediment Cu in the Lower Bay will likely occur by dredging areas that exceed the sediment guidelines (mostly marinas and the Turning Basin areas). Dredging to remediate Cu impairment in sediments is also expected to remediate Zn and Hg sediment impairment. The remediation of sediment Zn by dredging may also decrease Zn concentrations in fish tissue.

As described in the SED, dredging activities may result in increased turbidity and reduced dissolved oxygen concentrations in areas in and adjacent to the dredging operations. There is also the potential for mobilization of pollutants adhered to sediments when those sediments are disturbed/removed; however, these impacts are expected to be short-term and localized in nature. Waste discharge requirements issued by the Regional Board to regulate discharges associated with these dredging operations would include provisions for the implementation of BMPs designed to minimize and prevent such adverse impacts. No significant, long-term lowering of water quality is anticipated.

CONCLUSIONS

Based on the above discussion, implementation of the approved Cu TMDLs and Zn, Hg, As and Cr Action Plans will not result in a significant, long-term lowering of water quality. The goal and anticipated effects of these TMDLs and Action Plans is to improve water quality and protect beneficial uses. The proposed TMDLs and Action Plans are, therefore, in conformance with both federal and state antidegradation policies.

8.3 ECONOMICS - COST CONSIDERATIONS

COST CONSIDERATIONS TO ACHIEVE BOAT NUMERIC TARGETS AND TMDL ALLOCATIONS FOR Cu FROM HULL PAINTS

The proposed Cu TMDLs and recommended implementation plan could result in additional costs for dischargers (in particular boaters).

1) Conversion from Cu to nontoxic or non-Cu hull paints

The major method of meeting the Cu TMDLs' allocations is the conversion from Cu to nontoxic or non-Cu hull paints. The proposed schedule of compliance allows for the conversions to take place over time as part of the normal boat maintenance process; however, the conversion from Cu to

nontoxic or non-Cu paints will involve an initial expense since the Cu hull paints need to be stripped before the application of nontoxic paints. Additionally, most nontoxic paints need to be sprayed on rather than rolled-on like Cu paints and paint cost may be higher than the cost of Cu paints. While nontoxic paints cost more to apply and must be cleaned more often, they are more durable and in the long term may cost less than Cu hull paints, since nontoxic paints may last 5-7 years compared to 2-3 years for Cu paints (San Diego Unified Port District 2011). (Costs for nontoxic paints in Newport Bay averaged approximately $5,000 for a 40 foot boat in 2011 (Coastkeeper 2013). Non-toxic paint costs are also shown below (Table 8-1).

Table 8-1 Costs of alternative antifouling coatings

Type	Cost/gal	Coverage (square feet)
Epoxy	$89 - $140	315-1,574
Ceramic-Epoxy	$98	136
Siliconized Epoxy	$189-$350	144-220
Polymer Based	$40	400

Source: Gonzalez and Johnson, 2008. Prices and other information were effective as of July 2007.

2) Use of BMPs for Hull Cleaning and Alternative Methods such as the Container/Filter Method
BMPs must also be used to achieve the allocation to boats in the Cu TMDLs. These include the use of soft cloths for hull cleaning. The conversion from the use of non-BMPs to BMPs (abrasive pads to soft cloths) will reduce Cu discharge to Bay waters, and thereby improve environmental conditions. In addition, a new BMP strategy for cleaning hulls consists of a container/filter strategy where the boat is cleaned inside a slip liner specifically made for hull-cleaning, and after cleaning the water is filtered through multiple filters to remove pollutants before being returned to the Bay. In addition, the particulates and fouling that settle to the bottom of the container are removed, dried and taken to an appropriate landfill. This cleaning method costs approximately double that of a routine cleaning by a diver; however, *all discharges from hull cleaning are removed from Bay waters.*

3) Convert to lower leach rate Cu AFPs
In the interim as boats are converted to nontoxic AFPs, boaters may reduce Cu discharges by using Cu AFPs with leach rates at or below DPR's maximum allowable leach rate of 9.5 $\mu g/cm^2/d$ for Cu AFPs. The cost of Cu paints with lower leach rates should be comparable (or even lower) than Cu paints currently in use; however, paints with lower Cu may need to be painted more frequently (Carson 2002).

3) Dredging to Remediate Sediment Cu in Lower Newport Bay
Dredging will likely be necessary to remediate sediment Cu in Lower Bay (mostly in marinas and the Turning Basin areas). Initially, a more extensive marina study needs to be conducted to determine the extent of sediment Cu exceedances in marinas. Costs will include the study cost, and the cost of dredging to remediate marinas that exceed the sediment Cu guidelines.

COST CONSIDERATIONS TO ACHIEVE NUMERIC TARGETS FOR Zn, Hg, As AND Cr

Zn and Hg: Dredging to Remediate Sediment Cu in Lower Newport Bay
The dredging required to remediate sediment Cu in the Lower Bay, will also remove sediment Zn and Hg; therefore, no additional dredging costs are anticipated to remediate sediment Zn and Hg over those required for dredging sediment Cu to meet the Cu TMDLs.

As and Cr: Source Identification Study to Characterize Sources of As and Cr in Upper and Lower Newport Bay
Action Plans rather than TMDLs are recommended for As and Cr since sources of these metals are not well characterized and allocations cannot be assigned. Impairment for As and Cr was found in

fish tissue. A more complete source analysis needs to be conducted so that BMPs may be identified and implemented to remediate these metals. Additional remediation costs may be required after sources have been identified, and an implementation plan is developed. The costs of these BMPs cannot be determined at this time.

9.0 PEER REVIEW, STAKEHOLDER PARTICIPATION, AND STAFF RECOMMENDATION

9.1 PEER REVIEW

Pursuant to Health and Safety Code Section 57004, proposed rules that have a scientific basis or components generally must be submitted for external scientific peer review. This additional review is not required if a new application of an adequately peer review product does not depart significantly from its scientific approach.

The recommended Cu TMDLs rely on the same scientific approach and peer-reviewed model employed by USEPA in establishing the Toxics TMDLs for Cu and other metals in 2002. Peer reviewed models developed by the US Navy were used to calculate load allocations for Cu. Therefore, additional scientific peer review of the proposed Cu TMDLs is not necessary.

Findings of impairment for Zn, Hg, As and Cr were based on the methodology set forth in the State Board's Listing Policy, and used criteria set forth in that Listing Policy and/or recommended by the USFWS based on peer reviewed literature. The recommended Action Plans for these constituents rely on further investigations of the Bay and possible sources to direct future action. Therefore, no scientific peer review of the proposed Action Plans is required.

9.2 STAKEHOLDER PARTICIPATION

In accordance with the State Water Board's regulations for the implementation of CEQA, Board staff held two CEQA scoping meetings on July 23, 2015 (afternoon and evening) in Newport Beach, Calfornia. Notice of the meetings was posted on the Regional Board website and sent electronically to those included on the Board's Lyris list for the metals TMDLs. At the scoping meetings, an overview of the amendments was presented by Board staff. The scoping meeting provided participants the opportunity to comment on the proposed basin plan amendments and appropriate scope and content of the SED to be prepared for the proposed Basin Plan amendments (BPAs). Oral and written comments were received at and in response to the scoping meetings. These comments and Board staff's responses are attached as a separate document.

A presentation to the Regional Board and the public on the proposed BPAs was conducted on July 24, 2015.

Regional Board Staff participate in and contribute to the Statewide Marina Workgroup, Cu Workgroup Meetings, and Alternative Boat Paint Meetings with staff from other Regional Boards and State Board, DPR, Coastal Commission, Port of San Diego and other local agencies. Regional Board staff also attend stakeholder meetings including the Newport Bay Watershed Management Committee, OC Coastal Coalition and others. These meetings offer a forum for discussion with staff of regulatory agencies (and interested and affected parties) of Cu and other metals issues in the waters of the State. The marina workgroup, in particular, has focused on Cu issues in marinas since Cu exceeds water quality criteria in a number of marinas, especially in southern California. A number of Cu studies and legislative actions have resulted from these meetings.

The Regional Board will conduct a public hearing, on October 28, 2016, to consider adoption of the proposed amendments. Changes to the proposed amendments may be made in response to comments provided. A Notice of Public Hearing/Notice of Filing (Notice) was published in newspapers of general circulation in Orange County and the City of Newport Beach (August 30, 2016). The Notice was also posted on the Regional Board website and sent electronically to the Board's Lyris mailing list. The Notice was published, posted and distributed at least 45 days prior to the scheduled Regional Board meeting. Regional Board staff will prepare written responses to comments that are received in accordance with the schedule established in the Notice. Written comments and responses will be included in the administrative record of this matter as an attachment to this staff report.

9.3 STAFF RECOMMENDATION

Regional Board staff recommends that the Regional Board approve Resolution No. RS-2016-0059, to 1) Confirm the preliminary determination by Regional Board staff that the proposed amendments could not have a significant effect on the environment and certifying the environmental checklist and analysis document (Attachment 2 to the staff report); and, 2) Incorporate the Basin Plan amendments shown in the attachment to Resolution No. 2016-0059.

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shows Hg guidelines as 0.1, 0.2, 0.3 µg/g ww for wildlife, fish and human health, respectively

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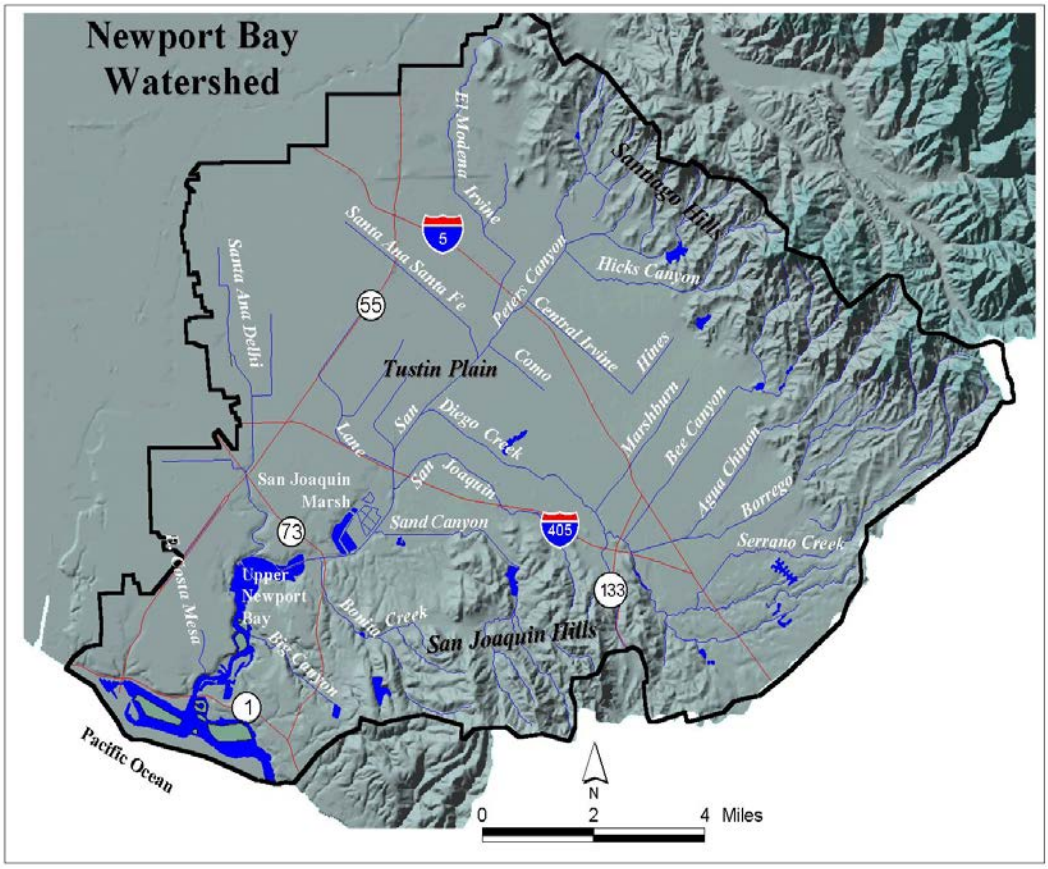
APPENDIX 0 MAP OF NEWPORT BAY WATERSHED



APPENDIX 1 303d HISTORY AND SUMMARY FOR NEWPORT BAY AND SAN DIEGO CREEK

Table 1-1 303d List Summary for toxic pollutants including metals in Upper and Lower Newport Bay (Summary as of 2010)

	Upper Newport Bay (Ecological Reserve)	**Lower Newport Bay**
1990	Elevated shellfish tissue levels -no pollutants listed	Elevated shellfish tissue levels -no pollutants listed
1991	Threat of recreational impacts Threat of toxic pollutants	same as 1990
1994	same as 1991	Recreational impacts Elevated shellfish tissue levels Toxic bioassay results
12 Tab1996	Recreational impacts Sedimentation **Threat of toxic pollutants** Threat from stormwater runoff	same as 1994 **Heavy metals, Toxic pollutants** Public health concern
1998	**Metals** Sedimentation/Siltation	**Metals**
2002	**Metals**	**Metals**
2006	**Copper, Metals** Sediment Toxicity	***Copper** Sediment Toxicity
2010	**Copper, Metals** Sediment Toxicity	**Copper** Sediment Toxicity

*In Lower Bay, the general category of 'Metals' was Delisted due to State Board assessment of individual metals in 2006 (all metals assessed were Do Not List except for Copper)
http://www.waterboards.ca.gov/santaana/water_issues/programs/tmdl/docs/303d/2010_303d.pdf

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Table 1-2 303d List Summary for toxic pollutants including metals in San Diego Creek – Reaches 1, 2 (Summary as of 2010)

	San Diego Creek	
1986-87	SD Creek	no pollutant
1990	split into Reaches 1, 2	Elevated fish tissue levels, Elevated shellfish tissue levels no pollutants listed
1991	Reaches 1,2	same as 90
1994	Reaches 1,2	same as 91
1996	Reaches 1,2	same as 94, still no pollutants listed
	Reach 1	+ Sedimentation
1998	Reaches 1,2	pollutants added
	Reach 1	**metals,** sedimentation/siltation
	Reach 2	**metals,** unknown toxicity sedimentation/siltation
2002	Reach 1	**metals off R1** (USEPA's Toxics TMDL promulgated)
	Reach 2	**metals,** unknown toxicity metals still on R2 (should have been removed w/R1)
2006	Reach 1	**individual metals data reviewed by SB (Cd, Cu, Cr, Pb, Ni are Do Not List (DNL)), (Zn is DNL but fact sheet is missing)**
	Reach 2	**metals** **request to delist metals submitted w/ OC data** **–RB staff agrees w/request to delist Reach 2**
2010	Reach 1	**no metals listed**
	Reach 2	**no metals listed** **(unknown toxicity)**

*Reach 1 is downstream of Jeffrey Road, ^Reach 2 is upstream of Jeffrey Road to the headwaters
http://www.waterboards.ca.gov/santaana/water_issues/programs/tmdl/docs/303d/2010_303d.pdf

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APPENDIX 2 SUMMARY OF DECISION SHEETS (CORRECTED) AS OF 2010

Upper Newport Bay					
Metal	**status**	**water (>CTR criteria)**	**sediment**	**tissue**	
Cu (4972)	**LIST**	***0/3 BG'03 Correct*** **2/4 USEPA'04** ***13/27 CK'07 Add***	**0/2 >ERM BG'03**		
Ag (5797) also(5911)	**DNL**	**0/3 BG'03**	**0/2 >PEL BG'03**		
As (5776)	**DNL**	**0/3 BG'03**	**0/2 >ERM BG'03**	**0/23 fish TSMP'00**	
Cd (5550)	**DNL**	**0/3 BG'03**	**0/2 >PEL BG'03**	**0/8 fish TSMP'00**	
Cr (5723)	**DNL**	***0/3 BG'03 Add***	***0/2 >PEL BG'03 Add***		
Pb (5869)	**DNL**	**0/3 BG'03**	***0/2 >PEL BG'03 Correct***		
Hg (5206)	**DNL**	***0/3 BG'03***	***0/2 >PEL BG'03 Correct*** ***0/6 >ERM Ph'98 Add***	**0/23 fish TSMP'00**	
Ni (4960)	**DNL**	**0/3 BG'03**	***0/2 >PEL BG'03 Add***		
Zn **Add sheet**	**DNL**	***0/3 BG'03 Add***	***0/2 >PEL BG'03 Add***		
****Metals (7267)**	**LIST**	**should be DELISTED**			
Toxicity		***10/15 Bay'04***	***6/10 Bay'04*** ***3/12 Ph'98*** ***6/6 Ph'98 (porewater)***		
Lower Newport Bay					
Metal	**status**	**water (>CTR criteria)**	**sediment**	**tissue**	
Cu (5752)	**DONOT DELIST**	***58/78 CK'07 Add***	***1/3 >PEL BG'03*** ***16/78 >ERM CK'07 Add***		
Ag, An, Cd, Pb, Zn (5546)	**DNL**		**0/3 >ERM BG'03** ***Zn 12/78>ERM CK'07Add***		
As (4395)	**DNL**		**0/3 >ERM BG'03**	**0/74 fish TSMP'00**	
Cd (4316)	**DNL**		**0/3 >PEL BG'03**	**0/74 fish TSMP'00**	
Cr ***Add sheet***	***DNL***		***0/3 >PEL BG'03 Add***	***Add*** ***0/74 fish TSMP'00***	
Hg (5753)	**DNL**		***1/3 >PEL BG'03 Correct*** ***3/11 >ERM Ph'98 Add*** ***7/13 >ERM NF'09 Add*** ***24/78 >ERM CK'07 Add***	**0/74 fish TSMP'00**	
Ni ***Add sheet***	***DNL***		***0/3 >PEL BG'03 Add***	***Add*** ***0/74 fish TSMP'00***	
****Metals (6772)**	**DELIST**				
Toxicity		***8/10 Bay'04***	***8/10 Bay'04*** ***6/18 Ph'98*** ***11/12 Ph'98 (porewater)***		

*Additions to Decision sheets in blue and italics and show "Add"
Corrections are in blue and italics and show "Corr"

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Benthic Degradation showed 2/6 Transitional, 0/6 Degraded sites for Upper Bay, and 5/13 Transitional, 4/13 Degraded sites for Lower Bay; and significant correlation w/benthic index and Cd, Cr, Cu, Fe and Ni (Phillips'98)
Decision sheets can be downloaded at the following links
http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml (Appendix 5)
http://www.waterboards.ca.gov/water_issues/programs/tmdl/2010state_ir_reports/table_of_contents.shtml

TABLE REFERENCES
BG'03 =Bay & Greenstein 2003 (#439)
Bay'04 =Bay *et al.* 2004 (#722)
Ph'98 =Phillips *et al.* 1998 (#706)
CK'07 =OC Coastkeeper 2007
NF'09 =NewFields 2009

DATA NOT SHOWN in Decision sheets
Allen *et al.* 2004 (#441)
Bay'04 –no dissolved metals >CTR (Cu, Zn, Hg, As, Cd, Cr, Pb, Hg, Ni, Ag)
CK'07 =OC Coastkeeper 2007 –submitted for 2012
(For CK data, exceedances for all metals analyzed, except Cu, were 0/27 Upper Bay, 0/78 Lower Bay, sediment toxicity was also analyzed in this study)
Orange Co monitoring data

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http://www.waterboards.ca.gov/water_issues/programs/tmdl/2010state_ir_reports/table_of_contents.shtml#r8
http://www.waterboards.ca.gov/water_issues/programs/tmdl/2010state_ir_reports/00033.shtml#6772

DECISION ID 6772 Region 8
Newport Bay, Lower (entire lower bay, including Rhine Channel, Turning Basin and South Lido Channel to east end of H-J Moorings)

Pollutant:	**Metals**
Final Listing Decision:	**Delist from 303(d) list (TMDL required list)**
Last Listing Cycle's Final Listing Decision:	Delist from 303(d) list (TMDL required list)(2006)
Revision Status	Original
Reason for Delisting:	Flaws in original listing
Impairment from Pollutant or Pollution:	Pollutant
Conclusion:	This pollutant is being considered for removal from the section 303(d) list under section 4.1 of the Listing Policy. Under section 4.1 a single line of evidence is necessary to assess listing status. Based on the readily available data and information, the weight of evidence indicates that there is sufficient justification in favor of removing this water segment-pollutant combination from the section 303(d) list. Currently, Newport Bay, lower, is listed for metals. It is not possible, in a general listing, to determine which specific pollutant is causing or contributing to a water quality impacts. There is sufficient justification for removing the general listings for metals from the 303(d) list and replace these general listings with the specific pollutants when found to be exceeding.
RWQCB Board Staff Recommendation:	No new data were assessed for 2008. The decision has not changed.
SWRCB Board Staff Recommendation:	After review of this Regional Board decision, SWRCB staff recommend the decision be approved by the State Board.
USEPA Decision:	

Line of Evidence (LOE) for Decision ID 6772, Metals Region 8
Newport Bay, Lower (entire lower bay, including Rhine Channel, Turning Basin and South Lido Channel to east end of H-J Moorings)

LOE ID:	295
Pollutant:	Metals
LOE Subgroup:	Narrative Description Data
Matrix:	Not Specified
Fraction:	None
Beneficial Use:	Marine Habitat
Number of Samples:	0
Number of Exceedances:	0
Data and Information Type:	Not Specified
Data Used to Assess Water Quality:	Currently, Newport Bay, lower, is listed for metals. It is not possible, in a general listing, to determine which specific pollutant is causing or contributing to a water quality impacts. There is sufficient justification for removing the general listings for metals from the 303(d) list and replace these general

	listings with the specific pollutants when found to be exceeding.
Data Reference:	Placeholder reference 2006 303(d)
Water Quality Objective/Criterion:	
Objective/Criterion Reference:	
Evaluation Guideline:	
Guideline Reference:	
Spatial Representation:	
Temporal Representation:	
Environmental Conditions:	
QAPP Information:	QA Info Missing
QAPP Information Reference(s):	

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http://www.waterboards.ca.gov/water_issues/programs/tmdl/2010state_ir_reports/00147.shtml#7267

DECISION ID 7267 Region 8
Newport Bay, Upper (Ecological Reserve)

Pollutant:	**Metals**
Final Listing Decision:	**List on 303(d) list (TMDL required list)**
Last Listing Cycle's Final Listing Decision:	List on 303(d) list (TMDL required list)(2006)
Revision Status	Original
Sources:	Urban Runoff/Storm Sewers
Expected TMDL Completion Date:	2019
Impairment from Pollutant or Pollution:	Pollutant
Conclusion:	303(d) listing decisions made prior to 2006 were not held in an assessment database. The Regional Boards will update this decision when new data and information become available and are assessed.
RWQCB Board Staff Recommendation:	No new data were assessed for 2008. The decision has not changed.
SWRCB Board Staff Recommendation:	N/A
USEPA Decision:	

Line of Evidence (LOE) for Decision ID 7267, Metals Region 8
Newport Bay, Upper (Ecological Reserve)

LOE ID:	4426
Pollutant:	Metals
LOE Subgroup:	Pollutant-Water
Matrix:	Water
Fraction:	Not Recorded
Beneficial Use:	Cold Freshwater Habitat
Number of Samples:	0
Number of Exceedances:	0
Data and Information Type:	Not Specified
Data Used to Assess Water Quality:	Unspecified--This LOE is a placeholder to support a 303(d) listing decision made prior to 2006.
Data Reference:	Placeholder reference pre-2006 303(d)
Water Quality Objective/Criterion:	Unspecified
Objective/Criterion Reference:	Placeholder reference pre-2006 303(d)
Evaluation Guideline:	Unspecified
Guideline Reference:	Placeholder reference pre-2006 303(d)
Spatial Representation:	Unspecified
Temporal Representation:	Unspecified
Environmental Conditions:	Unspecified
QAPP Information:	Unspecified
QAPP Information Reference(s):	

APPENDIX 3 STATE LISTING POLICY FOR IMPAIRED WATERS *(Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List, SWRCB 2004)*

Table 3.1 is from the State Listing Policy and shows the number of exceedances needed to identify a waterbody as impaired.

Table 3.1: Minimum number of measured exceedances needed to place a water segment on the section 303(d) list for toxicants

Null Hypothesis: Actual exceedance proportion < 3 percent.
Alternate Hypothesis: Actual exceedance proportion > 18 percent.
The minimum effect size is 15 percent.

Sample Size	List if the number of exceedances equal or is greater than
2 – 24	2*
25 – 36	3
37 – 47	4
48 – 59	5
60 – 71	6
72 – 82	7
83 – 94	8
95 – 106	9
107 – 117	10
118 – 129	11

*Application of the binomial test requires a minimum sample size of 16. The number of exceedances required using the binomial test at a sample size of 16 is extended to smaller sample sizes.

For sample sizes greater than 129, the minimum number of measured exceedances is established where α and β < 0.2 and where |α - β| is minimized.

α = Excel® Function BINOMDIST(n-k, n, 1 – 0.03, TRUE)
β = Excel® Function BINOMDIST(k-1, n, 0.18, TRUE)
where n = the number of samples,
k = minimum number of measured exceedances to place a water on the section 303(d) list,
0.03 = acceptable exceedance proportion, and
0.18 = unacceptable exceedance proportion.

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APPENDIX 4 ADDITIONAL DATA ANALYSIS FOR SOME INDIVIDUAL STUDIES

4.1 Lower Newport Bay Copper-Metals Marina Study *(Marina Study 4.2.2.1)*

(OC Coastkeeper and Candelaria, 2007)
http://www.waterboards.ca.gov/santaana/water_issues/programs/tmdl/docs/newport/finalcufinal_report.pdf

The goal of this project was to determine 1) whether Copper (Cu) and other metals were elevated in marinas compared to the channel outside each marina, 2) whether Cu and other metals exceeded CTR saltwater criteria in marina and channel waters, 3) whether Cu and other metals exceeded sediment ERM and ERL guidelines, and 4) whether water and/or sediment toxicity was present. These data were also collected to provide additional data to the Department of Pesticide Regulation (DPR) on Cu concentrations and water and sediment toxicity in marina areas.
Water and sediment samples were collected in 8 marinas and in the channel outside each marina. Water samples were analyzed for dissolved and total metals (USEPA priority metals), DOC, TSS and salinity; sediment samples were analyzed for total metals and TOC. Samples were collected in May, August and December 2006, and a total of 105 water samples and 105 sediment samples were collected. In summer 2006 (August)**,** a subset of water and sediment samples was also analyzed for water and sediment toxicity, and PCBs and PAHs; sediments were also analyzed for grain size.

Results
Water Dissolved Copper (Cu) was the only metal to exceed the acute and chronic CTR saltwater criteria (4.8, 3.1µg/L) (Table 4-1). Cu means were higher, in general, in marinas compared to their corresponding channels although this was not statistically significant because the Turning Basin area in the Lower Bay had elevated metals in both marina and channel waters (Table 4-2). Note that marina and channel Cu means in the Turning Basin area and S. Lido Channel ALL exceeded the Cu CTR saltwater criteria. Mean dissolved Cu concentrations in water exceeded the Cu CTR saltwater criteria in 6/8 marinas and 4/8 channels.
Sediment In sediment samples, Cu, Mercury (Hg), and Zinc (Zn) exceeded the ERM sediment guidelines in the Lower Bay, and most of the exceedances were in the Turning Basin area, which demonstrates that the Turning Basin area should be noted as an area of concern (Table 4-1). Sediments also exceeded the ERL sediment guidelines for Cu, Zn, Hg, Cd, Ni, Pb, As, Ag (Table 4-1). (ERL sediment guidelines from Long et al. 1995, are commonly used as targets for metals tmdls.). Mean sediment Cu concentrations exceeded the ERM or ERL sediment guidelines in 8/8 marinas and 7/8 channels.
Toxicity No water toxicity was found in samples tested; however, sediment toxicity was found at most sites tested (Table 4-2). A map of sampling sites is shown in this appendix, Figure 4-0. This report was one of those evaluated by DPR during the decision process to reevaluate the registration of Cu boat bottom paints.

Impairment (Copper (Cu) in water; Cu, Zinc (Zn), Mercury (Hg) in sediments, Sediment Toxicity)
****Water** The data demonstrate that both Upper and Lower Newport Bay waters are still impaired for Cu. Bay waters tested exceed the dissolved Cu CTR saltwater criteria. Bay waters tested include marina waters within the Bay.

Sediment The data also show that sediments exceed the ERM guidelines for Cu, Zn and Hg in the Lower Bay, especially in the Turning Basin area, and the majority of sediments analyzed were positive for toxicity.

Table 4-1 Newport Bay Marina Study –Data from 2006

Exceedances of CTR saltwater criteria, Sediment guidelines ERM (ERL)										
		Water*	**Sediment**							
	n	**Cu**	**Cu**	**Zn**	**Hg**	**Ag**	**Cd**	**Ni**	**Pb**	**As**
Criteria or Guideline ERM (ERL)		Acute, chronic 4.8, 3.1	270 (34)	410 (150)	0.71 (0.15)	3.7 (1.0)	9.6 (1.2)	51.6 (20.9)	218 (46.7)	70 (8.2)
Upper Bay										
Dunes	**12**	**0, 5**	**(12)**	**(8)**			**(10)**	**(6)**		**(3)**
DeAnza	**15**	**1, 7**	**(13)**	**(11)**	**(1)**		**(6)**	**(10)**		**(7)**
Lower Bay										
BYB	**15**	**3, 2**	**1 (14)**	**(14)**	**2 (9)**			**(13)**		**(12)**
Bahia	**15**	**0, 5**	**1 (14)**	**(10)**	**(5)**		**(11)**	**(9)**		**(8)**
Harbor	**12**	**4, 7**	**4 (8)**	**7 (4)**	**2 (2)**	**1 ( )**	**(10)**	**(9)**	**(11)**	**(10)**
Lido Vill	**12**	**8, 4**	**2 (10)**	**(11)**	**4 (7)**	**(2)**		**(11)**	**(9)**	**(11)**
Lido Yacht	**12**	**7, 5**	**8 (4)**	**4 (8)**	**12 ( )**		**(4)**	**(11)**	**(4)**	**(12)**
H & J	**12**	**2, 8**	**(12)**	**1 (11)**	**4 (8)**		**(1)**	**(9)**		**(10)**
Total –all sites	**105**	**66**	**16 (60)**	**12 (77)**	**24 (31)**	**1 (2)**	**(42)**	**(78)**	**(24)**	**(73)**

*other metals analyzed in water (Zn, Hg, As, Cd, Cr, Pb, Ni, Ag) have NO exceedances of CTR acute or chronic saltwater criteria
n =number of samples

Table 4-2 Mean Cu concentrations in water and sediment + sediment toxicity (Marina study)

	Water –dissolved Cu (µg/L)			**Sediment (µg/g)**			**Sediment Toxicity***
	marina	**channel**	**max**	**marina**	**channel**	**max**	
Dunes	**3.1**	**2.1**	**4.0**	**82**	**44**	**121**	**X**
DeAnza	**3.7**	**2.3**	**6.8**	**111**	**32**	**169**	**X**
BYB	**3.9**	**2.2**	**5.6**	**155**	**110**	**279^**	**0**
Bahia	**3.0**	**2.0**	**4.4**	**184**	**79**	**350**	**X**
Harbor	**5.2**	**5.0**	**8.2**	**197**	**203**	**536^**	**X**
Lido Vill	**5.6**	**4.4**	**11.0**	**233**	**104**	**318**	**XX**
Lido Yacht	**5.8**	**4.9**	**10.0**	**317**	**175**	**365**	**0X**
H & J	**3.8**	**3.5**	**4.9**	**155**	**136**	**216**	**X**

blue numbers -exceed water quality criteria or sediment guidelines (ERM, ERL)
^ maximum sediment concentration was near a storm drain outlet
*Sediment toxicity, X = toxic (all toxicity was < 70% survival)
XX or 0X = 2 samples at that site

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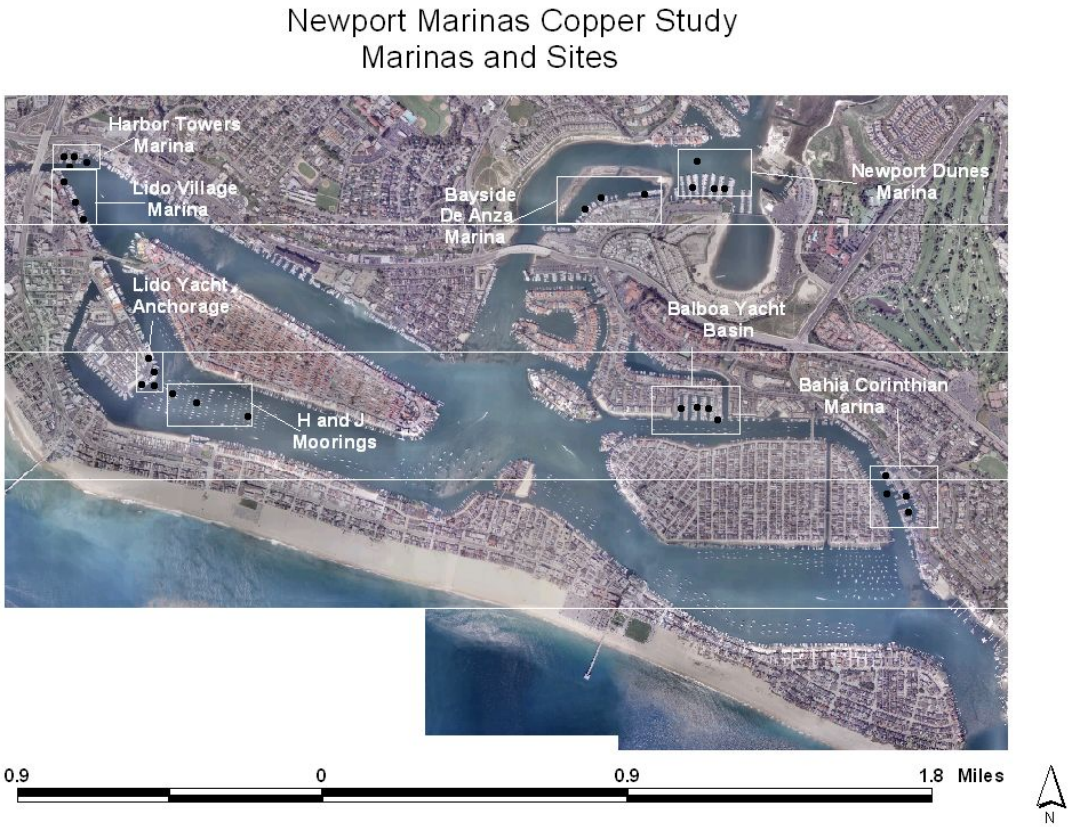
Figure 4-1 Map of Lower Newport Bay Marina Sites (Marina Study 4.2.2.1)



*Note that the Northwest corner of the Bay, including Harbor Towers Marina and Lido Village Marina, is considered to be the Turning Basin area of Newport Bay

4.2 Orange County storm water/dry weather and sediment data in Bay monitoring (County of Orange (OC) stormwater monitoring data 4.2.2.2)

Monitoring is ongoing and quarterly (OC Stormwater data 2006-09).
Water samples are analyzed for dissolved metals, and sediment samples are analyzed for total metals and sediment toxicity.

Results
Water Dissolved Copper (Cu) concentrations exceeded the CTR acute and chronic saltwater criteria (4.8 and 3.1µg/L, respectively) (Figure 4-2). No other metals exceeded the dissolved CTR saltwater criteria in water samples.
Sediment In sediment samples, only Mercury (Hg) exceeded the ERM sediment guidelines in two samples in the Lower Bay in the Turning Basin area; however, there were numerous exceedances of the ERL sediment guidelines for multiple metals (Cu, Zn, Hg, Cd, Ni, As) (Table 4-3). There was a higher percent of ERL exceedances in the Lower Bay compared to the Upper Bay for most metals, except for Cd, and a higher number of exceedances in 2006-07 compared to other years (Figure 4-3).
Toxicity Sediment toxicity was found in 12/16, 3/6 and 1/16 samples in the Upper Bay, and in 6/8, 0/6 and 0/8 sites in the Lower Bay, for 06/07, 07/08 and 08/09, respectively (Figure 4-4). Note that more samples in the Upper Bay showed toxicity in this data set, while only Cd had a higher percent of exceedances in the Upper Bay compared to the Lower Bay in 2007-09. (Cu, Zn, Hg, Ni, Pb and As all had a higher percent of exceedances in the Lower Bay).

Impairment (Copper (Cu) in water, Sediment toxicity)
****Water** The data demonstrate that Lower Newport Bay waters are still impaired for Cu. Bay waters tested did not include marina waters in this study.

Sediment The data also show that sediments exceed the ERM guidelines for Hg in the Lower Bay, and the sediments analyzed were positive for toxicity.

Table 4-3 Exceedances of ERM (ERL) sediment quality guidelines by year

	(OCPFRD data 2006/07, 2007/08, 2008/09)		
Metal**	**Upper Bay**	**Lower Bay**	**Sediment guidelines ERM (ERL)**
***Cu**	(7/17, 5/12, 7/16)	(8/8, 9/12, 7/8)	270 (34)
***Zn**	(2/17, 3/12, 4/16)	(6/8, 6/12, 4/8)	410 (150)
Hg	(0/15, 0/12, 0/16)	1/7, 1/10, 0/8 (3/7, 4/10, 5/8)	0.71 (0.15)
***Cd**	(5/17, 1/12, 4/16)	(4/8, 0/12, 0/8)	9.6 (1.2)
***Pb**	(0/17, 0/12, 0/16)	(2/8, 3/12, 2/8)	218 (46.7)
Ni	(2/17, 1/12, 5/16)	(4/8, 5/12, 4/8)	51.6 (20.9)
Ag	(1/17, 0/12, 0/16)	(0/8, 0/12, 1/8)	3.7 (1.0)
As	(3/17, 1/12, 5/16)	(5/8, 5/12, 4/8)	70 (8.2)

* Metals requiring TMDLs in the Newport Bay Toxics TMDLs (USEPA 2002)

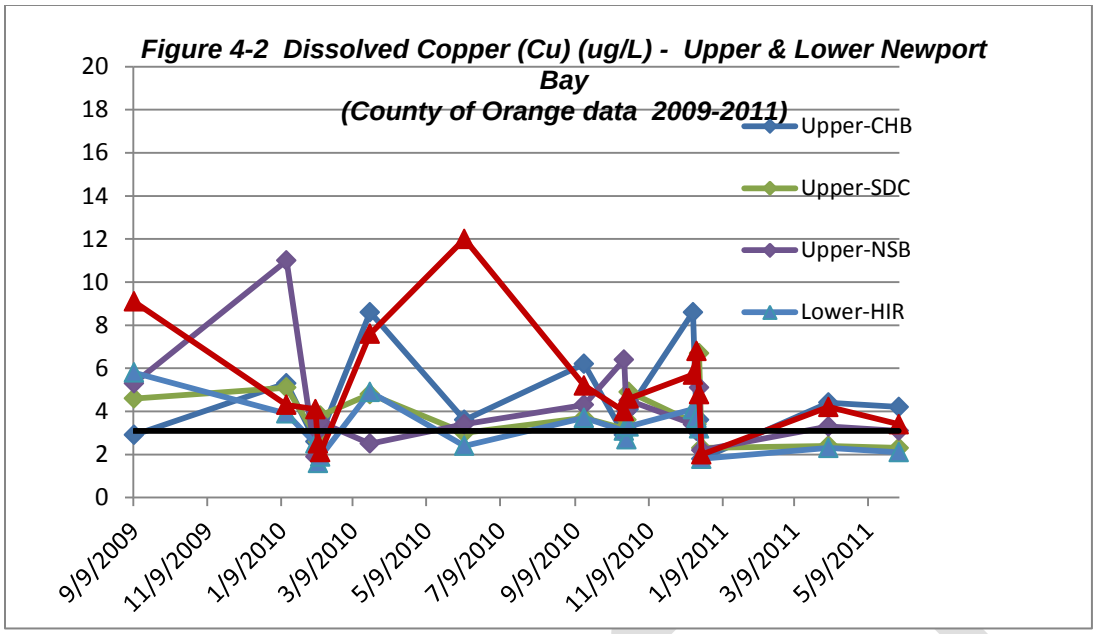
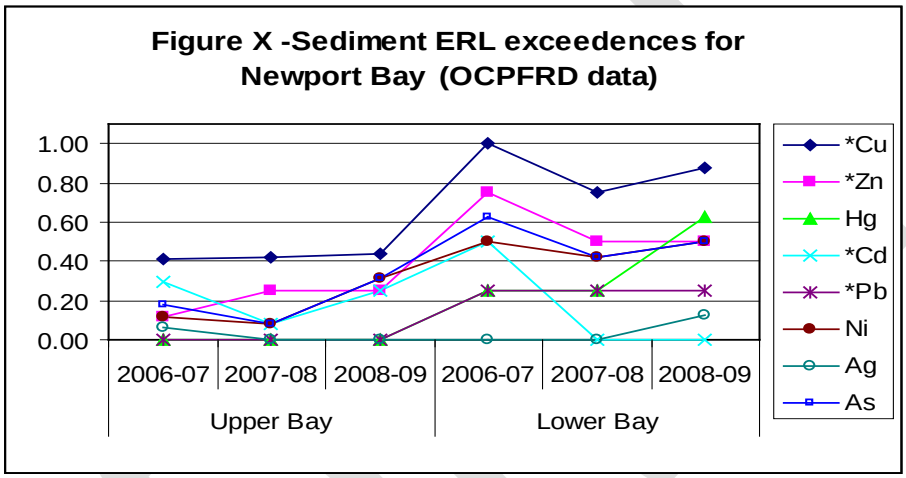
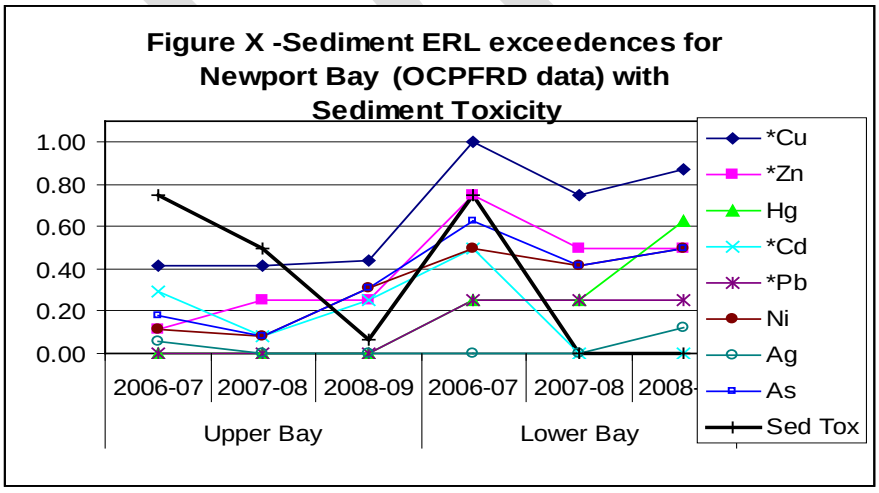


Figure 4-3

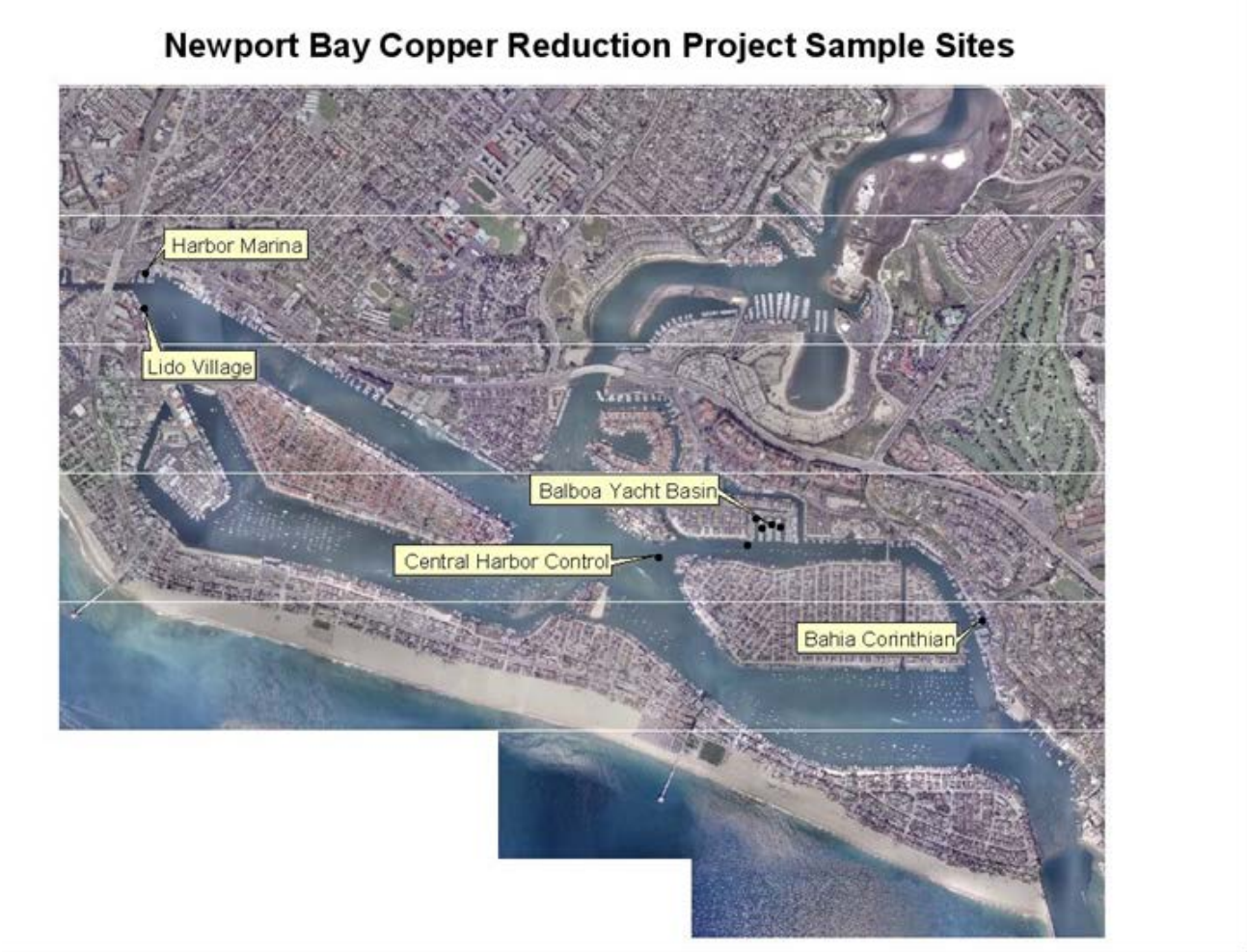


*****USEPA Toxics TMDL metals / *Figure 4-4*



*****USEPA Toxics TMDL metals

Figure 4-5 Map of Lower Newport Bay Sites (Copper Reduction Study 4.2.2.3)



APPENDIX 5 OLDER STUDY (BPTCP) used to evaluate Newport Bay for 303d list
Sediment Chemistry, Toxicity and Benthic Community Conditions in Selected Water Bodies of the Santa Ana Region (BPTCP -Phillips *et al.* '98)

This study was part of the Bay Protection and Toxic Cleanup Program (BPTCP) to monitor and assess the sediments in some California bays and estuaries using the Sediment Quality Triad approach to determine hot spots. This approach uses sediment chemistry, sediment toxicity and benthic data to determine the extent of contamination in a waterbody. In this study, samples were collected from Newport Bay, Anaheim Bay/Seal Beach and Huntington Beach/Bolsa Chica. Only Newport Bay results are discussed here.
Eighteen sites were sampled in Newport Bay. Subsurface water, pore water, sediment and benthic samples were collected. Sediment chemistry was run, and toxicity tests were conducted with subsurface water, pore water and sediment; benthic community analyses were also conducted.

Results
Water No chemistry analyses were conducted on water samples except for pore water in the Rhine Channel (not discussed here).
Sediment Upper Bay -No metals exceeded the ERM sediment guideline in 6 sites (Cu, Zn, Hg, Cd, Cr, Ni, Pb, As, Ag). Cu, Zn, Ni and Ag exceeded the ERL guideline in 4/6, 2/6, 2/6, 1/6 sites, respectively.
Lower Bay Hg exceeded the ERM in 3/11 sites. Zn exceeded the ERM in 1/11 sites. Cu, Zn, Cd, Cr, Ni, Pb and As exceeded the ERL guideline in 10/11, 9/11, 2/11, 6/11, 2/11, 6/11 sites, respectively.

Toxicity Upper Bay -Sediment toxicity to amphipods and *Ampelisca* was found in 2/7 and 1/5 samples, respectively. Toxicity was found in Pore water and Sediment-water interface tests (purple urchin larval development) in 6/6 and 5/7 samples, respectively. Lower Bay -Sediment toxicity to amphipods and Ampelisca was found in 5/12 and 1/6 samples, respectively. Toxicity was found in Pore water and Sediment-water interface tests (purple urchin larval development) in 11/12 and 1/12 samples, respectively.

Benthic Community Testing Upper Bay -2/6 samples were rated as Transitional, 0/6 samples were rated as Degraded.
Lower Bay –5/13 samples were rated as Transitional, 4/13 samples were rated as Degraded.
There were significant correlations between the benthic index and Cu, Cd, Cr, Ni and %fines in the Bay; however, the correlations were not separated for Upper vs Lower Bay.

Conclusions for Newport Bay
1 Hg exceeded the ERM sediment guidelines in 3/11sites (Turning Basin, WNB) and Zn exceeded the ERM sediment guidelines in 1/11 sites (WNB).
2 Newport Bay had the highest ERMQ values of any regional water body sampled.
Within the Bay, the highest ERMQ values (excluding the Rhine Channel) were found at Newport Island (WNB) and Arches drain (Turning Basin) and were due to Hg, Zn and total PCBs exceedances of the ERM sediment guidelines. (The Rhine Channel had the highest overall ERMQ values.)
3 Toxicity –Amphipod survival was negatively correlated with metals, total chlordane and total PCBs in Newport Bay. Purple urchin larval development in Bay porewater tests and Ampelisca toxicity were also correlated with some metals (including tributyl tin), and organics.
4 Benthic community tests showed significant degradation in 4 stations in Newport Bay, and overall the RBI was significantly correlated with several metals, several DDT metabolites and fine-grained sediments.
The Benthic index and amphipod toxicity were significantly correlated.
5 Two stations in Newport Bay (in addition to the Rhine Channel) (were placed in Category 5 –elevated chemistry, biological impacts, and the other stations were placed in categories 6 (biological impact, no elevated chemistry) and 7 (no biological impact or elevated chemistry .)

APPENDIX 6 SOURCE STUDIES & CALCULATIONS

6.1 RECREATIONAL BOATS

Copper antifouling paints (Cu AFPs) on boat hulls are the largest source of Cu to Newport Bay. Cu is discharged from Cu AFPs to prevent fouling while boats are sitting in the water (passive leaching). Cu is also discharged during hull cleaning, as both dissolved and particulate Cu, and the contribution from hull cleaning will be greater if BMPs are not used while cleaning boat hulls. Most boaters in Newport Bay currently use Cu AFPs on their boat hulls.

6.1.1 Cu LOADING CALCULATIONS FOR RECREATIONAL BOATS

For these Cu TMDLs, the Cu loading calculations for boats initially followed those in USEPA's Toxics TMDLs for Newport Bay (Section 6.1.2); however, in 2013, the Navy conducted a new study on Cu loading from boat hulls (Earley et al, 2013). The Earley study determined the Cu loading for one epoxy and one ablative Cu AFP that were chosen as representative of each paint type by the paint manufacturers. Note that the overall leach rates of the two 'representative' paints are lower than the maximum leach rate of 9.5 µg/cm^2/d determined by DPR; therefore, the loading estimates based on these paints may actually underestimate the Cu loading from Cu AFPs in Newport Bay. These Cu TMDLs will therefore use the Earley loading numbers modified to a leach rate of 9.5 µg/cm^2/d to determine Cu loading from boats in the Bay. Note also that these calculations only revise the source numbers for Cu from boat hulls (text Table 5-2), and do not impact the allocations for boat hulls (text Table 5-5) as the allocation numbers are based on the loading *capacity* for Cu in the Bay calculated by the bathtub model (Section 5.4).

Changes to USEPA's calculations. The Earley study measured Cu loading from both epoxy and ablative AFPs using three treatments: no treatment, BMPs and non-BMPs, and determined loading over a three year paint cycle, which is the life of most Cu AFPs. These loading numbers included initial leaching for a new Cu AFP, passive leaching and hull cleaning events. In addition, this study used a hull area of 41.062 m^2 (40ft boat, 13ft beam) compared to USEPA's hull area of 35.3 m^2 (40ft boat, 11ft beam).

6.1.1.1 Cu Loading based on Earley et al. 2013 using a leach rate of 9.5 µg/cm^2/d

The Earley study used one epoxy and one ablative paint chosen by the paint manufacturers as representative paints. Since the study was conducted, DPR has set a maximum allowable leach rate of 9.5 µg/cm^2/d; therefore, the Cu loading calculations were run adjusted from the Earley study for the higher leach rate.

Cu Loading Approximations per year using LR of 9.5 µg/cm^2/d for BMPs

Epoxy *Loading/yr* *boat*

3505.1 µg/cm^2/yr x 41.062m^2 x 10,000 slips x (10^{4}cm^2/m^2 x kg/10^{9}µg)
= 14392.6 kg/yr x 2.20462 lbs/kg
= 31730.3 lbs/yr
31730 lbs/yr /10,000slips ~ 3.17 lbs/boat/yr

Ablative *Loading/yr* *boat*

3499.7 µg/cm^2/yr x 41.062m^2 x 10,000 slips x (10^{4}cm^2/m^2 x kg/10^{9}µg)
=14370.5 kg/yr x 2.20462 lbs/kg
= 31681.4 lbs/yr
31681 lbs/yr /10,000slips ~ 3.17 lbs/boat/yr

Cu loading from boats for BMPs = 80% epoxy + 20% ablative
= (31730 lbs/yr x 0.800) + (31681 lbs/yr x 0.20)
= 25384 lbs/yr + 6336 lbs/yr
= 31720 lbs/yr ~ 3.17 lbs/boat/yr

Cu Loading Approximations per year using LR of 9.5 µg/cm^2/d for non-BMPs

Epoxy (based on Earley et al, Cu loading from epoxy paints for non-BMPs over BMPs =25.6%)

31730 lbs/yr + 0.256(31730 lbs/yr) = 39853 lbs/yr

Ablative (based on Earley et al, Cu loading from ablative paints for non-BMPs over BMPs =31.9%)

31681 lbs/yr + 0.319(31681 lbs/yr) = 41787 lbs/yr

Cu loading from boats for non-BMPs = 80% epoxy + 20% ablative
= (39853 lbs/yr x 0.800) + (41787 lbs/yr x 0.20)
= 31882 lbs/yr + 8357 lbs/yr
= 40240 lbs/yr ~ 4.02 lbs/boat/yr

Total Cu loading from boats = 50% BMPs + 50% non-BMPs
= (31720 lbs/yr x 0.50) + (40240 lbs/yr x 0.50)
= 15860 lbs/yr + 20120 lbs/yr = 35980 lbs/yr ~3.6 lbs/boat/yr

Since these Cu loading estimations are higher using DPR's maximum leach rate over Cu loading values in the Earley *et al.* study, this TMDL will use the Cu loading estimations as the Cu contribution from boats (text Table 5-2).

6.1.1.2 Cu Loading based solely on Earley et al. 2013 (for comparison only)

Cu Loading per year for BMPs with a 40ft boat (41.062m^2)

Loading/yr *boat*
Epoxy 2361.33µg/cm^2/yr x 41.062m^2 x 10,000 slips x (10^{4}cm^2/m^2 x kg/10^{9}µg)
= 9696.09 kg/yr x 2.20462 lbs/kg
= 21376 lbs/yr ~ 2.14 lbs/boat/yr

Loading/yr *boat*
Ablative 2501.33µg/cm^2/yr x 41.062m^2 x 10,000 slips x (10^{4}cm^2/m^2 x kg/10^{9}µg)
=10270.96 kg/yr x 2.20462 lbs/kg
= 22644 lbs/yr ~ 2.26 lbs/boat/yr

Based on conversations with boatyards and a paint distributer in Newport Bay, the approximate percentages of Cu epoxy and ablative AFPs are 80 and 20%, respectively; therefore, the Cu loading to Newport Bay for BMPs is:

Cu loading from boats for BMPs = 80% epoxy + 20% ablative
= (21376 lbs/yr x 0.800) + (22644 lbs/yr x 0.20)
= 17101 lbs/yr + 4529 lbs/yr = 21630 lbs/yr

Cu Loading per year for non-BMPs with a 40ft boat (41.062m^2)

Loading/yr *boat*
Epoxy 3172.33µg/cm^2/yr x 41.062m^2 x 10,000 slips x (10^{4}cm^2/m^2 x kg/10^{9}µg)
=13026.24 kg/yr x 2.20462 lbs/kg
= 28718 lbs/yr ~ 2.87 lbs/boat/yr

Loading/yr *boat*
Ablative 3674.33/cm^2/yr x 41.062m^2 x 10,000 slips x (10^{4}cm^2/m^2 x kg/10^{9}ug)

=15087.55 kg/yr x 2.20462 lbs/kg
= 33262 lbs/yr ~ 3.33 lbs/boat/yr

Cu loading from boats for non-BMPs = 80% epoxy + 20% ablative
= (28718 lbs/yr x 0.800) + (33262 lbs/yr x 0.20)
= 22974 lbs/yr + 6652 lbs/yr = 29626 lbs/yr

For Newport Bay, if we assume that 50% of the boats use BMPs and 50% do not, the resulting Cu load to Newport is:

Total Cu loading from boats = 50% BMPs + 50% non-BMPs
= (21630lbs/yr x 0.50) + (29626lbs/yr x 0.50)
= 10815 lbs/yr + 14813 lbs/yr = 25628 lbs/yr ~ 2.6 lbs/boat/yr

6.1.1.3 Cu Loading calculations for commercial boats greater than 79 feet

The Cu loading calculations for commercial boats greater than 79 feet use the same equations in 6.1.1.1 (loading calculations for recreational boats). The differences include boat size and paints used, and there are approximately 15 large commercial boats in Newport Bay. In addition, more commercial boats use ablative rather than epoxy paints.

These calculations also use the Earley *et al.* loading numbers modified to a leach rate of 9.5 $\mu g/cm^2/d$ to determine Cu loading from large commercials boats in the Bay. Note also that these calculations only add source numbers for Cu from large commercial boat hulls (text Table 5-2), and do not impact the allocations for boat hulls (text Table 5-5) as the allocation numbers are based on the loading *capacity* for Cu in the Bay as calculated by the bathtub model (Section 5.4).

Cu Loading Approximations per year using LR of 9.5 $\mu g/cm^2/d$ for BMPs
Epoxy *Loading/yr* *boat*
3505.1 $\mu g/cm^2/yr$ x 79.33 m^2 x 15 slips x ($10^4 cm^2/m^2$ x kg/$10^9 \mu g$)
= 41.71 kg/yr x 2.20462 lbs/kg
= 91.95 lbs/yr
91.95 lbs/yr /15 slips ~ 6.13 lbs/boat/yr

Ablative *Loading/yr* *boat*
3499.7 $\mu g/cm^2/yr$ x 79.33 m^2 x 15 slips x ($10^4 cm^2/m^2$ x kg/$10^9 \mu g$)
=41.64 kg/yr x 2.20462 lbs/kg
= 91.81 lbs/yr
91.81 lbs/yr /15 slips ~ 6.12 lbs/boat/yr

Cu loading from boats for BMPs = 20% epoxy + 80% ablative
= (91.95 lbs/yr x 0.20) + (91.81 lbs/yr x 0.80)
= 18.39 lbs/yr + 73.45 lbs/yr = 91.84lbs/yr

Cu Loading Approximations per year using LR of 9.5 $\mu g/cm^2/d$ for non-BMPs
Epoxy (based on Earley et al, Cu loading from epoxy paints for non-BMPs over BMPs =25.6%)
91.95 lbs/yr + 0.256(91.95 lbs/yr) = 115.49 lbs/yr

Ablative (based on Earley et al, Cu loading from ablative paints for non-BMPs over BMPs =31.9%)
91.81 lbs/yr + 0.319(91.81 lbs/yr) = 121.09 lbs/yr

Cu loading from boats for non-BMPs = 80% epoxy + 20% ablative
= (115.49 lbs/yr x 0.20) + (121.09 lbs/yr x 0.80)
= 23.10 lbs/yr + 96.87 lbs/yr = 119.97 lbs/yr

Total Cu loading from boats = 50% BMPs + 50% non-BMPs
= (91.84 lbs/yr x 0.50) + (119.97 lbs/yr x 0.50)
= 45.92 lbs/yr + 59.99 lbs/yr = 105.9 lbs/yr ~7.1 lbs/boat/yr

Since the Cu loading approximations are higher using the new maximum leach rate over Cu loading in the Earley *et al.* study, this TMDL will use these Cu loading approximations for the Cu source number for boats.

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6.1.2 USEPA's Cu LOADING CALCULATIONS FOR BOATS (RECREATIONAL ONLY)

In the Toxics TMDLs (USEPA, Toxics TMDLs, TSD Part E), USEPA used some information and equations from the draft TMDL for Dissolved Copper in Shelter Island Yacht Basin (SDRWQCB 2005) to determine the Cu load from recreational boat hulls.

6.1.2.1 Passive Leaching Calculations

Passive leaching occurs when Cu is discharged from Cu antifouling paints which mostly contain cuprous oxide. Cu antifouling paints are designed to leach Cu into the water to minimize the attachment of algae, barnacles and other fouling onto the boat hull. This Cu release contributes to the dissolved Cu concentrations in Newport Bay and other waters.

Average passive leaching rates have been reported as 3.9 µg/cm^2/day (Zirino and Seligman 2002) and 8-22 µg/cm^2/day (Valkirs et al, 2003). USEPA used a Cu leach rate of 10µg/cm^2/day in the Newport Bay Toxics TMDLs and the draft Shelter Island Cu TMDL.

The calculations below are based on those used in the Toxics TMDLs (and the Shelter Island Cu TMDL). Values used in both the Newport Bay and draft Shelter Island TMDLs are in non-italic print, values used only for Newport are in italics.

Assumptions
Most boaters in Newport Bay use Cu antifouling paints on their boat hulls.
There are approximately 10,000 boat slips in Newport Bay.
(This conservative approach assumes that all slips contain a boat.)
The average leach rate for Cu antifouling paints is 10µg/cm^2/day.
(Leach rates vary with the type of Cu antifouling paint.)
Boats are painted with Cu antifouling paints approximately every 2 years.
Mean boat length is 40 ft and wetted surface area is approximately 35.3 m^2
Average wetted surface area = Boat length x beam height x 0.85 (Interlux 1999)
In Newport Bay, the majority of recreational vessels are both power boats and sail boats.

Equations from the Toxics TMDL (USEPA 2002). Additions or revisions to the original calculations are highlighted.

Copper loading from passive leaching is calculated as follows:

Annual copper load (kg/yr) = P*S*N, and S = L*B*0.85

Where:
P = Passive leaching rate
N = Number of boats
S = Wetted hull surface area = Overall length*Beam*0.85
L = Average length
B = Average beam height

Given:
P = 10 µg/cm^2/day
N = 10,000 (number of boat slips in Newport Bay)
L = 12.2 m (= 40 ft)
B = 3.4 m
Wetted hull surface area = (Overall length)*(Beam width)*(0.85)

Wetted hull surface area = (12.2 m)*(3.4 m)*(0.85) = 35.258 m^2 (EPA used 35.3 m^2)
(Note that EPA's TMDL had beam "height" –this should be beam "width")

Annual Copper load = (10 μg/cm^2/day)*(35.258 m^2)*(*10,000* boat slips)*(10,000 cm^2/m^2)*(kg/10^9 μg)(365 day/yr)

Estimates of Copper load from passive leaching in Newport Bay= 12,869.17 kg/year (35,258 g/day)
12,869.17 kg/year x 2.20462lbs/kg = 28371.6 lbs/year

6.1.2.2 Hull Cleaning Calculations

Although most boats are coated with antifouling paints, which are designed to reduce the build-up of marine growth (fouling) on boat hulls, fouling does occur on boat hulls and needs to be cleaned off periodically. This fouling is commonly removed by divers while the boat remains in the water; or the boat may be hauled-out and the fouling removed on land. Divers use soft cloths or scrub pads depending on the type of fouling, and a number of divers try to follow best management practices for hull cleaning. (In the San Diego area, some marinas even follow a Clean Marina program which specifies practices for hull cleaning by divers.) Most recreational boats in southern California have their hulls cleaned nearly once per month.

In-water hull cleaning results in a discharge of both dissolved and particulate Cu. The amount of copper released from hull cleaning depends on the type of paint, cleaning method and frequency, and whether the paint is new or old. In San Diego Bay, it was estimated that underwater hull cleaning occurs about ten times per year for most recreational boats, and that boats are painted with Cu antifouling paints approximately every two years (Conway and Locke 1994). The Shelter Island Cu TMDL estimated 14 hull cleaning events per year (SDRWQCB 2005). In Newport Bay, hull cleaning is estimated to be a little less than once per month. More abrasive cleaning methods will release a higher amount of dissolved and particulate Cu, and the leaching rate usually increases just after a hull is cleaned. In addition, it is likely that newer paints release more Cu; however, studies on the quantification of Cu release with various hull cleaning methods and the age of Cu antifouling paints are limited.

One study demonstrated that the average dissolved Cu concentration near boats was 12 µg/L; however, during hull cleaning dissolved Cu concentrations increased to approximately 56 µg/L (McPherson and Peters 1995). After hull cleaning, Cu concentrations decreased to background within ten minutes (due to movement and dispersion of the Cu plume). In this study the boat was relatively clean to start so the diver used a moderately abrasive pad with moderate pressure; therefore, this study may greatly *underestimate* the amount of Cu released during more aggressive hull cleaning.

A Navy study evaluating Cu concentrations during hull cleaning of Navy boats showed that total Cu concentrations increased during hull cleaning but that Cu^{+2} ion activity remained fairly constant; therefore, they concluded that most of the Cu discharged from hull cleaning was in the particulate form (Valkirs *et al.* 1994). SCCWRP also conducted a passive leaching and hull cleaning study with 3 antifouling coatings on fiberglass panels, and reported that by mass 95% of the dissolved Cu from boats is from passive leaching, while only 5% is from hull cleaning (Schiff *et al.* 2006). Blossom and Anderson disagree since the SCCWRP study calculated the Cu discharge from hull cleaning for only one hour after cleaning although elevated Cu discharge from hull cleaning lasted for days, and they showed that in-water hull cleaning actually accounts for approximately 50% of the dissolved Cu concentrations discharged from boat hull paints (unpublished report, May 2007). These conclusions agree with USEPA's analysis in the Newport Bay Toxics TMDLs where passive leaching accounts for approximately 55% and hull cleaning accounted for approximately 45% of the

dissolved Cu discharged from boats. USEPA's analysis of Cu discharges from hull cleaning were based on plume measurements following hull cleaning rather than a hull cleaning leach rate (McPherson and Peters 1995).

With respect to particulate Cu, estimates of 2 pounds per year per boat from hull cleaning were determined in Shelter Island Yacht Basin (Brown and Schottle 2006). This particulate Cu was shown to be higher for hard vinyl coatings compared to modified epoxy, and for boats with 3 months of accumulated fouling compared to 1 month.

The calculations below are revised from the Newport Bay Toxics TMDLs (USEPA 2002), which used different equations than the final Shelter Island Cu TMDL to calculate Cu discharge from hull cleaning. The Newport Bay TMDL used plume concentrations from the McPherson and Peters study (1995) and plume equations from PRC (1997) to determine Cu discharges from hull cleaning. Values used for both Newport Bay and the draft Shelter Island TMDLs are in non-italic print, values used only for Newport are in italics.

Assumptions
Most boaters in Newport Bay use Cu antifouling paints on their boat hulls.
There are approximately 10,000 boat slips in Newport Bay.
(This conservative approach assumes that all slips contain a boat.)
Boats are painted with Cu antifouling paints approximately every 2 years.
Boat hulls are cleaned underwater approximately 11 times per year (almost once per month) in Newport Bay.
More abrasive cleaning methods release a higher amount of dissolved and particulate Cu.
Newer Cu paints also release more Cu.

Equations from the Toxics TMDL (USEPA 2002). Additions or revisions to the original calculations are highlighted.

Plume concentration (P_c) = (Total plume concentration) – (Background concentration)

$$P_c = (56\ \mu g/L) - (12\ \mu g/L) = 44\ \mu g/L$$

Plume volume (P_v) = $L_p * W_p * D_p$

$$P_v = (L_b + 6\ m + 6\ m)*(W_b + 6\ m + 6\ m)*(6\ m)$$

$$P_v = (24.2\ m)*(15.4\ m)*(6\ m) = 2236\ m^3 \text{ per cleaning event}$$

Where:
P_c = Plume concentration
P_v = Plume volume
L_p = Average plume length
W_p = Average plume width
D_p = Average plume depth
L_b = Average boat length
W_b = Average boat width
D_p = Average plume depth

Given:
L_b = 12.2 m
W_b = 3.4 m

Annual copper load = $N_h * P_v * P_c * N_v$

Where:
N_h= Number of hull cleaning events/year
P_v = Plume volume
P_c = Plume concentration
N_v = Number vessels

Given:
N_h = 11/year
P_v = 2236 m^3
P_c = 44 μg/L
N_v =10,000 (number of boat slips in Newport Bay)

Annual Copper load = (11days/yr)*(2236 m^3)*(44 μg/L)*(*10,000* boat slips)*(kg/10^9 μg)*(1000 L/m^3)

Estimates of Copper load from hull cleaning in Newport Bay = 10,822.24 kg/year (29,650 g/day)
10,822.24 kg/year x 2.20462lbs/kg = 23858.9 lbs/year

Passive leaching (lbs/year) + Hull cleaning (lbs/year) = Total contribution from boats
28371.6 lbs/year + 23858.9 lbs/year = 52230.5 lbs/year

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6.1.3 TMDL ALLOCATIONS and ESTIMATED LEACH RATES NEEDED TO MEET TMDLS*

NewportBay (Region 8) (using 41.062m^2 hull area)
Cu Allocation for boats
approx 6060lbs/yr ----> approx 2748.8kg/yr ----> 2748.8kg/yr/ 10,000slips ----> 0.275kg/boat/yr
LEACH RATE NEEDED approx 1.83µg/cm^2/d
Shelter Island, San Diego (Region 9) (using 35.258m^2 hull area)
Cu input Allocation
2100kg/yr ----> 79% reduction ----> 447kg/yr/ 2363 slips ----> 0.19kg/boat/yr
LEACH RATE NEEDED approx 1.47µg/cm^2/d
Marina del Rey, Los Angeles (Region 4) (using 30.056m^2 hull area)
Cu input
3608.6kg/yr ---->84.6% reduction ----> 557 kg/yr/ 4754slips ----> 0.117 kg/boat/yr
LEACH RATE NEEDED approx 1.07 µg/cm^2/d
**Leach rates based on equations from Newport Bay Toxics TMDL*

$$LR = \frac{\text{allowable Cu load (kg/yr)}}{(\text{boat size})(\#\text{boatslips})(10^{-5}\text{cm}^2/\text{m}^2\text{kg/ug})(365\text{d/yr})}$$

The leach rates (LR) determined above were calculated directly from the Cu allocations for boats in the corresponding Cu TMDLs (Newport Bay, Shelter Island, Marina del Rey). These LRs are set as LR_0.
The LR_0s were then adjusted upwards to account for 1) the use of BMPs by all (LR_1) and 2) the use of BMPs plus lower cleaning frequencies (LR_2) using the adjustment factors applied by DPR to their LR_0 in Table 6-1 of DPR's MAMPEC modeling study.

The LRs below demonstrate that the maximum allowable LR of 9.5 µg/cm^2/d determined by DPR *will NOT meet the TMDLs even when BMPs and lower cleaning frequencies are factored into the LRs*.
This is likely due to assumptions of the MAMPEC model w/respect to Cu loading from marinas and the difference in DPR's approach compared to the Regional Boards' approach. The Regional Boards' LR calculations are based on the allocations needed to meet the TMDLs for each water body, then adjusted upwards to account for BMPs and lower cleaning frequency. (The Cu allocations for boats in the TMDLs are determined from the *loading capacity of the water body*.) In addition, the Cu loading for Newport Bay's Cu TMDLs is based on a Cu allocation for the entire Bay, which contains 10,000 boats, rather than specific marinas. This harbor scenario is not represented in DPR's modeling and there are no scenarios in DPR's modeling assessment that include more than 4754 boats.

Table 6-1 Cu antifouling paint leach rates needed to meet TMDLs in Newport Bay, Shelter Island Yacht Basin and Marina del Rey

Waterbodies	**LR_0 to meet allocations**	**LR_1 assuming BMPs (max'm 28% reduction in Cu loading over non-BMPs frm DPR model-Table6) ($LR_0 + 0.28LR_0$)**	**LR_2 assuming BMPs + lower cleaning freq. ($LR_1 + 0.20LR_1$)**
Newport Bay	1.83µg/cm^2/d	2.35 µg/cm^2/d	2.82 µg/cm^2/d
Shelter Island Yacht Basin	1.47µg/cm^2/d	1.88 µg/cm^2/d	2.26 µg/cm^2/d
Marina del Rey	1.07µg/cm^2/d	1.37 µg/cm^2/d	1.64 µg/cm^2/d

6.2 TRIBUTARIES TO NEWPORT BAY (FRESHWATER)

County of Orange Monitoring Data for San Diego Creek, Santa Ana Delhi
(OC Stormwater data 2006-09)

Dissolved Cu loads from the major tributaries (San Diego Creek and Santa Ana Delhi) were calculated from the total Cu data from the County of Orange monitoring for the years (2006-11). The total daily discharge volumes were added to determine the total annual discharge by volume. The annual stormwater volume was then calculated as the sum of the discharge volumes >25cfs. (The threshold of >25cfs was used to represent storm events.) The total dry discharge volume was determined to be the difference between the total and stormwater discharge volumes.

Total Cu concentrations and dissolved Cu concentrations in stormwater and dry discharges were also calculated. For stormwater, an annual event mean concentration (annual SW EMC) was calculated from the separate EMCs measured during separate storms. For dry discharges, an annual mean Cu concentration was calculated by averaging the measured Cu concentrations of the dry discharges during the monitoring year. (Note that a monitoring year for the County of Orange extends from July to June of the following year.)

Annual Discharge Volume
SUM of daily discharge volumes = Total annual discharge volume (TAV)
SUM of daily discharge volumes >25cfs = Annual stormwater discharge volume (ASV)
TAV - ASV = Annual dry discharge volume (ADV)

Cu loads in stormwater and dry discharges

SUM of [Cu EMC per storm x storm volume] /(SUM of [storm volumes])
= Annual stormwater Cu EMC
Annual SW Cu EMC x annual stormwater volume (ASV) = annual Cu load from storms (lbs)

Mean Cu concentration in dry discharges x annual dry discharge volume (ADV)
= Annual Cu load from dry discharges
Annual Cu load from storms + Annual Cu load from dry discharges
= Annual Cu load (storms + dry)

Dissolved Cu loads were calculated from total Cu concentrations then converted by multiplying total Cu loads by 0.80 (USEPA's dissolved/total translator) to be conservative. Dissolved Cu loads were calculated from total Cu since actual dissolved/total ratios vary with metal, by year, by season (wet to dry) and possibly even by channel. (See Figure 6-1). Total Cu loads and total Cu concentrations in San Diego Creek and Santa Ana Delhi are shown in Tables 6.2.1 and 6.2.2, respectively.

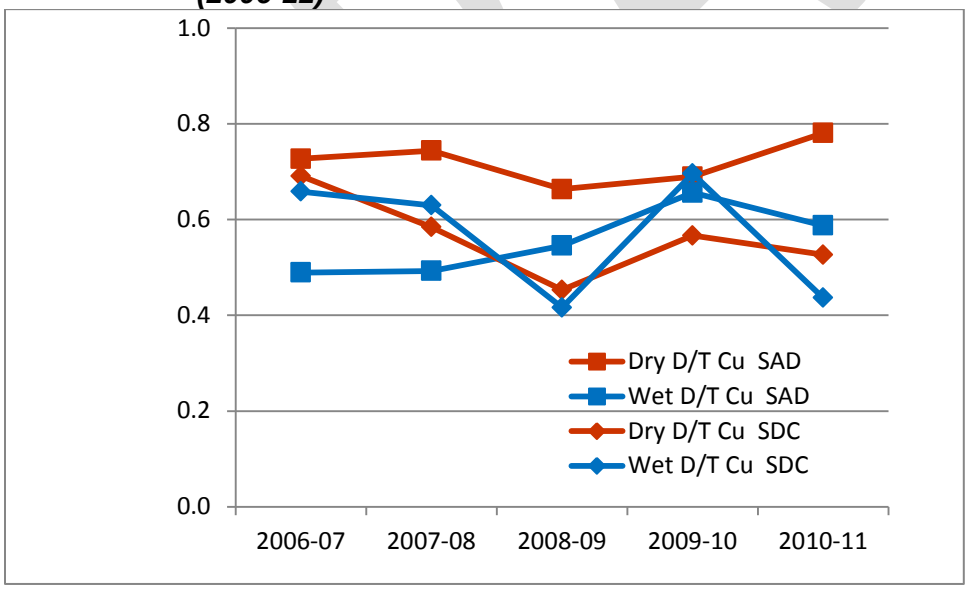
Table 6-2.1 Annual Total Copper (Cu) loads (lbs per year) from San Diego Creek (SDC) and Santa Ana Delhi (SAD) (County of Orange monitoring data 2006-2011)

	San Diego Creek (lbs total Cu/year)			Santa Ana Delhi (lbs total Cu/year)			
	Storm	Dry	Total	Storm	Dry	Total	SDC+SAD
2006-07	60.493	126.154	186.647	10.686	62.714	73.400	260.047
2007-08	440.418	112.461	552.879	220.198	63.497	283.695	836.574
2008-09	962.408	56.681	1019.089	228.616	91.333	319.949	1339.038
2009-10	1856.388	175.501	2031.889	497.718	140.303	638.021	2669.910
2010-11	4104.864	187.269	4292.133	460.818	88.617	549.435	4841.568

Table 6-2.2 Annual Mean Total Copper (Cu) concentrations (µg/L) in Stormwater and Dry Discharges from San Diego Creek (SDC) and Santa Ana Delhi (SAD) (County of Orange monitoring data 2009-10, 2010-11)

	San Diego Creek		Santa Ana Delhi	
	Storm (µg/L)	Dry (µg/L)	Storm (µg/L)	Dry (µg/L)
2006-07	12.311	6.452	32.479	9.468
2007-08	10.168	6.576	39.868	9.365
2008-09	24.422	4.943	41.554	14.118
2009-10	21.996	14.491	38.707	23.790
2010-11	29.427	12.223	30.655	17.739

Figure 6-1 Mean Dissolved/Total Ratios for Copper in San Diego Creek & Santa Ana Delhi (2006-11)



6.3 STORM DRAINS

Storm drain data -Newport Bay Stormdrain Metals Study March 2006, Completed January 2010 (OC Coastkeeper and Candelaria 2010)

This project determined metal loading from a subset of storm drains in Lower Newport Bay, and estimated metal loading from all storm drains in Lower and Upper Newport Bay. Water samples were collected from 20 storm drains (more than 10% of the total storm drains). Samples were collected in winter during storms and one dry event and in summer during dry weather (late winter 2006 through 2008). Dissolved and total metals (USEPA priority metals) were analyzed and compared to CTR saltwater criteria since runoff discharges directly into Newport Bay.

Results

Water Concentrations Dissolved copper (Cu) and zinc (Zn) exceeded the acute CTR saltwater criteria (4.8, 90 µg/L) in 20/20 and 13/20 drains, respectively; dissolved Cu, Zn, nickel (Ni) and cadmium (Cd) exceeded the chronic CTR saltwater criteria (3.1, 81, 9.3, 8.2 µg/L) in 20/20, 14/20, 11/20 and 1/20 drains, respectively (Table 6-3.1). In general, metal concentrations were higher in storm runoff than in dry weather runoff. Note that the highest amount of exceedances for Ni and Cd were from the Carnation drain. (Map below shows site locations.)

Table 6-3.1 Dissolved Metals* Exceedances of Acute, Chronic CTR Saltwater Criteria in Storm drain water

	>CTR Acute	>CTR Chronic	Mean Concentration	Mean Concentration Wet	Mean Concentration Dry
Cu	147/242	169/242	19.81	35.24	8.96
Zn	36/242	40/242	52.91	77.07	37.10
Ni	0/242	61/242	6.43	6.5	6.02
Cd	0/242	14/242	1.01	0.96	1.10

* Additional metals were analyzed (USEPA priority metals) but are not shown in this table.

Metal loads in Water Dissolved Cu loads are low compared to Cu discharged from boat bottom paints (over 50,000lbs/yr) or Cu in runoff from tributaries in the Toxics TMDL (USEPA 2002). Dissolved metal loads from other sources were also low compared to runoff from tributaries calculated in the Toxics TMDL (text Table 5-2). Dissolved metal loads from storm drains were originally calculated with a runoff coefficient of 0.5, and were 252lbs Cu, 612lbs Zn, 125lbs Ni, and 24lbs Cd for 2008, and 90lbs Cu, 207lbs Zn, 48lbs Ni, and 13lbs Cd for 2007 (Table 6-3.2). Metal loads were recalculated with a runoff coefficient of 0.9 (based on pers. communication w/City staff) (Table 6-3.2). (Total metals were measured with dissolved metals but total metal loads were not calculated as part of this project; however, dissolved/total (D/T) ratios were calculated (Table 6-3.2).

Table 6-3.2 Dissolved Metal Loads to Newport Bay from storm drains in 2007 and 2008 (Loads are reported as lbs, and based on a runoff coefficient of 0.9)*

	Wet 2007	Dry 2007	Dissolved 2007	Wet 2008	Dry 2008	Dissolved 2008	Mean Dissolved/ Total (D/T) ratio
Cu	131.53*	7.19	138.72	460.51	7.57	468.08	0.6
Zn	304.5	31.09	335.59	1089.48	34.0	1123.48	0.65
Ni	35.12	28.75	63.87	139.1	36.74	175.84	0.8
Cd	6.07	7.33	13.4	24.48	8.31	32.79	0.75

Revised table from the "Lower Newport Bay Stormdrain Metals Study" (Table 6 p18)
Cu =copper, Zn =zinc, Ni =nickel, Cd =cadmium
* Additional metals were analyzed (USEPA priority metals) but are not shown in this table

Dissolved metal loads for all drains were estimated from the actual loads from the 20 storm drains measured during this study; loads were based on a 0.9 runoff coefficient

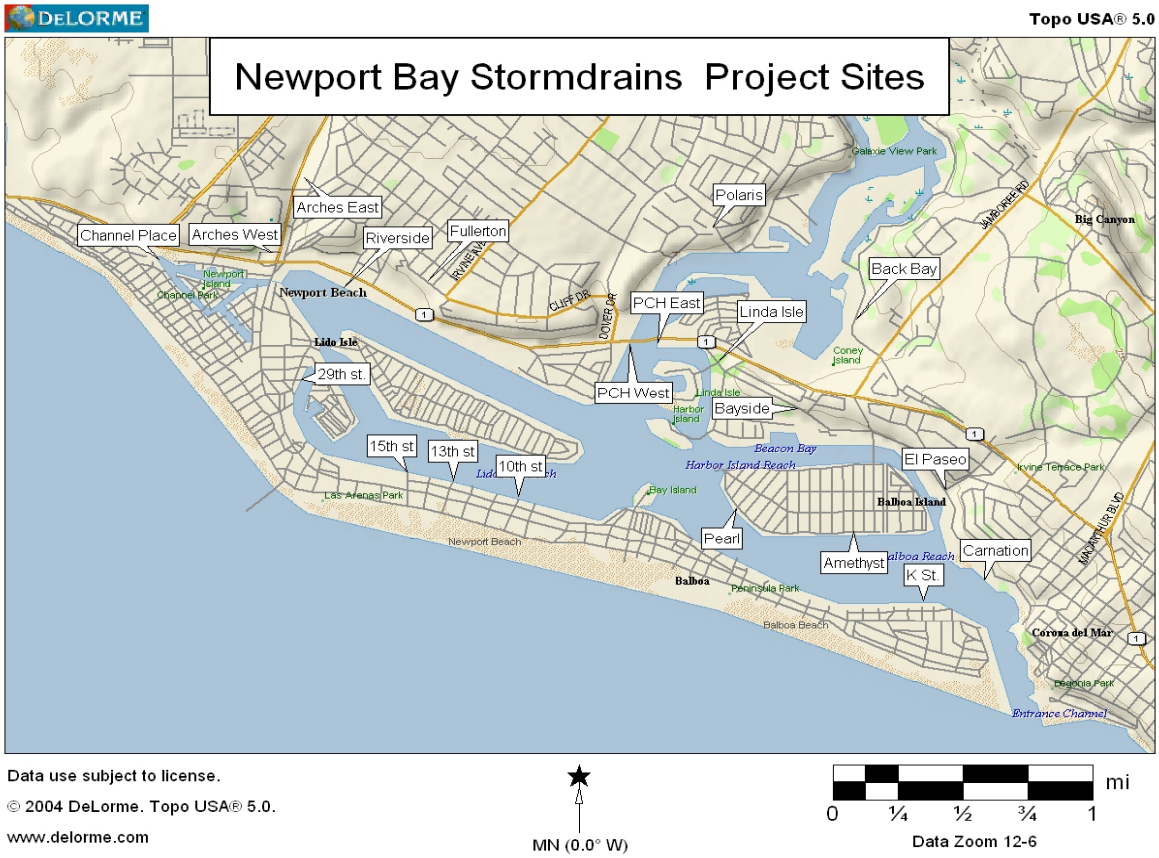
Dissolved metal loads from the 3 drains nearest to the Turning Basin were also calculated. These include Arches West, Arches East and Riverside. The largest loads for Cu, Zn and Cd were from the Arches West drain; Ni loads are similar in Arches West and Arches East (Table 6-3.3).

Table 6-3.3 Dissolved Metal Loads to Turning Basin area (TB) from storm drains in 2007 and 2008 (Loads reported as lbs)*

Metal	2007 data				2008 data			
	Arches West	Arches East	Riverside	Total load near TB	Arches West 2008	Arches East 2008	Riverside	Total load near TB
Cu	3.99	2.16	3.55	9.7	15.52	8.35	13.61	37.48
Zn	23.08	13.03	5.77	41.88	89.91	50.15	20.23	160.29
Ni	1.43	0.63	0.35	2.41	4.93	2.73	1.32	8.98
Cd	0.19	0.02	0.01	0.22	0.71	0.07	0.05	0.83

Cu =copper, Zn =zinc, Ni =nickel, Cd =cadmium
Dissolved metal loads for all drains were estimated from the actual loads from the 20 storm drains measured during this study; loads were based on a 0.9 runoff coefficient
* Additional metals were analyzed (USEPA priority metals) but are not shown in this table.
^Other drain near Turning Basin (TB) include Fullerton

Figure 6-2 Newport Bay Stormdrain Project Sites



6.4 SEDIMENTS

Metals Sediment Study in Lower Newport Bay (2012-2013) vs Copper-Metals Marina Study (2006-2007)

In 2012, parts of the Lower Bay were dredged. A sediment study was then conducted in 2012-2013 to determine sediment metal exceedances of the ERM guidelines in the new surface sediment samples in post-dredge areas, and in some marinas originally sampled in the 2007 Marina Study (Table 6.4). (Marina sites chosen for this sediment study were a subset of those that exceeded the Cu, Zn and Hg ERM guidelines in 2007). The newer sediment study data showed that sediment Cu, Zn and Hg continue to exceed the ERM guidelines in the marinas tested but not in the post-dredge areas (Figures 6-1 through 6-4). Some marinas, especially those in the Turning Basin area, may require future dredging to remove sediment Zn and Hg (dredging is likely to be part of the implementation of the Cu TMDLs to remediate sediment Cu). (Sediment data from the Cu-Metals Marina study (2007) showed that sediment Cu, Zn and Hg exceeded ERM sediment guidelines in a number of marinas, particularly in the Turning Basin area of Lower Newport Bay.)

In the Marina Study (2007), Lower Bay sediments also exceeded the ERL guidelines for cadmium (Cd), nickel (Ni), lead (Pb), arsenic (As) and silver (Ag). Upper Bay sediments exceeded the ERL guidelines for Cu, Zn, Hg, Cd, Ni, and As, but not Pb or Ag; *there were no exceedances of the ERM sediment guidelines in the Upper Bay*. In addition, the marina study showed sediment toxicity in 6/6 and 6/8 samples in the Lower and Upper Bay, respectively.

In the 2012 sediment study, Lower Bay sediments exceeded ERL guidelines for Cd, Ni, Pb, As and Cr. No samples were collected in the Upper Bay for this study. No sediment toxicity to *Eohastaruis* was found; sediment-water interface and pore water testing with *Mytilus* were not conducted due to insufficient funds.

These data sets showed that marina sites in the Turning Basin and Balboa Channel continue to exceed the ERM sediment guidelines for Hg, Zn and Cu, and are the highest concern with respect to sediment metals. Non-marina sites in open parts of the Bay (post-dredge sites and OC monitoring sites) exceeded the ERL guidelines for a number of metals in both the Upper and Lower Bay, but rarely exceeded the ERM guidelines. The highest priority areas for sediment metals (Cu, Zn, Hg) are, therefore, the marina sites in the Turning Basin area and Balboa Channel.

Table 6.4 Site locations in Metals Sediment Study and acronyms in Figures	
Marinas	
Harbor Marina	*aHM*
Lido Village	*aLV*
Lido Yacht Anchorage	*aLYA*
Dredge sites	
Lido Isle Reach North (West)	*LIN(W), LW2*
Lido Isle North East	*LE*
Lido Isle Reach South	*LIS(out), LS2*
Upper Newport Channel	*UNC, UNC2*
Balboa Island Channel	*BC(out), BC2*
Collins Island	*CI*
Harbor Island Reach	*HIR(out), HIR2*
Balboa Reach	*BR(end), BR2*
West Lido Area A	*WLA*
West Lido Area B	*WLB*
Yacht Anchorage Area Middle	*YAM2, YAM3*
Yacht Anchorage Area North	*YAN1, YAN2*

Figure 6-3 Sediment zinc exceedances of ERM and ERL guidelines

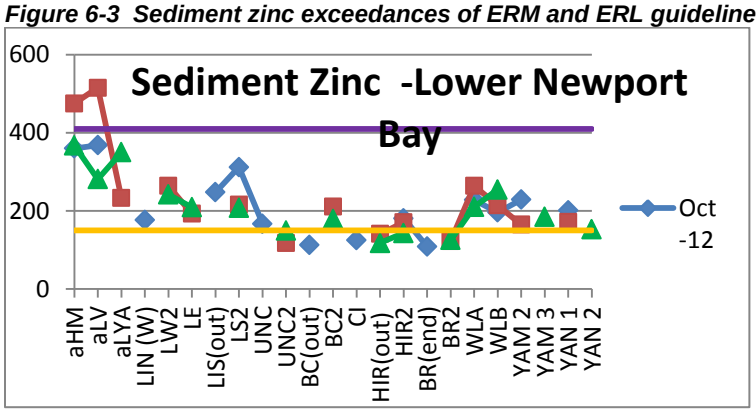


Figure 6-4 Sediment mercury exceedances of ERM and ERL guidelines

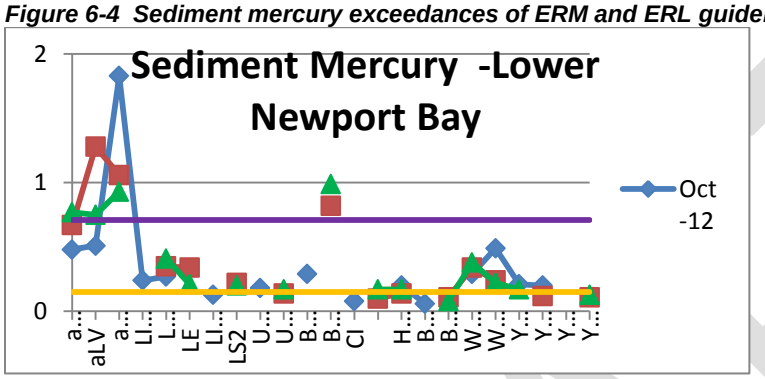


Figure 6-5 Sediment arsenic exceedances of ERL guideline (no exceedances of the ERM guideline 70µg/g)

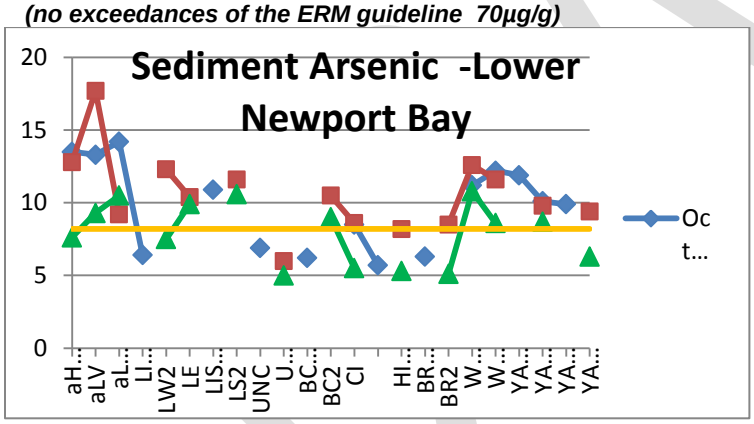
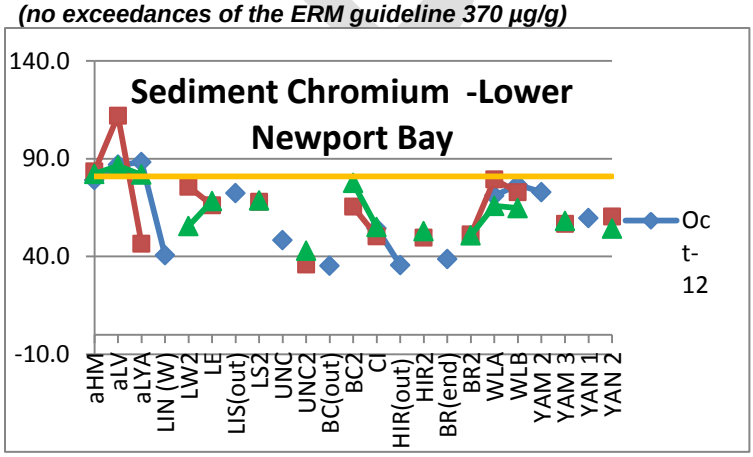


Figure 6-6 Sediment chromium exceedances of ERL guideline (no exceedances of the ERM guideline 370 µg/g)



APPENDIX 7 CALCULATIONS FOR COPPER –BATHTUB MODEL

1	**Input**		
2	Freshwater Inflow [median] (cfs)	16	
3	Freshwater Inflow Volume [median], Q_f (m^3/day)= 16cfs*86400s/d*0.0283m^3/ft^3	39121.92	
4	Newport Bay Surface Area, A (m^2)	5518000	
5	Newport Bay Mean Volume [mean of high & low volumes] V_b (m^3)	19000000	
6	Tidal Prism [high - low volumes], 1-M2 Tide (m^3 per M2 Tide)	10000000	
7	Tidal Period (hr)	12.42	
8	Total Flood Volume, Q_t (m^3/day) = = (2*$10^6$$m^3$/M2)*(24h/d/(2*12.42))	19323671.5	
9	Exchange Ratio	0.25	<--calibrationvalue
10	New Ocean Water Entering the Bay, Q_0 (m^3/day) = 0.25*19323671.5m^3/d	4830917.9	
11	Residence Time -average - (day)	5	<---not used
12	Flush Time (day)	3.90	<---residence time verification
13	Mixed Water Leaving the Bay, Q_b (m^3/day) = 4830917.87m^3/d+ 39121.9m^3/d	4870039.8	
14	Dissolved Cu Immediately Outside the Bay [ocean-observed] (mg/L)	0.00140	<---from so.calif seawater (CRG la
15	Dissolved Cu Inside the Bay [observed] (mg/L)	0.00200	<---from IRWD monitoring results
16	Dissolved Cu in the Ocean, C_0 (mg/L)	0.00020	
17	Net Settling [as a velocity] (m/day)	0.08000	
18	Dissolved Cu in Freshwater Inflow (lbs/year) = total FW Cu*0.8	5,616.00	**<--- input value from all freshwa**
19	Dissolved Cu in Freshwater Inflow, Lf (g/day) = (B18)lbs/yr*453.6g/lb*1yr/365d	6,979.23	
20	Dissolved Cu Loading from Boats, L_I (g/day) = total Cu boats*0.8	**74,468.00**	**<-- estimated Cu loading from boat based on calibration (match model calculated dissol against to obervated values (Ji**
21	Particulate Fraction - *Actual Estimated*	0.20000	
22	*Actual* Cu Load - FW + Boats (g/d) = (B19)g/d + (B20)g/d	81,447.22630	
23			
24	**Intermediate Calculations**		
25	Mass into the Bay (MassIn) (g/day)	82413.40988	
26	Q_0C_0+L_f +L_i = 4830917.87m3/d *(B16)mg/L* 1000L/m3 *g/1000mg) +(B19)g/d + (B20)g/d		**<---sum of freshwater load and ocean water load**
27	Volume Out		
28	Q_b + 1.25AvsFp = 4870039.79m3/day + (1.25 *5518000m2 *0.08m/d *B21)	4980399.794	
29			
30	**Results**		
31	Estimated Dissolved Cu in the Bay [water column] (µg/L) = (B25) g/d /4980399.79m3/d)*1000µg/g	**16.55**	
32			
33	**Criteria**		
34	Dissolved Cu WQ Criteria [water column] (µg/L)	3.1	
35	Max. Loading Capacity (g/day) Lf +Li = Criteria MassIn -Q_0C_0 = (B34)µg/L*4980399.79m3/d*(1000L/m^3/10^6µg/g)-(B10*B16g/d)	14473.06	
36	Max. Loading Capacity (lb/year) = (B35)g/d *365d/yr *lb/453.6g	**11646.09**	
37	Max. Loading Capacity (boat)((g/day) = (B36)g/d -(B19)g/d	7493.83	

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APPENDIX 8 LIST OF MARINAS AND ANCHORAGES IN NEWPORT BAY

Customer Name	Service Address
Newport Dunes	101 N. Bayside Dr.,NB 92660
De Anza Bayside Village	300 Coast Hwy E, NB 92660
Cal Recreation - Bayside & BYC	1137 Bayside Dr., NB 92660
Bahia Corinthian Yacht Club	1601 Bayside Dr. CDM 92625
Balboa Yacht Club	1801 Bayside Dr., CDM 92625
Channel Reef Comm. Assn.	2525 Ocean Blvd., CDM 92625
Newport Bay Towers	310 Fernando, NB 92661
Balboa Pavilion Co.	400 Main St., NB 92661
Newport Landing Marina	503 Edgewater Ave. E, 92662
Balboa Boat Rentals - Vallely (Rodheim)	510 Edgwewater Pl., Bal 92662
Fun Zone Boat Co.	600 Edgewater Pl. NB 92661
Fun Zone Boat Co.	600 Edgewater Pl, NB 92661
Hill's Boat Service	814 Bay Ave. E, BAL 92661
Balboa Angling Club	200 A St. Pier, BAL 92661
Newport Harbor Yacht Club	720 Bay Ave. W, BAL 92661
American Legion	215 15th Street, NB 92663
South Coast Shipyard	223 21st Street, NB 92663
Sullivan Trust	227 20th Street, NB 92663
Sea Spray Boat Yard	226 21st Street NB 92663
Etco Investments	2122 Newport Blvd., NB 92663
Woody's Wharf	2318 Newport Blvd., NB 92663
James, Steve	2406 Newport Blvd., NB 92663
Balboa Boat Yard	2414 Newport Blvd., NB 92663
Vista Del Lido	611 Lido Park Dr., NB 92663
Lido Park Place Marina	633 Lido Park Dr., NB 92663
Lido Sailing Club	3300 Via LidoNB 92663
Pamela Whitesides	3316 Via Lido NB 92663
Lido Marina Village - Marvin Eng.	3366 Via Lido, NB 92663
Elks Lodge #1767	3456 VIA Oporto, NB 92663
Waterfront Newport Beach LLC	2901 Coast Hwy W #200, NB 92663
Mariners Mile Professional Building	3101 Coast Hwy W, NB 92663
Newport Towers HOA	3121 Coast Hwy W, NB 92663
Villa Nova	3131 Coast Hwy W, NB 92663
Balboa Bay Club	1221 Coast Hwy W, NB 92663
OCC Intercollegiate Sailing & Rowing	1801 Coast Hwy W, NB 92663
Newport Sea Base	1931 Coast Hwy W, NB 92663
Duffy Electric Boat Company	2001 Coast Hwy W, NB 92663
Ardell Marina	2101 Coast Hwy W, NB 92663
VMA Mariners Mile LLC- Hornblower	2439 Coast Hwy W, NB 92663
VMA Mariners Mile LLC - Pedigree	2439 Coast Hwy W, NB 92663

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VMA Mariners Mile LLC - Bayport	2505 Coast Hwy W, NB 92663
Goodin Family Trust	2527 Coast Hwy W, NB 92663
Viking's Port	2547 Coast Hwy W, NB 92663
Cal Rec - Bayshore Marina	2572 Bayshore Dr., NB 92663
Primm Family Trust	2601 Coast Hwy W, NB 92663
Marina Properties	2607 Coast Hwy W, NB 92663
Port Calypso	2633 Coast Hwy W, NB 92663
Newport Bay Management - Larson's Shipyard	2703 Coast Hwy W, NB 92663
Dick Dock LLC (Rusty Pelican)	2735 Coast Hwy W, NB 92663
Crow's Nest - Gordon Barienbrock	2751 Coast Hwy W, NB 92663
Crow's Nest - Gordon Barienbrock	2801 Coast Hwy W, NB 92663
Swales Anchorage	2888 Bayshore Dr., NB 92663
Cal Rec - Balboa Marina	201 Coast Hwy E, NB 92660
Newport Marina	919 Bayside Dr., NB 92660
Cal Recreation - Villa Cove	1001,1137, 1099 Bayside Dr., NB 92660
Cannery Village	700 Lido Park Dr, NB 92663
Blue Water Marina	630-670 Lido Park Dr, NB 92663
28th St. Marina	2600 Newport Blvd, NB 92663
Cannery Village Marina	2800 Lafayette Ave., NB 92663
Ridgeway Trust	2804 Lafayette, NB 92663
Herlihy, John	2806 Lafayette, NB 92663
Hall, Richard	2808 Lafayette, NB 92663
126 Properties LLC	2812 Lafayette, NB 92663
Morehart/Cervantes	2814 Lafayette, NB 92663
Le Quai	2816 Lafayette, NB 92663
Schock Boats	2818 Lafayette, NB 92663
Schock Boats	2900 Lafayette, NB 92663
Cannery Restaurant	3010 Lafayette, NB 92663
Bellport - Lido Peninsula Yacht Anchorage	717 Lido Park Dr., NB 92663
Harbor Marina	3333 Coast Hwy W, NB 92663
Island Marine Fuel & Ferry Landing	406 Bay Front S, BI 92662
Robert Teller	504 Bay Front S, BI 92662
Vivian Vallely	508 S Bay Front, BI 92662
Balboa Yacht Basin	829 Harbor Island Dr., 92660

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Substitute Environmental Document for Proposed Basin Plan Amendments

for the Newport Bay Copper (Cu) TMDLs

and Non-TMDL Action Plans

for Zinc, Mercury, Arsenic and Chromium

Santa Ana Regional Water Quality Control Board

August 30, 2016

ACRONYMS

ACOE – Army Corps of Engineers
AFPs – antifouling paints
BIOL - Preservation of biological habitats of special significance
BMP – Best management practice
BPA – Basin Plan Amendment
BPTCP – Bay Protection and Toxics Cleanup Program
cfs – cubic feet per second
Caltrans – California Department of Transportation
CASQA – California Stormwater Quality Association
CCC – California Coastal Commission
CEQA – California Environmental Quality Act
COMM - Commercial and sportfishing
CWA – Clean Water Act
CTR – California Toxics Rule
DOC – dissolved organic carbon
DPR – Department of Pesticide Regulation
EIR –Environmental Impact Report
ERL –Effects range low (sediment guideline)
EST - Estuarine habitat
LA – Load allocation
Metals As – Arsenic
Cd – Cadmium
Cu – Copper
Hg – Mercury
Pb – Lead
Zn – Zinc
MAR - Marine habitat
NAV – Navigation
ND – Negative Declaration
NPDES –National Pollutant Discharge Elimination System
OAL – Office of Administrative Law
ppt – parts per thousand
RARE - Rare, threatened, or endangered species
REC1 - Water contact recreation
REC2 - Non-contact water recreation
SARWQCB – Santa Ana Regional Water Quality Control Board
SED – Substitute environmental document
SHEL =Shellfish harvesting
SIP – State Implementation Plan
SMW – State Mussel Watch
SPWN - Spawning, reproduction, and development
SSO – Site-specific objective
SWAMP – Surface Water Ambient Monitoring Program
SWRCB – State Water Resources Control Board (State Board)
TEL – threshold effects level (sediment guideline)
TMDL – Total maximum daily load

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TOC – total organic carbon
TSO – Time schedule order
TSS – total suspended solids
$\mu g/cm^2/d$ – micrograms per centimeter^2 per day (leach rate)
USEPA – United States Environmental Protection Agency
USFWS – United States Fish and Wildlife Service
WILD - Wildlife habitat
WLA – Waste load allocation

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1.0 INTRODUCTION

The California Regional Water Quality Control Board, Santa Ana Region (Regional Board) proposes to amend the Water Quality Control Plan for the Santa Ana River Basin (Basin Plan; Santa Ana Regional Water Quality Control Board [SARWQCB] 2008) to incorporate Copper (Cu) Total Maximum Daily Loads (TMDLs) and Non-TMDL Action Plans (Action Plans) for Zinc (Zn), Mercury (Hg), Arsenic (As) and Chromium (Cr) for Newport Bay.

As described in detail in Section 1.1, the Regional Board is required to comply with the California Environmental Quality Act (CEQA) when considering amendments to the Basin Plan. Accordingly, this Substitute Environmental Document (SED), which includes an Environmental Checklist (Checklist) and analysis of the findings in the Checklist, has been prepared to address the potential environmental effects of adoption and implementation of the proposed Basin Plan amendments (the Proposed Project).

If the Basin Plan amendments are approved, Copper (Cu) TMDLs and Action Plans for Zn, Hg, As and Cr would be adopted and implemented. (See *Staff Report for Basin Plan Amendments for Copper TMDLs and Non-TMDL Action Plans for Zinc, Mercury, Arsenic and Chromium in Newport Bay, California, L.M. Candelaria 2016).* The Cu TMDLs and Action Plan for Zn would replace the Cu and Zn TMDLs promulgated by USEPA in June 2002. USEPA's TMDLs for Cadmium (Cd) and Lead (Pb) should be depromulgated based on the metals impairment assessment by Board staff. USEPA did not find impairment due to As and no TMDL for As was promulgated; but found impairment for Hg and Cr only in the Rhine Channel. However, Board staff's assessment indicates impairment due to these metals and Action Plans are now recommended. While USEPA's TMDLs do not include an implementation plan, actions are already required (and have been taken by the Regional Board and dischargers) to implement and achieve USEPA's TMDLs. This includes the issuance of National Pollutant Discharge Elimination System (NPDES) permits by the Regional Board for discharges of metals to surface waters. These permits specify discharge limitations and other requirements that are consistent with and appropriately implement USEPA's TMDLs. As stated, dischargers have implemented a variety of tasks and projects to address metals in the watershed in response to these permit requirements.

The proposed Cu TMDLs and Action Plans for Zn, Hg, As and Cr are described in detail in the Staff Report accompanying the Basin Plan amendment, and are summarized in the proposed draft Basin Plan amendment. The Staff Report, draft Basin Plan amendment and other relevant documentation can be found at the Regional Board's website at:
http://www.waterboards.ca.gov/santaana/water_issues/programs/tmdl/tmdl_metals.shtml.

A summary description of the Proposed Project is provided in Section 2 of this SED. Section 3 describes the environmental and regulatory setting for the Proposed Project. A discussion of reasonably foreseeable methods of compliance with the Cu TMDLs and Zn, Hg, As and Cr Action Plans, the Environmental Checklist and analysis of the findings in the Checklist are provided in Section 4. Section 5 includes a discussion of alternatives to the Proposed Project. References used in completing the analysis are listed in Section 6.

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Based on the analysis of the findings in the Checklist, Regional Board staff concludes that the implementation of the reasonably foreseeable methods of compliance with the proposed Cu TMDLs and Zn, Hg, As and Cr Action Plans will have less than significant impacts on the environment since mitigation measures for potential impacts are available and can and should be implemented by local agencies as site-specific projects are implemented. The goal of the TMDLs and Action Plans is to improve and protect water quality and beneficial use conditions in the Newport Bay watershed.

1.1 REQUIREMENTS FOR ENVIRONMENTAL IMPACT ANALYSIS TO THE NEWPORT BAY WATERSHED BY THE BASIN PLAN AMENDMENT FOR THE COPPER TMDLS AND ZINC, MERCURY, ARSENIC AND CHROMIUM ACTION PLANS

Pursuant to §15251(g) of the CEQA Guidelines (California Code of Regulations (CCR), Title 14, Division 6, Chapter 3, §15000 *et seq*.), the Water Quality Control (Basin)/Section 208 Planning Program of the State and Regional Water Boards has been certified by the Secretary for Resources as exempt from the requirement to prepare an Environmental Impact Report (EIR), Negative Declaration (ND) or Initial Study. However, an environmental analysis is to be presented in a substitute document that includes at a minimum:

1. A description of the proposed activities; and,

2. Either (a) or (b):

   (a) Alternatives to the activities and mitigation measures to avoid or reduce any significant or potentially significant effects that the proposed project may have on the environment; or,

   (b) A statement that the proposed project would not have any significant or potentially significant effects on the environment, supported by a checklist or other documentation.[1]

Additionally, the Regional Board must comply with the State Water Resource Control Board's regulations for implementation of CEQA for exempt regulatory programs when amending basin plans (CCR, Title 23, § 3775-3781). These regulations require early public consultation (Section 1.1.1) and the completion of a Substitute Environmental Document (SED), consisting of a written report containing an environmental analysis of the project and a completed Environmental Checklist. The issues identified in the Environmental Checklist must be evaluated in the checklist or elsewhere in the SED. Other documentation may also be included.

The SED must include:

1. A brief description of the proposed project;

[1] CEQA Guidelines, §15252.

2. Identification of any significant or potentially significant adverse environmental impacts of the proposed project;

3. An analysis of reasonable alternatives to the proposed project and mitigation measures to avoid or reduce any significant or potentially significant adverse environmental impacts; and,

4. An environmental analysis of the reasonably foreseeable methods of compliance. This environmental analysis must include, at a minimum, all of the following:

    a) an identification of the reasonably foreseeable methods of compliance with the project;
    b) an analysis of any reasonably foreseeable significant adverse environmental impacts associated with those methods of compliance;
    c) an analysis of reasonably foreseeable alternative methods of compliance that would have less significant adverse environmental impacts; and,
    d) an analysis of reasonably foreseeable mitigation measures that would minimize any unavoidable significant adverse environmental impacts of the reasonably foreseeable methods of compliance.

In preparing the environmental analysis of reasonably foreseeable methods of compliance, the Regional Board may utilize numerical ranges or averages where specific data are not available; however, the Board is not required to engage in speculation or conjecture.

The environmental analysis must take into account a reasonable range of environmental, economic and technical factors, population and geographic areas and specific sites, but the Board is not required to conduct a site-specific project level analysis of the methods of compliance, which CEQA may otherwise require of those agencies who are responsible for complying with the revised Basin Plan when they determine the manner in which they will comply.

For each of the significant or potentially significant adverse environmental impacts of the project or reasonably foreseeable methods of compliance with the project that are identified (if any), the SED must contain findings as described in the CEQA Guidelines §15091, and, if applicable, a statement of overriding considerations as described in CEQA Guidelines §15093.

The environmental analysis for the Basin Plan amendments must also comply with §15187 of the CEQA Guidelines. Section 15187 establishes requirements for rules and regulations requiring the installation of pollution control equipment, establishment of performance standards[2], and establishment of a treatment requirement by the State Water Resources Control Board (SWRCB or State Board) and regional water quality control boards (among other

[2] The term "performance standard" is not defined in CEQA but in the rulemaking provisions of the Administrative Procedures Act (Government Code §11340-11359). A "performance standard" is a regulation that describes an objective with the criteria stated for achieving the objective (Government Code §11342(d))

agencies).[3] The requirements established in §15187 are mirrored in the State Water Resources Control Board's regulations. Specifically, pursuant to §15187, the environmental analysis for such a rule or regulation must include at least the following:

1. An analysis of reasonably foreseeable environmental impacts of the methods of compliance;

2. An analysis of reasonably foreseeable feasible mitigation measures relating to those impacts; and

3. An analysis of reasonably foreseeable alternative means of compliance with the rule or regulation, which would avoid or eliminate the identified impacts.

Once again, the analysis must consider a reasonable range of environmental, economic, and technical factors, population and geographic areas, and specific sites. Where specific data are not available, the Santa Ana Water Board may utilize numerical ranges and averages but is neither required nor encouraged to engage in speculation or conjecture. A project-specific level analysis is not required, nor is it feasible.

Pursuant to Water Code §13360, the Santa Ana Water Board is prohibited from specifying the design, location, type of construction, or particular manner of compliance with waste discharge requirements or other orders. Instead, those entities subject to the proposed Basin Plan amendments are responsible for identifying compliance strategies, and conducting the required CEQA analysis of implementation of the selected strategies at the project-level. Thus, the Santa Ana Water Board cannot conduct project-level CEQA analyses of strategies that would be implemented by others, nor is it required to do so.

This document analyzes the potential environmental effects of implementing reasonably foreseeable methods of compliance on a Programmatic Level. Consistent with the CEQA Guidelines and Water Code Sections identified above, the environmental analysis contained herein includes a written analysis that identifies a reasonable range of reasonably foreseeable compliance strategies (Section 4), presents an Environmental Checklist and evaluates reasonably foreseeable environmental effects and mitigation measures, if applicable (Section 4), and discusses alternatives to the Proposed Project (Section 5). This analysis takes into consideration a reasonable range of environmental and economic factors, population and geographic areas and specific sites.

To fulfill the basic functions of CEQA (to evaluate and inform the public and decision-makers of the potential adverse environmental impacts of a project, identify suitable alternatives and mitigation measures and provide for public participation), a CEQA review does not need to be exhaustive, nor do the CEQA documents need to be perfect. They need only be adequate,

[3] The proposed Basin Plan amendment involves the adoption of copper (Cu) TMDLs and Action Plans for Zn, Hg, As and Cr, including an implementation plan to achieve those TMDLs. As such, the TMDLs would be considered as establishing performance standards. Therefore this environmental analysis must comply with CEQA Section 15187.

complete, and good faith efforts at full disclosure (CEQA Guidelines, § 15151). Nor does a CEQA analysis require unanimity of opinion among experts. The analysis is satisfactory as long as those opinions are considered (CEQA Guidelines, §15151).

This SED is intended to satisfy the standards for adequacy delineated in the CEQA Guidelines as they appear in CCR Title 14 §15000 *et seq.* and applicable case law.

In this SED, the Regional Board staff has performed a good faith effort at full disclosure of the reasonably foreseeable environmental impacts that could accompany implementation of the reasonably foreseeable methods of compliance with the proposed Cu TMDLs and Zn, Hg, As and Cr Action Plans for Newport Bay.

The Regional Board has made this SED available to the public for comment along with the Staff Report and the proposed Basin Plan amendment. These documents will be considered as a whole when evaluating the environmental impacts of implementing the Cu TMDLs and Action Plans. When completed, this SED will also include a response to comments on the SED.

1.1.1 CEQA Scoping Meetings and Regional Board Presentation

In accordance with the State Board's regulations for the implementation of CEQA (CCR Title 23, §3775.5), the Regional Board held two CEQA scoping meetings, on July 23, 2015 at the City of Newport Beach (City), to initiate public participation in the development of this SED. A notice of the CEQA Scoping hearing was sent to potentially interested and affected parties. An informational item was also presented at the July 24, 2015 Regional Board meeting. Input from all stakeholders and interested parties was solicited at these meetings and at the Regional Board meeting for consideration in the development of the SED.

During the CEQA Scoping meeting, Regional Board staff identified and discussed the regulatory basis for TMDLs, including applicable statutory and regulatory requirements; the metals TMDLs for Newport Bay promulgated by USEPA in 2002; and the proposed Cu TMDLs and Zn, Hg, As and Cr Action Plans. Board staff described a number of reasonably foreseeable methods of compliance with the TMDLs and Action Plans. These reasonably foreseeable compliance methods include actions to 1) decrease Cu discharges from boats, tributary runoff and storm drains; 2) remediate sediment Cu in marinas; 3) address sediment Zn and Hg, and Zn fish tissue impairment; and 4) address As and Cr fish tissue impairment.

2.0 PROJECT DESCRIPTION

The Regional Board proposes to amend the Basin Plan to incorporate Copper (Cu) TMDLs and Action Plans for Zinc (Zn), Mercury (Hg), Arsenic (As) and Chromium (Cr) in Newport Bay. The goals of these TMDLs and Action Plans are to correct impairment in waters due to Cu, in sediments due to Cu, Zn and Hg, and to address fish/mussel tissue impairment due to Zn, As and Cr.

The proposed Cu TMDLs and Action Plan for Zn would replace the Cu and Zn TMDLs promulgated by USEPA in June 2002. Action Plans, rather than TMDLs, are recommended for

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Zn and Hg since the remediation of sediment Cu (required by the Cu TMDL) should also remediate sediment Zn and Hg; therefore, therefore, a TMDL is not warranted at this time. Action Plans, rather than TMDLs, are recommended for As and Cr since sources of As and Cr need to be characterized; therefore, allocations cannot be assigned at this time. The As and Cr implementation tasks include a source analysis study. Based on the results of the additional studies, subsequent regulatory action may include the development and implementation of future TMDL(s). It should be noted that USEPA did not promulgate a TMDL for As, and promulgated separate TMDLs for Hg and Cr only in the Rhine Channel, so the proposed Action Plans, if approved, would impose new requirements on responsible parties. *(Note that if the Cu TMDLs or Zn, Hg, As and Cr Action Plans are not adopted, then USEPA's TMDLs for Cu, Zn, Cd and Pb will remain in place and will need to be implemented. These TMDLs include higher reductions for Cu loads from boats (92% compared to 83% in the proposed Cu TMDLs), and include allocations for Zn, Cd and Pb that must be met. Board staff's Metals Impairment Assessment found no impairment for Cd and Pb, and Zn impairment that could be addressed by an Action Plan with Hg.)*

As noted above, actions are already required to implement and achieve USEPA's TMDLs. This includes the issuance of National Pollutant Discharge Elimination System (NPDES) permits by the Regional Board for discharges of metals to surface waters. These permits specify discharge limitations and other requirements that are consistent with and appropriately implement USEPA's TMDLs.

If the proposed TMDLs and Action Plans are approved and replace USEPA's corresponding TMDLs, as expected, USEPA's TMDLs for Cu and Zn will be depromulgated and will no longer apply for regulatory purposes. Actions already taken and underway to address impairment from metals, in response to USEPA's TMDLs, are expected to continue to be employed in implementation of the proposed TMDLs and Action Plans, once approved. The evaluation of the potential effects of adoption and implementation of the proposed TMDLs and Action Plans is conducted in this context in this SED.

The proposed Cu TMDLs include:

(1) Numeric targets for Cu in water based on the California Toxics Rule (CTR) chronic and acute criteria;
(2) Numeric targets for Cu in sediments based on the Effects Range Low (ERL) sediment guidelines;
(3) Total Maximum Daily Loads (TMDLs) for Cu discharged into Newport Bay;
(4) Wasteload and load allocations for point source and nonpoint source inputs of Cu to the Bay; and,
(5) A recommended implementation plan (tasks and schedules) through which the numeric targets, TMDLs and allocations will be achieved.

The proposed Zn, Hg, As and Cr Action Plans include:

(1) Numeric targets for Zn, Hg, As and Cr in water based on the California Toxics Rule (CTR) chronic and acute criteria;
(2) Numeric targets for Zn, Hg, As and Cr in sediments based on the Effects Range Low (ERL) sediment guidelines;

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(3) Numeric targets for Zn, Hg, As and Cr in fish tissue based on guidelines for human health and wildlife; and
(4) A recommended implementation plan (tasks and schedules) through which the numeric targets will be achieved;
(5) The Action Plans for Zn, Hg, As and Cr do not contain TMDLs or allocations.

USEPA's Metals TMDLs (for Cu, Zn, Cadmium (Cd) and Lead (Pb)) do not include implementation plans. States are required by federal regulations to incorporate TMDLs into water quality management plans, which are intended to direct implementation (40 CFR 130.6). In California, water quality management plans include Regional Water Quality Control Plans (Basin Plans) and statewide water quality control plans. Under California law, a TMDL incorporated into the Basin Plan must include an implementation plan. The proposed amendments include the recommended implementation plan for the TMDLs and Action Plans and, thus, fulfill this obligation.

The proposed Cu TMDLs and Zn, Hg, As and Cr Action Plans, including the implementation tasks and schedules, were developed through scientific and technical inquiry with USEPA, US Fish and Wildlife Service (USFWS), Orange County Coastkeeper and with input from stakeholders and other active participants, including environmental organizations. The proposed Cu TMDLs also included scientific and technical input from the US Navy, Department of Pesticide Regulation (DPR), and the Statewide Marina Workgroup (that includes State Board and other Regional Boards, the Port of San Diego, Orange County Coastkeeper, DPR, California Coastal Commission (CCC) and others). These efforts are documented in the Staff Report on the Regional Board's website:
http://www.waterboards.ca.gov/santaana/water_issues/programs/tmdl/tmdl_metals.shtml.

The recommended implementation plans for the Cu TMDLs and Zn, Hg, As and Cr Action Plans are described in greater detail in Section 4. This Section includes a detailed discussion of the reasonably foreseeable methods of compliance, and the environmental analysis of the potential environmental effects of implementing these methods of compliance.

3.0 ENVIRONMENTAL AND REGULATORY SETTING

3.1 Environmental Setting

The Newport Bay/San Diego Creek watershed is located in Central Orange County in the southwest corner of the Santa Ana River Basin, about 35 miles southeast of Los Angeles and 70 miles north of San Diego (Figure 1-1). The watershed encompasses 154 square miles and includes portions of the Cities of Newport Beach, Irvine, Laguna Hills, Lake Forest, Tustin, Orange, Santa Ana, and Costa Mesa. Mountains on three sides encircle the watershed; runoff from these mountains drains across the Tustin Plain and enters Upper Newport Bay via San Diego Creek. Newport Bay is a combination of two distinct water bodies - Lower and Upper Newport Bay, divided by the Pacific Coast Highway (PCH) Bridge. The Lower Bay, where the majority of commerce and recreational boating exists, is highly developed. The Upper Bay

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contains both a diverse mix of development in its lower reach and an undeveloped ecological reserve to the north.[4]

San Diego Creek flows into Upper Newport Bay and is divided into two reaches. Reach 1 is located downstream of Jeffrey Road and Reach 2 lies upstream of Jeffrey Road to the headwaters. The San Diego Creek watershed (105 square miles) is divided into two main tributaries:

- Peters Canyon Wash, which drains Peters Canyon, Rattlesnake Canyon, and Hicks Canyon Washes that have their headwaters in the foothills of the Santa Ana Mountains, and
- San Diego Creek itself, which receives flows from Peters Canyon Wash in Reach 1 and includes Bee Canyon, Round Canyon, Marshburn Channel, Agua Chinon Wash, Borrego Canyon Wash and Serrano Creek

Important freshwater drainages to Upper Newport Bay, together covering 49 square miles, include the San Diego Creek, Santa Ana-Delhi Channel, Big Canyon Wash, Costa Mesa Channel and other local drainages.

San Diego Creek is the largest contributor (95%) of freshwater flow into Upper Newport Bay, followed by Santa Ana-Delhi Channel (~5%) (ACOE 2000). The table below summarizes the drainage areas of the major tributaries.

Drainage Areas of the Newport Bay Watershed*

Tributary	Drainage Area (acres)	Drainage Area (%)
San Diego Creek	47,300	48
Peters Canyon Wash	28,200	29
Santa Ana-Delhi	11,000	11
Other Drainage Areas	12,000	12

*Table 1-2, USEPA's Toxics TMDLs, 2002

The hydrology of the watershed has been substantially altered over the past 150 years, first by agriculture and second by substantial urbanization. The watershed is currently comprised of approximately 68 percent urban, less than seven percent agriculture, while still maintaining a significant portion of open space, located mainly in the foothills and headland areas, based on the most recent land use data[5]. The most dramatic change to the watershed occurred when

[4]USEPA. Toxics TMDLs for San Diego Creek and Newport Bay, 2002.

[5] *Source: Orange County Department of Public Works, provided May 2014.*

San Diego Creek was channelized in the early 1960s. This caused the Creek to discharge directly into Upper Newport Bay.

Upper Newport Bay

Upper Newport Bay contains one of the highest quality wetland areas remaining in Southern California. The Upper Bay estuary contains a State Ecological reserve in the upper half with habitat designated for sensitive species, including several endangered bird species including Ridgway's rail, the California least tern and Least Bell's vireo, and Belding's savannah sparrow (which is listed as endangered by the state). Several sediment basins are found in the Upper Bay and are periodically dredged by the Army Corps of Engineers (ACOE). The last sediment dredging and restoration project was conducted in 2005. The Upper Bay also contains the Newport Dunes Recreation area (Dunes), a small public beach which is the main swimming area in the Upper Bay. The Dunes area is located in the lower part of Upper Bay, south of the Ecological Reserve. North Star Beach is also located in the Upper Bay just south of the Ecological Reserve. The lower part of the Upper Bay also contains several marinas, including the Dunes and DeAnza marinas, which are located near the Dunes Recreation area and just north of Pacific Coast Highway bridge, respectively. Historical water uses for Upper Bay included water skiing, commercial and sport fishing (although limited fishing occurs presently), shellfish harvesting, preservation of rare species, marine habitat and recreation, including kayaking, boating and bird watching.

Lower Newport Bay

The Lower Newport Bay area, including Lido and Balboa Islands, is highly urbanized and residential. The Lower Bay also includes a number of marinas and mooring areas that contain approximately 10,000 boats, and approximately 5 boatyards. The Rhine Channel, a small dead-end reach in the southwestern part of Lower Bay, is an isolated area with poor tidal flushing and minimal storm drain input. The Regional Board has identified Rhine Channel as a toxic hotspot based on previous investigations (BPTCP 1997). West Newport Bay and the Turning Basin area are also areas that tend to have low tidal flushing and tend to accumulate pollutants in waters and sediments. The entire Newport Bay up to the mouth of San Diego Creek is subject to tidal influence.

The climate is characterized by short, mild winters, and warm dry summers. Average rainfall is approximately 13 inches per year. Ninety percent (90%) of annual rainfall occurs between November and April, with minor precipitation during summer months. From 2006 to 2011, San Diego Creek had a mean base flow rate of less than 10 cubic feet per second (cfs) for flows less than 25 cfs (mean of 8.4 cfs). This is a decrease from the mean base flow rate of 12 cfs for 1994 to 2002, reported in the Toxics TMDL. For storm events, flows may be as high as 8000 cfs. San Diego Creek is mostly freshwater with a wide range of hardness values and small influences by the slightly saline water table (less than 1 or 2% salinity). Santa Ana Delhi had a mean base flow rate of less than 5 cfs for flows less than 25 cfs (mean of 3.2 cfs) for 2006 to 2011, with storm flows almost to 500 cfs. The Upper Bay is an estuary with mostly saline water during dry weather, and heavy freshwater inflow from San Diego Creek and Santa Ana-Delhi Channel during major storms, which mostly occur in winter. Lower Bay waters are dominated by saline waters (30 to 35 parts per thousand (ppt)) due to twice-daily ocean tides which enter the Bay via the jetty entrance.

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The actions identified in the recommended Copper (Cu) TMDL Implementation Plan and Zinc (Zn), Mercury (Hg), Arsenic (As) and Chromium (Cr) Action Plans and are intended to reduce Cu in Bay waters and sediments, Zn and Hg in sediments (and Zn in fish tissue), and As and Cr concentrations in fish tissue, and protect the beneficial uses of the Bay (Figure 1-1). The existing or potential beneficial uses of surface waters in the Newport Bay watershed that may be affected by metals are designated in the Regional Board's Basin Plan and are shown in the table below.

A more detailed description of the watershed is provided in the Staff Report (Sections 1.1 and 1.2).

Beneficial Uses of Upper and Lower Newport Bay

	NAV	REC1	REC2	COMM	BIOL	WILD	RARE	SPWN	MAR	SHELL	EST
Upper Newport Bay		X	X	X	X	X	X	X	X	X	X
Lower Newport Bay*	X	X	X	X		X	X	X	X	X	

X = Existing or potential beneficial use, I = Intermittent beneficial use, * Includes the Rhine Channel
NAV =Navigation, REC1 =Water contact recreation, REC2 =Non-contact water recreation,
COMM =Commercial and sportfishing, BIOL =Preservation of biological habitats of special significance,
WILD =Wildlife habitat, RARE =Rare, threatened, or endangered species,
SPWN =Spawning, reproduction, and development, MAR =Marine habitat,
SHEL =Shellfish harvesting, EST =Estuarine habitat

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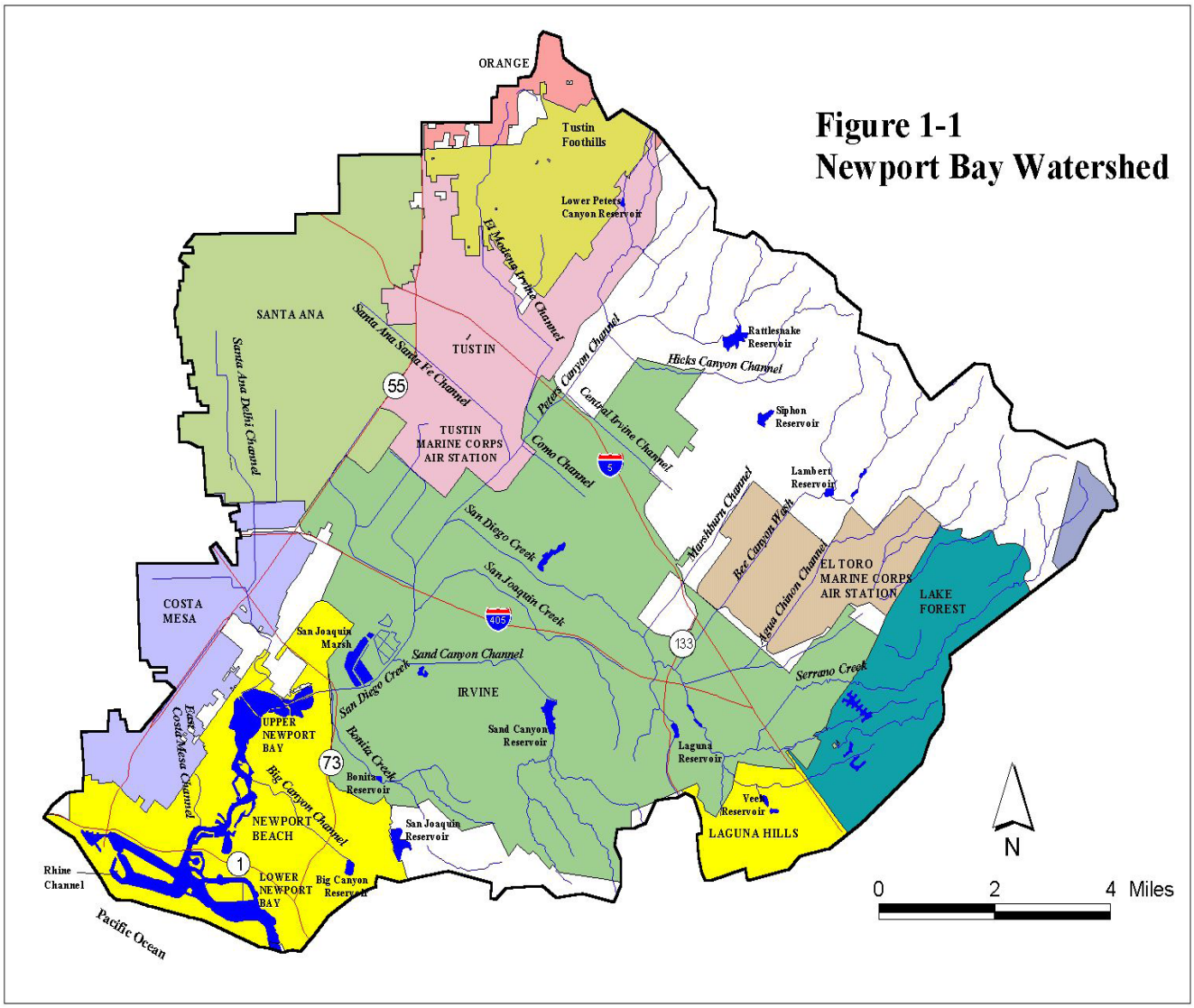
Figure 1-1
Newport Bay Watershed
ORANGE
Tustin Foothills
Lower Peters Canyon Reservoir
El Modena Irvine Channel
SANTA ANA
Santa Ana Santa Fe Channel
TUSTIN
Santa Ana Delhi Channel
55
TUSTIN MARINE CORPS AIR STATION
Peters Canyon Channel
Central Irvine Channel
Como Channel
5
Rattlesnake Reservoir
Hicks Canyon Channel
Siphon Reservoir
Lambert Reservoir
Marshburn Channel
Bee Canyon Wash
Agua Chinon Channel
EL TORO MARINE CORPS AIR STATION
LAKE FOREST
San Diego Creek
San Joaquin Creek
COSTA MESA
San Joaquin Marsh
405
133
Sand Canyon Channel
Serrano Creek
IRVINE
UPPER NEWPORT BAY
East Costa Mesa Channel
Sand Canyon Reservoir
Laguna Reservoir
Bonita Creek
73
Big Canyon Channel
Bonita Reservoir
Veeh Reservoir
NEWPORT BEACH
San Joaquin Reservoir
LAGUNA HILLS
1
LOWER NEWPORT BAY
Big Canyon Reservoir
Rhine Channel
Pacific Ocean
N
0
2
4 Miles

3.2. Regulatory Setting

Under Section 303(d) of the federal Clean Water Act (CWA) states are required to develop lists of impaired surface waters. These are waters for which technology-based regulations and other required controls are not stringent enough to meet the water quality standards set by states. Water quality standards include water quality objectives, designated beneficial uses to which the surface waters are or may be put, and an antidegradation policy.

The Basin Plan specifies the water quality standards applicable to surface (and ground) waters in the Santa Ana Region. The requirement for an antidegradation policy is satisfied by State Board Resolution No. 68-16[6], which is incorporated in the Basin Plan by reference.

The Clean Water Act requires that states establish priority rankings for waters on the 303(d) lists and develop Total Maximum Daily Loads (TMDLs) for these waters. A TMDL is the maximum amount of a pollutant, such as Cu, that a water body can receive and still safely meet water quality standards. In addition, USEPA recently identified a new framework for implementing the CWA 303(d) program that allows states to identify and implement alternatives to TMDLs that are expected to achieve the same or better water quality results in a more efficient and expeditious manner[7]. The Action Plans identified by Board staff for Zn, Hg, As and Cr are alternative strategies to TMDLs.

USEPA has oversight authority for the 303(d) program and is required to review, and approve or disapprove TMDLs submitted by states. If USEPA disapproves a TMDL submitted by a state, USEPA is required to instead establish the TMDL for that water body.

The elements of TMDLs are described in federal law and regulations (CWA Sec. 303(d) and 40 CFR §§ 130.2; 130.7). TMDLs must include seasonal variations in water quality and a margin of safety (MOS) to account for uncertainty in predicting how well pollutant reductions will result in meeting water quality standards. TMDLs must also allocate total allowable loads to point sources (e.g., discharges subjected to regulation under the NPDES program) and nonpoint sources (other sources, including anthropogenic and natural background discharges). Wasteload allocations (WLAs) are assigned to point sources and load allocations (LAs) are assigned to nonpoint sources.

TMDLs are generally established in California through the basin planning process, (i.e., an amendment to the basin plan is adopted by the Regional Board that incorporates the TMDL(s) along with a new or revised program of implementation designed to meet the TMDL(s)).

On October 31, 1997, USEPA entered into a consent decree (decree), (*Defend the Bay, Inc. v. Marcus, (N.D. Cal. No. C 97-3997 MMC)*), which established a schedule for development of TMDLs in San Diego Creek and Newport Bay. The decree required development of TMDLs for multiple toxic pollutants by January 15, 2002. The agreement also provided that USEPA would establish the required TMDLs within ninety (90) days if the State failed to establish approved TMDLs by the deadline. In early April 2002, the decree was modified to extend the deadline for USEPA to establish these TMDLs to June 15, 2002 (USEPA 2002).

[6] http://www.waterboards.ca.gov/board_decisions/adopted_orders/resolutions/1968/rs68_016.pdf

[7] "A New Long-Term Vision for Assessment, Restoration and Protection under the Clean Water Act Section 303(d) Program", USEPA, December 5, 2013.

Relying in part on work completed by Regional Board staff, in June 2002, USEPA established the Toxics TMDLs for San Diego Creek and Newport Bay (including TMDLs for Cu and other metals) in compliance with the terms of the decree. The TMDLs were designed to attain the water quality objectives[8] for Cu, Cd, Zn and Pb, and other specified toxic pollutants in the Newport Bay, and were prepared pursuant to state and federal requirements to attain water quality standards. Although the technical portion of the TMDLs was adopted, an implementation plan was not developed as implementation plans are the responsibility of the state.

The proposed project is the adoption and implementation of multiple Basin Plan amendments to incorporate: *(1) Cu TMDLs for Newport Bay; (2) Zn, Hg, As and Cr Action Plans for Newport Bay; and (3) implementation tasks and schedules to meet the numeric targets and allocations for Cu, and the numeric targets for Zn, Hg, As and Cr.*

Upon approval by the State Board and Office of Administrative Law (OAL) of the proposed Basin Plan amendments, the amendments will be forwarded to USEPA for review and approval. If USEPA approves the State-approved Cu TMDLs and Zn, Hg, As and Cr Action Plans, the revised Cu TMDLs and Zn Action Plan will replace USEPA's Cu TMDLs. In addition, it is expected that USEPA will depromulgate the Zn, Cd and Pb TMDLs for Newport Bay based on the Metals Impairment Assessment conducted by Board staff (Staff Report, Section 4.0).

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[8] USEPA's Toxics TMDLs establishes numeric targets, load allocations, and waste load allocations for Cu, Cd, Zn and Pb based on the saltwater California Toxics Rule (CTR) acute and chronic criteria. (USEPA's Toxics TMDLs also established numeric targets for Cu, Cd, Zn and Pb for San Diego Creek based on flow tiers.)

4.0 ENVIRONMENTAL IMPACT ANALYSIS

This section presents the Environmental Checklist, identifying the potential adverse environmental impacts of implementing the proposed Cu TMDLs and Zn, Hg, As and Cr Action Plans. This Checklist is based on consideration of the potential impacts of the reasonably foreseeable methods of compliance with the TMDLs, described in Section 4.1. Analysis of the Checklist findings, and Regional Board staff's conclusions regarding the level of potential environmental impact, are presented in Section 4. 2.

4.1 Implementation Plans for Cu TMDLs and Zn, Hg, As and Cr Action Plans

Revised Cu TMDLs and Action Plans for Zn, Hg, As and Cr are proposed as Basin Plan Amendments. Action Plans, rather than TMDLs, are recommended for Zn and Hg since the remediation of sediment Cu (required by the Cu TMDL) should also remediate sediment Zn and Hg; therefore, therefore, a TMDL is not warranted at this time. Action Plans, rather than TMDLs, are recommended for As and Cr since sources of As and Cr need to be characterized; therefore, allocations cannot be assigned at this time. (Note that if the Cu TMDLs or Zn, Hg, As and Cr Action Plans are not adopted, then USEPA's TMDLs for Cu, Zn, Cd and Pb will remain in place and will need to be implemented. These TMDLs include higher reductions for Cu loads from boats (92% compared to 83% in the proposed Cu TMDLs), and include allocations for Zn, Cd and Pb that must be met. Board staff's Metals Impairment Assessment found no impairment for Cd and Pb, and sediment Zn impairment that could be addressed by an Action Plan (and remediation required by the Cu TMDLs.)

4.1.1 Implementation of Cu TMDLs - Required Tasks and Reasonably Foreseeable Methods of Compliance

4.1.1.1 Reduce Copper Loads from Copper Antifouling Paints (Cu AFPs) on Recreational and Commercial Boats

Since Cu antifouling paints (AFPs) are the largest source of Cu to Newport Bay, the highest priority for the Cu TMDLs is the reduction of Cu loads from Cu AFPs. An approximately 83% reduction in Cu discharges from Cu AFPs is required to meet the TMDL allocation assigned to boats.[9] The main strategy to accomplish this Cu load reduction from boats is the conversion of boats from Cu AFPs to nontoxic AFPs/coatings. In addition, while boats are being converted to nontoxic AFPs/coatings, all divers must be required to use BMPs for underwater hull cleaning including the use of soft cloths or hull cleaning container/filter methods. As described below, compliance with the TMDL boat allocation will likely require a combination of these strategies, implemented over time (Staff Report, Section 5.6.3.1.2).

The proposed TMDL implementation plan requires dischargers, including the City of Newport Beach, the County of Orange, marina and boatyard owners/operators, underwater hull cleaners and individual boat owners to prepare and submit one or more proposed implementation plans and schedules to address the reduction of Cu loads from boats, and to determine the effectiveness of the plans when implemented. The plan(s) would be implemented upon approval by the Regional Board. The dischargers are encouraged to work collaboratively to develop a

[9] Note that USEPA's TMDLs require a 92% reduction in Cu loads from boats, which is higher than the reduction required by the proposed Cu TMDLs.

comprehensive plan(s) for resource efficiency, effectiveness and timeliness. The City of Newport Beach and County of Orange are encouraged to take a leadership role in the preparation and implementation of these plans.

(1) Convert boats from Cu AFPs to nontoxic AFPs.
The attainment of these Cu TMDLs will require the conversion of boats from Cu to nontoxic AFPs/coatings. This conversion is both reasonable and possible since several studies on alternative paints have demonstrated that nontoxic AFPs or coatings are available and cost effective compared to traditional Cu AFPs. Time will be needed to implement the conversion from Cu to nontoxic AFPs and to evaluate and implement other measures to reduce Cu discharges from boats; therefore, Cu AFPs may be replaced during the regular repainting schedule so boaters will not be required to convert to nontoxic paints immediately. In addition, in the interim (until the final date of compliance with the Cu TMDLs), some boaters may convert to non-Cu AFPs or Cu AFPs with leach rates at or below DPR's maximum allowable leach rate of 9.5µg/cm^2/d.

Economics. There will be an initial cost to convert from Cu to nontoxic AFPs since the old Cu AFPs must be stripped before the application of a nontoxic paint. In addition, nontoxic paints must be sprayed on rather than rolled-on (like Cu), so nontoxic paints cost approximately double to apply. The long term cost of nontoxic paints, however, is equivalent to or lower than the cost of Cu paints since nontoxic paints last 5-7 years while Cu paints last 2-3 years.

Note that paint manufacturers are developing nontoxic formulas that can be rolled on rather than sprayed on, and/or applied over old Cu AFPs ; these formula modifications will reduce the cost of the initial application of a nontoxic paint. Note also that a 319h Boat Conversion Project was conducted in a target marina in the Bay, but only ten boats took advantage of this incentive program.

Again, as described above, pursuant to the 2002 USEPA Cu TMDLs, a substantial reduction in Cu loads from boats is already required (92%); while the Cu load reduction for boats identified in the proposed Cu TMDLs (83%) is less that required by USEPA's TMDLs.

(2) Use of BMPs for hull cleaning including soft cloths or hull cleaning container/filter methods.

BMPs for hull cleaning. As boats are converted to nontoxic AFPs, all underwater hull cleaners should use BMPs for hull cleaning. A hull cleaning study by the US Navy showed that Cu loads for non-BMPs were approximately 28% higher than loads using BMPs for two test paints (Earley et al. 2013[10]). (Non-BMPs use abrasive pads to clean boat hulls, while BMPs use soft pads. If it is assumed that half the hull cleaners currently use BMPs and half use non-BMPs, then approximately 14% reduction in Cu loading may be achieved if all divers use BMPs.)

[10] Earley, P.J., B.L. Swope, K. Barbeau, R. Bundy, J.A. McDonald and I. Rivera-Duarte. 2013. Life cycle contributions of copper from vessel painting and maintenance activities. Biofouling.

While the conversion from non-BMPs to BMPs will not be sufficient by itself to achieve these Cu TMDLs, it is reasonable and appropriate to require the consistent use of BMPs throughout the Bay to minimize the discharge of Cu to surface waters during hull cleaning. BMP training and requirements for BMP use are expected to be part of any strategy proposed by responsible parties to achieve the requisite Cu reductions from Cu AFPs.

The use of BMPs would also be required to achieve USEPA's Cu TMDLs and to reduce the discharge of pollutants to surface waters, consistent with the goal of the federal Clean Water Act.

Economics. Soft cloths. The conversion from the use of non-BMPs to BMPs should have no substantial cost increase.

Hull cleaning container/filter methods. A new BMP strategy for cleaning hulls consists of a container/filter method where a boat is cleaned inside a slip liner. The water is then filtered before discharging to the Bay, and the solids are collected and disposed of in an appropriate landfill. The result is that no Cu load (dissolved, total or particulate) from hull cleaning is discharged into the Bay. This results in cleaner waters and sediments.

Economics. The use of a container/filter system will cost approximately double that of a routine hull cleaning by a diver; however, the removal of Cu loads discharged during hull cleaning from Bay waters will help to clean up the Bay, and may reduce the number of boat conversions from Cu to nontoxic paints required to meet the Cu TMDLs. In addition, local divers may be trained to use this container/filter system so that they can protect Bay waters and continue to clean hulls.

(3) Continue monitoring in marinas, channels and Bay waters

Marinas, channels and open water sites in Newport Bay shall be monitored for dissolved and total Cu concentrations in water and sediment, and water and sediment toxicity; and the data evaluated to determine Cu load reduction and the effects of the reduced Cu load from Cu AFPs on Cu concentrations and Cu loading in marina and channel waters and sediments. Monitoring shall include dissolved and total Cu concentrations in water and sediment; water and sediment toxicity testing; water quality parameters including dissolved organic carbon (DOC), pH, salinity, temperature, total suspended solids (TSS), total organic carbon (TOC); and benthic testing (if necessary).

Economics. Marina monitoring should be incorporated into routine monitoring of the Bay, and include the same parameters that are monitored for other sites. Such monitoring would also be necessary to assess compliance with USEPA's already established TMDLs.

(4) Continue Education Programs for boaters, and boatyard and marina owner/operators and staff.

Identify and evaluate existing boater and boat related education program(s) in the Bay, and revise those programs as necessary to include the following at a minimum:

(5.1) Cu water quality issues and TMDL requirements,
(5.2) Information on 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;
(5.3) Nontoxic AFP use requirements including recommended BMPs for hull cleaning and frequency of cleaning;
(5.4) BMP requirements for all underwater hull cleaners including soft cloths or hull cleaning containment methods, and BMP requirements for boatyards[11].
(5.5) 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); and
(5.6) Potential boat storage options, such as dry dock and/or slip liners.

Economics. Education programs will be an additional cost; however, the benefits to water quality in the Bay will outweigh these initial costs. Education programs were already begun in the Bay as part of the 319(h) Cu Reduction Program[12] *conducted (mostly in Balboa Yacht Basin) in fall 2010 through winter 2013. In addition, a City resolution was passed "to encourage the use of copper-free boat bottom paints" (Resolution 2010-53).*

4.1.1.2 Remediate areas of known sediment Cu impairment, and identify/remediate sediment impairment in areas where no or limited sediment Cu data exists

Areas impaired for sediment Cu are mostly marinas that were characterized in the Cu-Metals Marina Study (Coastkeeper & Candelaria 2007). The second priority of the implementation plan for the proposed Cu TMDLs is to remediate areas of known sediment Cu impairment; and to evaluate areas where no or limited sediment data exists, especially marina areas, to determine the extent of impairment in non-characterized areas of the Bay. A more extensive marina survey is indicated to fully assess the extent of sediment Cu exceedances and sediment toxicity in marina and boatyard areas in the Bay. Corrective actions required in the Cu TMDLs to address Cu sediment impairment, such as dredging, are also expected to remediate sediment impairment due to zinc (Zn) and mercury (Hg) (Staff Report, Section 5.6.3.2).

The proposed TMDL implementation plan requires dischargers, including the City of Newport Beach, the County of Orange, marina and boatyard owners/operators, underwater hull cleaners and individual boat owners to prepare and submit one or more proposed implementation plans and schedules to address known areas of sediment impairment, and to determine sediment impairment in areas of the Bay with no or limited sediment data. The plan(s) would be implemented upon approval by the Regional Board. The dischargers are encouraged to work

[11] Boatyard operations are regulated under the State Board's General Industrial Storm Water Permit, which requires the development and implementation of Storm Water Pollution Prevention Plans and prohibits the discharge of unauthorized non-storm water discharges (zero discharge), such as process wastewater generated at boatyards. In short, BMPs are already required at boatyard facilities.

[12] Orange County Coastkeeper. March 2013. Newport Bay Copper Reduction Study. Report for Santa Ana Regional Water Board.

collaboratively to develop a comprehensive plan(s) as a matter of resource efficiency, effectiveness and timeliness. The City of Newport Beach and County of Orange are encouraged to take a leadership role in the preparation and implementation of these plans.

Economics. A characterization study of marinas not evaluated in the Cu-Metals Marina Study (Coastkeeper & Candelaria 2007[13]) should be conducted to determine the impairment in marinas in the Bay. This study will be an additional cost. Dredging operations will entail cost. To the extent feasible, these dredging operations may be planned to coincide with dredging operations designed to address shallow depths and navigation issues.

4.1.1.3 Meet Copper (Cu) allocations for tributary runoff

The third priority of the implementation plan for the proposed Cu TMDLs is to meet the Cu allocations for tributary runoff. The source analysis shows that discharges of Cu from major tributaries (storm and dry weather runoff) are the second largest source of Cu to Newport Bay (Staff Report, Section 5.6.3.3). The allocation for tributary runoff is equivalent to the Cu load in tributary runoff at the writing of the Cu TMDLs. (Metal loads from San Diego Creek have already been reduced with the implementation of the Sediment TMDLs, and are not expected to decrease further.) While San Diego Creek is no longer 303(d) listed for metals, including Cu, the Creek and Santa Ana Delhi are sources of Cu to Newport Bay. The dischargers will be required to continue monitoring to ensure that Cu loads from tributary runoff remain at or below the Cu allocations in this TMDL. Monitoring of metals is already being conducted.

Economics. Since metals monitoring is already being conducted, there should be no significant economic impact, unless Cu loads from tributaries exceed the Cu allocations for tributaries and corrective actions are necessary.

4.1.1.4 Evaluate Copper (Cu) Discharges from Storm Drains for Local Impacts

The source analysis showed that discharges of Cu from storm drains are low compared to the largest sources of Cu (Cu from Cu AFPs on boats, and tributary runoff) (Staff Report, Section 5.6.3.4). While the overall Cu input from storm drains may be small compared to other sources, Cu loads may have local impacts in receiving waters near the larger storm drains, such as the Arches drains.

Pursuant to this proposed TMDL implementation plan, the City of Newport Beach and the County of Orange are required to develop and implement upon Regional Board approval a plan and schedule to determine the significance of localized Cu loads in runoff from storm drains that directly enter Upper and Lower Newport Bay. The intent is to assess the effects of Cu in storm drain runoff on local receiving waters and sediment quality and beneficial uses. Requirements for this investigation and for the development and implementation of a corrective action plan, where found to be necessary, will be incorporated in the revised MS4 permit. Corrective action to reduce Cu discharges and eliminate Cu impairment will be required where the data demonstrate impairment based on the criteria identified in the State Water Board's 303(d) Listing Policy (Water Quality Control Policy for developing California's Clean Water Act Section 303(d) List).

[13] Orange County Coastkeeper and L.M.Candelaria. July 2007. Lower Newport Bay Copper-Metals Marina Study. Report for Santa Ana Regional Water Board.

Economics. There will be costs involved in executing the requisite evaluation of local impacts of Cu in storm drain runoff. Additional costs may be incurred if corrective actions are shown to be necessary. It is our understanding that the City is already working on diversions of some storm drains in dry weather.

4.1.1.5 Continue Monitoring

Monitoring is necessary to evaluate the effects of the strategies implemented in response to the Cu TMDLs and to determine progress towards achieving water quality standards; therefore, it is a key element of this TMDL implementation plan.

Monitoring for Cu and other metals in the Bay and its tributaries is conducted by the dischargers on a routine basis, largely in response to the requirements of the MS4 permit. The proposed implementation plan requires the dischargers to develop and implement, upon Regional Board approval, a monitoring plan to address the needs of this TMDL. The expectations for this monitoring are identified in the Staff Report (Section 5.6.3.5.). In brief, this plan should include the monitoring of Cu in water and sediments, toxicity in water and sediments, and benthic testing in sediments if sediment Cu exceeds guidelines and toxicity is present . The proposed plan should include sampling of the following:

- *Bay waters and sediments, including open bay, marina and channel sites*
- *Tributary runoff including San Diego Creek, Santa Ana Delhi and Big Canyon Wash*
- *Storm drain runoff*

The proposed monitoring plan should be integrated with ongoing monitoring to the extent feasible. Monitoring of storm drains that empty directly into the Bay should be coordinated with monitoring of marinas, channels, open water sites and tributaries. The monitoring plan shall include the following analyses at a minimum:

(1) Bay monitoring in Upper and Lower Newport Bay.

- *Bay waters. Monitoring of dissolved and total copper (Cu) in water, and standard water quality parameters including pH, salinity, temperature, total suspended solids (TSS), dissolved organic carbon (DOC), total organic carbon (TOC); and toxicity testing.*
- *Bay sediments. Monitoring of total Cu in sediments; pH and total organic carbon (TOC); and toxicity testing. If sediment toxicity is high, benthic monitoring should be conducted.*
- *Bay monitoring shall include marina sites, as well as channel sites for both water and sediment testing as described above.*

(2) Tributary monitoring in San Diego Creek, Santa Ana Delhi, Big Canyon Wash.

- *Tributary waters. Monitoring of dissolved and total Cu in water, and standard water quality parameters including pH, salinity, temperature, total suspended solids (TSS), dissolved organic carbon (DOC), total organic carbon (TOC); and toxicity testing in runoff from the major tributaries, San Diego Creek and Santa Ana Delhi and Big Canyon Wash.*

(3) Storm drain monitoring.

- *Runoff from storm drains in Lower Newport Bay, including storm drains that empty into marinas, should also be monitored for dissolved and total Cu in water, and standard*

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water quality parameters including pH, salinity, temperature, total suspended solids (TSS), dissolved organic carbon (DOC) and total organic carbon (TOC).

(4) Fish/Shellfish tissue monitoring.

- *Monitoring of Cu shall continue in fish and mussel tissue, especially since State Mussel Watch (SMW) data shows an increasing trend in Cu concentrations in mussels over the last ten years (Stillway et al. 2012, SWAMP Report[14]).*

In addition, the proposed monitoring program must include a plan to evaluate the efficacy of the implementation tasks required to achieve the Cu load reductions required by this TMDL. The results of this monitoring are expected to support adaptive management of tasks and strategies to ensure efficient and effective implementation of the Cu TMDLs. Special studies may also be conducted to achieve the requirements of the Cu TMDLs.

Economics. A large part of the above recommended monitoring is already being conducted by the County of Orange. Additional monitoring, if required, could be added to this monitoring program. Integration of this monitoring with already established and ongoing monitoring programs is expected to reduce costs.

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[14] Stillway, M., D. Markiewicz, B. Anderson, and B. Phillips. 2012. Toxicity in California Waters: Santa Ana Region. Report for Surface Water Ambient Monitoring Program (SWAMP)

4.1.2 Implementation of Zn, Hg, As and Cr Action Plans - Required Tasks and Reasonably Foreseeable Methods of Compliance

4.1.2.1 Zn and Hg Action Plans

(1) Remediate areas of known sediment Zn and Hg impairment, and identify/remediate sediment impairment in areas where no or limited sediment Zn and Hg data exists

Areas impaired for sediment Zn and Hg are mostly marinas that were characterized in the Cu-Metals Marina Study (Coastkeeper & Candelaria 2007). The highest priority for the Zn and Hg Action Plans is to remediate areas of known sediment Zn and Hg impairment; and to evaluate areas where no or limited sediment data exists, especially marina areas, to determine the extent of impairment in non-characterized areas of the Bay. A more extensive marina survey is indicated to fully assess the extent of sediment Zn and Hg exceedances and sediment toxicity in marina and boatyard areas in the Bay. Corrective actions required in the Cu TMDLs to address Cu sediment impairment, such as dredging, are also expected to remediate sediment impairment due to zinc (Zn) and mercury (Hg).

The proposed TMDL implementation plan requires dischargers, including the City of Newport Beach, the County of Orange, marina and boatyard owners/operators, underwater hull cleaners and individual boat owners to prepare and submit one or more proposed implementation plans and schedules to address known areas of sediment impairment, and to determine sediment impairment in areas of the Bay with no or limited sediment data. The plan(s) would be implemented upon approval by the Regional Board. The dischargers are encouraged to work collaboratively to develop a comprehensive plan(s) as a matter of resource efficiency, effectiveness and timeliness. The City of Newport Beach and County of Orange are encouraged to take a leadership role in the preparation and implementation of these plans.

Economics. There will be costs associated with monitoring, characterization and dredging or implementation of other remediation strategies, where found necessary. The Cu TMDLs require that a characterization study of marinas not evaluated in the Cu-Metals Marina Study (Coastkeeper & Candelaria 2007) be conducted to determine the impairment in marinas in the Bay. The evaluation of other metals can be easily added to this study so that Zn and Hg will be characterized along with Cu. The costs of additional analyses should not be significant.

(2) Continued Monitoring

- *Monitoring of Zn, Hg (and Cu) should continue in both water and sediments (especially in the Lower Bay marina areas and the Turning Basin/S. Lido Channel areas), and tributary runoff, and Zn and Hg loads should be determined annually from tributary runoff.*
- *Monitoring of Zn should continue in fish and mussels in the Lower Bay.*

(3) Additional characterization studies

- *A Metals Sediment Study in the Lower Bay also determined concentrations of Zn, Hg (and Cu) in post-dredge surface sediments. Further work is needed to determine the extent of Zn, Hg (and Cu) in surface sediments throughout all of the Lower Newport Bay.*
- *Sediments near boatyards should be tested to determine whether Zn, Hg (and Cu) exceed the ERM sediment guidelines and sediment toxicity is present. (This can be combined with marina study described above.)*

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- *A study to quantify the contribution of Zn discharges from Zn anodes and Zn boat paints should be conducted. (This should include the quantification of Zn released from Zn anodes (dissolved and particulate), and a determination of the dissolution rates of Zn from Zn anodes.)*
- *Total Zn and Hg data from the Storm Drain Study should be analyzed to determine total Zn loads from storm drains in the Turning Basin area (dissolved loads were calculated for the study report).*
- *A hydrodynamic flow model should be reviewed to determine whether loads from the tributaries impact the Turning Basin.*

Remediation Strategies

- *Based on the monitoring and characterization studies identified above, the proposed Action Plan must identify appropriate remediation strategies, such as dredging. Strategies should be included for the Turning Basin area in Lower Newport Bay, including marinas, to remediate sediment Zn, Hg (and Cu). Additional areas of the Bay, including marinas, may also need dredging pending results from the more extensive marina sediment study.*

Economics. There will be costs associated with monitoring and characterization, dredging and implementation of other remediation strategies, where found necessary. The additional characterization studies will have a cost, but can be 1) conducted in combination with other studies, 2) conducted in a phased approach dependent on results from initial studies and monitoring. The Cu TMDLs require that a characterization study of marinas not evaluated in the Cu-Metals Marina Study (Coastkeeper & Candelaria 2007) be conducted to determine the Cu impairment in marinas and channels in the Bay. Testing and evaluation of other metals can be easily added to this study so that Zn and Hg will be characterized along with Cu. The costs of additional analyses should not be significant.

4.1.2.2 As and Cr Action Plans

Monitoring and characterization are required to determine the sources of As and Cr. Based on the results, remediation strategies can be developed. These monitoring and investigations can be coordinated with other ongoing or planned monitoring to maximize efficiency and minimize costs.

(1) Source Analysis

A source identification study is needed to determine the source(s) of As and Cr. This study should include sampling of surface sediments throughout Lower Newport Bay, including marina sediments, to determine whether As and Cr exceed the ERM sediment guidelines and sediment toxicity is present.

(2) Continued Monitoring

- *Monitoring of As and Cr should continue in both water and sediments, in both the Upper and Lower Bay, <u>and</u> tributary runoff, and Zn and Hg loads should be determined annually from tributary runoff.*

(3) Additional characterization studies

- *Sediments near boatyards should be tested to determine whether As and Cr exceed the ERM sediment guidelines and sediment toxicity is present.*
- *Total As and Cr from the Storm Drain Study should also be analyzed to determine total As and Cr loads from storm drains in the Turning Basin area (dissolved loads were calculated for study report).*
- *Vegetation and algae studies may also be warranted as algae was shown to contain As and Cr.*

Remediation Strategies

- *Remediation strategies are not proposed at this time since all sources of As and Cr have not been quantified. Of the sources that have been quantified, mean annual As and Cr loads from storm drains are small, along with the Cr load from tributaries. The mean annual As load from tributaries is higher and may be evaluated for possible source reduction.*

As discussed above, reevaluation of the TMDL may result in revised TMDLs based upon evaluation of the results of the implementation tasks including studies, monitoring and remediation. The reevaluation will occur 5 years after the approval of the BPA.

4.1.3 Summary of Reasonably Foreseeable Methods of Compliance

In summary, implementation of the proposed Cu TMDLs and Zn, Hg, As and Cr Action Plans is expected to require actions by responsible parties that can be placed in four broad categories:
(1) Conversion of Cu AFPs to nontoxic AFPs (or in the interim, to non-Cu hull paints or Cu AFPs with leach rates at or below 9.5 µg/cm^2/d), during the normal hull repainting schedule;
(2) Use of BMPs during hull cleaning (e.g., soft cloths and/or hull cleaning container/filter methods);
(3) Dredging of sediments, especially in marinas;
(4) Monitoring and characterization of areas with no or little data, which may dictate the need for and nature of future remedial actions.
The environmental analysis that follows addresses the potential environmental effects of each of these types of actions. Public education and outreach is expected to be an important component of implementation. Education and outreach is not expected to have any physical effect on the environment and is not further considered in this analysis.

4.2 Impacts and Mitigation

This section presents the Environmental Checklist and analysis of the potential environmental impacts, and mitigation where applicable, for the reasonably foreseeable methods of compliance described in the preceding sections. The environmental analysis takes into account a reasonable range of environmental, economic, and technical factors, populations and geographic areas, and to the extent known, implementation sites. The analysis also takes into account knowledge and experience gained with the implementation of Cu TMDLs in San Diego (Shelter Island) and Los Angeles (Marina del Rey). The Checklist and analyses are intended to satisfy the regulations described in Section 1.1.

The environmental setting in which the impacts may occur is Newport Bay and its watershed, to the extent that control actions in the Bay and watershed become necessary to address metals inputs to the Bay. The Bay and watershed are shown in Figure 1-1 and described in Section 3.1.

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4.2.1 Approach to Environmental Impact Analysis and Mitigation

A significant effect on the environment is defined in the California Code of Regulations as "*a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project, including land, air, water, minerals, flora, fauna, ambient noise, and objects of historic or aesthetic significance. An economic or social change by itself shall not be considered a significant effect on the environment. A social or economic change related to a physical change may be considered in determining whether the physical change is significant."*

In formulating answers to the Checklist questions, including the mandatory findings of significance, Regional Board staff's analysis takes into consideration the following:

1. The specific location and nature of all projects and tasks that are required to address impairment due to Cu, Zn, Hg, As and Cr cannot be determined at this time; therefore, the evaluation of the potential environmental effects of implementation of reasonably foreseeable methods of compliance is conducted at a programmatic level. As specific projects are proposed, the local lead agency(ies) will need to complete requisite CEQA analysis and certification at the project level.

2. USEPA established Metals TMDLs for Newport Bay, including Cu, Cd, Zn and Pb TMDLs, in 2002. The Regional Board and stakeholders have taken and are taking actions, including the implementation of certain BMPs in the watershed, in response to these TMDLs. If approved, as expected, the proposed Cu TMDLs and Zn Action Plan will replace USEPA's TMDLs for Cu and Zn, and these TMDLs will be depromulgated and will no longer apply for regulatory purposes. In addition, based on Board staff's Metals Impairment Assessment, USEPA's TMDLs for Zn, Cd and Pb should be depromulgated (Staff Report, Section 4.0). The potential environmental effects of the implementation of the proposed TMDLs and Action Plans must be considered in the context of existing requirements for Cu and other metals reductions, and actions already taken and planned to achieve those reductions.

3. The analysis below assumes that project proponents will design, install, and maintain implementation measures following all applicable laws, regulations, ordinances, and formally adopted municipal and/or agency codes, standards, and practices. Several handbooks are available and currently used by agencies that provide guidance for the selection of certain Design Pollution Prevention, Construction Site, and Maintenance BMPs into a project to minimize environmental impacts (California Stormwater Quality Association [CASQA] 2003, California Department of Transportation [Caltrans] 2007 and 2007a).

4. Proposed projects, such as dredging, could generate varying degrees of environmental impacts including, but not limited to, noise associated with construction, air emissions associated with vessels and dredging equipment, transport and operations, and/or traffic associated with increased vehicle trips to work sites. Examples of generally accepted and recognized mitigation measures for dredging projects include: mitigation of excessive noise by conducting dredging activities during certain times of the day; use of less noisy equipment and use of sound barriers; and reduction of air emissions by use of lower emissions vehicles. These mitigation methods and BMPs are intended to avoid or minimize site-specific impacts to less than significant levels. For the purposes of this programmatic CEQA analysis, it is assumed that these mitigation methods and BMPs

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will be employed, consistent with standards project permitting and building practices, ordinances, etc. and with any mitigation requirements imposed through project-level CEQA analysis and certification.

5. The significance of potential environmental effects was considered in relation to the duration, size of the impact area, and probability of occurrence. Social or economic changes related to a physical change in the environment were also considered in determining whether there would be a significant effect on the environment; however, adverse social and economic impacts alone are not considered significant effects on the environment. The Regional Board has analyzed the costs of implementing reasonably foreseeable BMPs to comply with the TMDLs and Action Plans. These economic factors have been considered in this environmental analysis and are summarized in the Staff Report (Section 8.3).

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4.2.2 Environmental Checklist

ISSUES

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
I. AESTHETICS -- Would the project:				
a) Have a substantial adverse effect on a scenic vista?	☐	☐	☐	☒
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☐	☐	☒
c) Substantially degrade the existing visual character or quality of the site and its surroundings?	☐	☐	☒	☐
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☐	☒	☐
II. AGRICULTURE RESOURCES: In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Dept. of Conservation as an optional model to use in assessing impacts on agriculture and farmland. Would the project:				
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☐	☒

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	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?	☐	☐	☐	☒
c) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use?	☐	☐	☐	☒
III. AIR QUALITY -- Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Would the project:				
a) Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☒	☐
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☐	☐	☒	☐
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?	☐	☒	☐	☐
d) Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☒	☐
e) Create objectionable odors affecting a substantial number of people?	☐	☒	☐	☐

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	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
IV. BIOLOGICAL RESOURCES -- Would the project:				
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?	☐	☒	☐	☐
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?	☐	☒	☐	☐
c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☐	☐	☒
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☒	☐	☐
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☐	☒
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☐	☒

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	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
V. CULTURAL RESOURCES -- Would the project:				
a) Cause a substantial adverse change in the significance of a historical resource as defined in § 15064.5?	☐	☐	☐	☒
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to § 15064.5?	☐	☐	☐	☒
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☐	☐	☒
d) Disturb any human remains, including those interred outside of formal cemeteries?	☐	☐	☐	☒
VI. GEOLOGY AND SOILS -- Would the project:				
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:				
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.	☐	☐	☐	☒
ii) Strong seismic ground shaking?	☐	☐	☐	☒
iii) Seismic-related ground failure, including liquefaction?	☐	☐	☐	☒
iv) Landslides?	☐	☐	☐	☒
b) Result in substantial soil erosion or the loss of topsoil?	☐	☐	☐	☒

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	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?	☐	☐	☐	☒
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?	☐	☐	☐	☒
e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?	☐	☐	☐	☒
VII. GREENHOUSE GAS EMISSIONS. Would the project:				
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	☐	☒	☐	☐
b) Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?	☐	☒	☐	☐
VIII. HAZARDS AND HAZARDOUS MATERIALS -- Would the project:				
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	☒	☐
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☐	☒	☐

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	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☐	☒
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☐	☒
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	☒
h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☐	☐	☒
IX. HYDROLOGY AND WATER QUALITY -- Would the project:				
a) Violate any water quality standards or waste discharge requirements?	☐	☐	☒	☐

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	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	☐	☐	☐	☒
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?	☐	☐	☐	☒
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?	☐	☐	☐	☒
e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	☐	☐	☐	☒
f) Otherwise substantially degrade water quality?	☐	☐	☒	☐
g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	☐	☐	☐	☒
h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?	☐	☐	☐	☒

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	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?	☐	☐	☐	☒
j) Inundation by seiche, tsunami, or mudflow?	☐	☐	☐	☒
X. LAND USE AND PLANNING - Would the project:				
a) Physically divide an established community?	☐	☐	☐	☒
b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☐	☒
c) Conflict with any applicable habitat conservation plan or natural community conservation plan?	☐	☐	☐	☒
XI. MINERAL RESOURCES -- Would the project:				
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☐	☒
b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?	☐	☐	☐	☒
XII. NOISE -- Would the project result in:				
a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☐	☐	☒

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	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	☐	☒
c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☐	☒
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☒	☐
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒
f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒
XIII. POPULATION AND HOUSING -- Would the project:				
a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☐	☒
b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒

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	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
XIV. PUBLIC SERVICES				
a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:				
Fire protection?	☐	☐	☐	☒
Police protection?	☐	☐	☐	☒
Schools?	☐	☐	☐	☒
Parks?	☐	☐	☐	☒
Other public facilities?	☐	☐	☐	☒
XV. RECREATION				
a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☐	☒
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	☐	☐	☐	☒

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	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
XVI. TRANSPORTATION/TRAFFIC -- Would the project:				
a) Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?	☐	☐	☐	☒
b) Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?	☐	☐	☐	☒
c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	☐	☐	☐	☒
d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☐	☒
e) Result in inadequate emergency access?	☐	☐	☐	☒
f) Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance of such facilities?	☐	☐	☐	☒

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	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
XVII. UTILITIES AND SERVICE SYSTEMS -- Would the project:				
a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☐	☐	☐	☒
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒
c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒
d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	☐	☐	☐	☒
e) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☐	☒
f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☒	☐	☐
g) Comply with federal, state, and local statutes and regulations related to solid waste?	☐	☐	☐	☒
XVIII. MANDATORY FINDINGS OF SIGNIFICANCE				

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	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	☐	☒	☐	☐
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?	☐	☐	☐	☒
c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☐	☒	☐

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4.2.2 Environmental Checklist Analysis

I. AESTHETICS – Would the project:

a) Have a substantial adverse effect on a scenic vista?

Answer: a) No impact

Discussion: Dredging of sediments impaired due to Cu, Zn and Hg is likely to be necessary to implement the proposed Cu TMDLs and Zn and Hg Action Plans. Such operations are not expected to impact scenic vistas. Dredging equipment and operations have the potential to affect views of the Bay; however, such impacts would be of limited duration and spatial extent when impaired areas are dredged. Other reasonably foreseeable methods of compliance (including conversions of Cu AFPs to nontoxic AFPS, use of BMPs for boat hull cleaning, and monitoring and characterization studies) are expected to have no effect on scenic vistas or views of the Bay.

b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?

Answer: b) No impact

Discussion: See response to I. a. None of the reasonably foreseeable methods of compliance with the TMDLs/Action Plans would have an effect on land-based scenic resources.

c) Substantially degrade the existing visual character or quality of the site and its surroundings?

Answer: c) Less than Significant Impact

Discussion: See responses to I. a & b. The reasonably foreseeable methods of compliance would have no or only limited effects on the visual quality of the Bay. As described in I. a, above, dredging operations and equipment may adversely affect Bay aesthetics, but this impact would be limited in duration and spatial extent.

d) Create a new source of substantial light or glare that would adversely affect day or nighttime views in the area?

Answer: d) Less than Significant Impact

Discussion: All of the reasonably foreseeable methods of compliance are expected to be implemented during daylight hours; nighttime activities that would necessitate nighttime lighting are likely to be minimal. There may be temporary nighttime lighting at dredging operations for safety and security purposes; however, any such impact would be temporary and less than significant.

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II. AGRICULTURAL RESOURCES – Would the project:

a) **Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?**

Answer: a) No impact

Discussion: None of the reasonably foreseeable methods of compliance will necessitate changes to or have any effect on farmland.

b) **Conflict with existing zoning for agricultural use, or a Williamson Act contract?**

Answer: b) No impact.

Discussion: None of the reasonably foreseeable methods of compliance will have any effect on farmland, areas zoned for agricultural use, or a Williamson Act contract.

c) **Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use?**

Answer: c) No impact.

Discussion: See response to item II. a, above.

III. AIR QUALITY - Would the project:

a) **Conflict with or obstruct implementation of the applicable air quality plan?**

Answer: a) Less than Significant Impact

Discussion: The project area is within the jurisdiction of the South Coast Air Quality Management District (SCAQMD). The South Coast Air Basin (SCAB), which includes Orange County and the non-desert portions of Los Angeles, Riverside, and San Bernardino Counties, is designated nonattainment for particulate matter 10 microns in diameter or less (PM_{10}) and particulate matter 2.5 microns in diameter or less ($PM_{2.5}$), and is a severe-17 nonattainment area for ozone under the federal standards for these criteria pollutants (i.e., ambient air in the SCAB does not meet the federal standards for these pollutants) (SCAQMD 2007). The area is also an extreme nonattainment area for ozone as classified under state law (*Ibid*.)

The SCAQMD Air Quality Management Plan (AQMP) contains control strategies designed to ensure continued attainment of ambient air quality standards (AAQS) for pollutants meeting said standards and to bring about attainment for those that do not. The AQMP sets a goal of demonstrating attainment of the federal $PM_{2.5}$ ambient air

quality standard by 2015 and the federal 8-hour ozone standard by 2024, while making expeditious progress toward attainment of state standards. The AQMP contains numerous stationary and mobile source control measures, including those under SCAQMD jurisdiction, as well as strategies contained in the California Air Resources Board's (CARB) *2007 State Implementation Plan* (SIP), other supplemental strategies, and regional transportation control measures.

Reasonably Foreseeable Methods of Compliance with the Proposed TMDLs and Action Plans

The implementation plans require 1) the conversion of boats from Cu AFPs to nontoxic AFPs, and the use of BMPs for hull cleaning, 2) the remediation of sediment impairment due to Cu, Zn and Hg, likely by dredging, and 3) monitoring and characterization studies.

1) The conversion of boats with Cu AFPs to non-toxic AFPs (or to non-Cu AFPs or Cu AFPs with leach rates below 9.5µg/cm^2/d (alternative AFPs) in the interim), will be necessary to achieve the Cu reductions required in the proposed Cu TMDLs. Per the proposed TMDL implementation plan, and interim and final compliance schedules, this conversion from Cu to nontoxic AFPs will take place over time during routine boat repainting. The conversion to nontoxic AFPs (and alternative AFPs), would not result in increased air quality impacts that would be in conflict with the applicable air quality plan. Further, the reduction of Cu discharges from boat hulls is already required by USEPA's 2002 Cu TMDLs. (*Note that USEPA's Cu TMDLs require a 92% reduction of Cu discharges from boats compared to an 83% reduction required in the proposed Cu TMDLs*). For both USEPA's Cu TMDLs and the proposed Cu TMDLs, these reductions will require, at least in part, the conversion of boats from Cu AFPs to nontoxic AFPs, and the use of BMPs for hull cleaning including soft cloths or hull cleaning container/filter methods.

The use of BMPs during hull cleaning, rather than non-BMPs, will help to reduce Cu loads from hull cleaning. The use of BMPs over non-BMPs would not result in increased air quality impact. The use of a hull cleaning container/filter method uses a filter system that requires a generator. This method may have minor impacts to air quality but they would be limited in duration and spatial extent. *The use of BMPs, such as soft cloths or container/filter methods, during hull cleaning would be an expected strategy to achieve the already established USEPA Cu TMDLs.*

The proposed TMDLs would not have an increased impact on the environment relative to any potential impacts from the implementation of the established USEPA Cu TMDLs.

2) The remediation of sediment impairment due to Cu, Zn and Hg), will likely be achieved by dredging those impaired areas. Dredging operations necessary to address sediment impairment by Cu, Zn and Hg, would entail the use of vessels and dredging equipment that rely on combustion engines. Monitoring and investigations may rely on increased vehicular and vessel traffic to reach specific water body locations of interest.

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Emissions of various criteria pollutants for which AAQS have been adopted at both state and federal levels, as well as diesel particulate emissions and possibly other hazardous air contaminants, would likely result from engine use associated with these activities. Although these air emissions impacts would be temporary, they could be significant depending on the types of controls implemented, local meteorology, and other factors.

Since a substantial portion of NO_X, SO_X, and VOC emissions in the SCAB are under state jurisdiction, the 2007 AQMP relies heavily on successful implementation of CARB's State Strategy for reducing emissions of these criteria pollutants to attain the AAQS for ozone and $PM_{2.5}$. This strategy has resulted in the adoption of several regulations aimed at reducing emissions from most forms of mobile sources.

Air emissions from vessel/vehicle/ dredge equipment are not expected to conflict with or obstruct implementation of the AQMP as sufficient legal mechanisms exist to both accommodate increases in air emissions from new projects, as well as enforcement mechanisms for noncompliance with the AQMP. Criteria pollutants are subject to planning requirements aimed at maintaining and achieving applicable AAQS. The SCAQMD has the authority to enforce state and federal laws and regulations and SCAQMD rules and regulations in order to ensure compliance with the AQMP. With implementation of the required mitigation measures and compliance with the applicable federal, state, and SCAQMD rules and regulations, the reasonably foreseeable methods of compliance would be consistent with the SCAQMD AQMP and would not violate the criteria identified above. Since the specific location and scope of all BMPs that will be needed to comply with the TMDLs and Action Plans is unknown at this time, project level agencies will need to review BMPs on a project-by-project basis to determine the significance of this impact, and recommend mitigation as needed to assure compliance with applicable SCAQMD rules and regulations.

It should be noted that USEPA's TMDLs, including those for Cu and Zn, include numeric targets to be achieved in sediment, as well as water column targets. It is likely that dredging operations to remediate sediments that exceed the sediment targets in the proposed TMDLs and Action Plans would also be necessary to achieve the sediment targets in USEPA's TMDLs.[15]

3) Monitoring and characterization studies are a requisite part of any implementation strategy to achieve either USEPA's TMDLs or the proposed TMDLs and Action Plans; therefore, the proposed TMDLs and Action Plans would not have an increased impact on the environment, including air quality, over any potential impact resulting from the implementation of the already established USEPA TMDLs.

The implementation of new stationary sources of emissions is not expected to be necessary to achieve compliance with the TMDLs and Action Plans.

[15] Note that sediment targets in USEPA's TMDLs are based on lower sediment guidelines (TELs) compared to sediment targets in the proposed Cu TMDLs and Zn,Hg,As and Cr Action Plans which are based on ERLs.

b) **Violate any air quality standard or contribute substantially to an existing or projected air quality violation?**

Answer: b) Less than Significant Impact

Discussion: Depending on the quantity and nature of emissions associated with dredging operations implemented to remediate sediment impairment due to Cu, Zn and Hg, and increased vehicular/vessel traffic necessary to conduct monitoring and investigations, including special studies, related to all the metals for which TMDLs and Action Plans are now proposed, a substantial contribution to an existing or projected violation of the AAQS could result but it would likely be temporary. Existing mechanisms are available and required to reduce the likelihood of such violations and render the potential for this impact as less than significant.

See also response III.a. Implementation of the proposed TMDLs and Action Plans is not expected to result in greater potential for adverse environmental impacts than implementation of the already established USEPA TMDLs.

c) **Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?**

Answer: c) Less than Significant with Mitigation Incorporated

Discussion: As stated above, the SCAB is designated nonattainment for PM_{10}, $PM_{2.5}$, and ozone under the federal and state AAQS. The implementation of dredging operations and increased use of vessels/vehicles to conduct monitoring and investigations necessary to implement and comply with the AAQS and the TMDLs and Action Plans may result in increases of criteria pollutants for limited duration and spatial extent.. Although increases in emissions that conform to applicable regulations are considered within the framework of the AQMP, the fact that the region is currently in nonattainment for these pollutants would indicate that any increased emissions are cumulatively considerable.

The AQMP projects attainment of the nonattainment pollutants PM_{10}, $PM_{2.5}$, and ozone, through application of current and future emission reduction measures. For example, for stationary emissions units, new projects that have a potential to emit four tons per year or more of any of these pollutants must offset the emissions at a ratio of between 1.0 and 1.2, depending on the nature of the emissions reduction credit source[16]. Since emissions reductions credits (ERCs) are determined to be real, quantifiable, enforceable, and permanent by the SCAQMD, using them to offset emissions increases would not result in a net emissions increase of the nonattainment criteria pollutants in a cumulative sense, disregarding local spatialized impacts. An emissions increase near

[16] SCAQMD Rules 1303(b);1304(d); and Regulation XVI, Mobile Source Offset Program.

four tons per year per project may be considerable when factoring in other sources of criteria pollutants in the SCAB, including both mobile and stationary sources. However, many projects may contribute substantially less than four tons/year depending on project needs. For example, a 500 brake horsepower (bhp) diesel engine employed in a BMP project would have a worst case potential to emit of 0.72 tons diesel particulate matter per year where the engine was determined to be subject to the 0.15 grams/bhp per hour limit in California Administrative Code, Title 17, Section 93115.6 (50 hours or less required maintenance and testing and no exemptions apply).

As described above and in the preceding Air Quality responses, responsible agencies implementing specific projects such as dredging and monitoring programs can reduce the impact of increased emissions due to project implementation by (1) complying with all applicable rules and (2) implementing voluntary programs to reduce emissions beyond applicable requirements. This may include employing cleaner technologies and equipment.

Once again, it is important to note that implementation of the proposed TMDLs and Action Plans would not have any greater potential environmental impact than the implementation of the already established USEPA TMDLs.

d) **Expose sensitive receptors to substantial pollutant concentrations?**

Answer: d) Less than Significant Impact

Discussion: Sensitive receptors generally include children, the elderly, and those with existing pre-conditions that may be worsened by exposure of air contaminants emitted at project sites (e.g., dredging). This may also include sensitive aquatic organisms. Project related emissions may expose sensitive receptors to pollutant concentrations, which may be substantial depending on the sensitivity of the exposed individual, local meteorology, and the types and locations of engines/equipment employed.

See also prior responses. Implementation of the proposed TMDLs and Action Plans is not expected to result in greater potential for adverse environmental impacts than implementation of the already established USEPA TMDLs.

The exposure of sensitive receptors to substantial pollutant concentrations can and will be required to be reduced by the implementation of available BMPs to insignificant levels pursuant to existing regulations, laws and SCAQMD requirements.

e) **Create objectionable odors affecting a substantial number of people?**

Answer: e) Less than Significant impact with Mitigation Incorporated

Discussion: Noxious odors can result from the exhaust from vehicles and equipment used to implement the reasonably foreseeable methods of compliance. Such impacts would be of limited duration and spatial extent. Dredging could expose sediments causing odors (e.g., sulfides).

The emission of air contaminants that create a condition of public nuisance is prohibited by SCAQMD Rule 402. Conformance with existing regulations, including the use of vehicles meeting applicable operating and emissions standards, would reduce noxious emissions. Objectionable odors from engine exhaust or from dredging sites would be temporary and would dissipate once the vehicle has passed through the area or when the dredging operation is complete.

See also prior responses. *Implementation of the proposed TMDLs and Action Plans is not expected to result in greater potential for adverse environmental impacts than implementation of the already established USEPA TMDLs.*

It may be feasible to schedule dredging activities during periods when there are fewer people in the area. These mitigation measures can and should be required by local lead or responsible agencies through their CEQA and/or planning processes.

IV. BIOLOGICAL RESOURCES - Would the project:

a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife (CDFW) or U.S. Fish and Wildlife Service (USFWS)?

Answer: a) Less than Significant Impact with Mitigation Incorporated

Discussion: State and/or federal listed threatened and endangered species that are known to or may occur in freshwater areas of Newport Bay and its watershed include:

Birds

- California Least Tern - (*Sterna antillarum browni* (endangered piscivorous bird present and nesting in the Newport Bay watershed),
- Ridgway's Rail - *Rallus obsoletus levipes* (endangered omnivorous bird - largest colony in California is located in Upper Newport Bay)
- Western snowy plover - *Charadrius alexandrinus nivosus* (threatened shorebird)
- California Gnatcatcher - *Polioptila californica californica* (threatened terrestrial bird that eats insects, some of which have an aquatic larval stage)
- Least Bell's Vireo - *Vireo bellii pusillus* (endangered terrestrial bird that eats insects, some of which have an aquatic larval stage)
- Southwestern Willow Flycatcher – *Empidonax traillii extimas* (endandered terrestrial bird that eats insects, some of which have an aquatic larval stage)

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Amphibians

- Western Pond turtle - *Clemmys marmorata pallida* (California species of special concern; potential habitat in Big Canyon Wash; no confirmed population)
- Arroyo toad - *Bufo (syn. Anaxyrus) californicus* (endangered; potential habitat in the watershed, though probably only found in the upper reaches; no confirmed populations)

None of the reasonably foreseeable methods of compliance with the proposed TMDLs and Action Plans is expected to have any significant, long-term adverse effect on biological resources, including listed or candidate species of concern.

The implementation plans requires 1) the conversion of boats from Cu AFPs to nontoxic AFPs, and the use of BMPs for hull cleaning, 2) the remediation of sediment impairment due to Cu, Zn and Hg, likely by dredging, and 3) monitoring and characterization studies.

1) The conversion of boats from Cu AFPs to nontoxic AFPs can be implemented during the routine repainting of boat hulls during periodic boat hull maintenance. *The conversion from Cu AFPs to nontoxic (or alternative) AFPs conducted as part of this routine process will have no adverse impact. The conversion from Cu to nontoxic (or alternative) AFPs would already be required to achieve USEPA's established Cu TMDLs; and the proposed Cu TMDLs would require less reduction in Cu loads from boats (83%) than USEPA's TMDLs which require a 92% load reduction from boats. This lower reduction in Cu loads required by the proposed Cu TMDLs would also require a lower number of boat conversions to nontoxic AFPs.*

The use of BMPs during hull cleaning, rather than non-BMPs, will help to reduce Cu loads to the Bay; , thereby improving conditions for the biota without causing other adverse impact to biological resources and the environment.
The hull cleaning container/filter method uses a container for cleaning hulls that contains the dirty water and solids from hull cleaning. The water is then filtered before being discharged into the Bay and the solids at the bottom of the container are collected, so that *no Cu (or other metal) discharges from hull cleaning are released to the Bay from this hull cleaning method.* This method, therefore, improves water and sediment quality for the biota without causing other adverse impact to biological resources and the environment.

Once again, the use of boat conversions from Cu to nontoxic AFPs and the use of BMPs during hull cleaning would be strategies to achieve the already established USEPA Cu TMDLs. The proposed Cu TMDLs would not have an increased impact on the environment relative to any potential impacts of the established USEPA Cu TMDLs.

2) The remediation of sediment impairment due to Cu, Zn and Hg, will likely be achieved by dredging those impaired areas. Dredging operations have the potential to cause disturbances to both aquatic organisms and avian wildlife, including the

endangered/threatened species listed above, as a result of the physical presence and operation of vessels and dredge equipment and their operators, noise associated with the operations, and increases in turbidity or other water quality effects (See IX. Hydrology and Water Quality) that may result from the removal of sediment. Removal of sediment would result in the loss of the benthic organisms living in the sediments; however, no benthic organisms are listed or a candidate species of concern.

Specific dredging projects would be reviewed and approved by the CDFW, USFWS and the Regional Board (for consideration of Clean Water Act Section 401 water quality standards certification and regulation under waste discharge requirements). These agencies would disallow or require modification of projects that would result in significant adverse impacts on the biota and related beneficial uses.

Specific dredging projects would be subject to requirements for avoidance and mitigation imposed by the CDFW, and USFWS in cases involving federally-listed species. Dredging requirements include: pre-dredging surveys to determine the presence of endangered and/or sensitive wildlife and vegetative species (such as eelgrass) and the need for mitigation for those species; incorporation of buffer areas in the project design; project timing restrictions to minimize impact(s) to sensitive species, especially during nesting activities; and minimization of impact by use of alternative design/implementation features.

Areas that have been dredged are expected to be repopulated naturally by benthic organisms such that no significant long-term adverse impacts to these organisms is expected to occur. Dredging projects will need to be conducted in accordance with the avoidance and mitigation requirements of the Southern California Eelgrass Mitigation Policy.

The potential adverse effects of dredging operations on water quality and, thereby, on biological resources would be short-term in nature and can be reduced to less than significant by the implementation of standard BMPs, such as silt curtains. Requirements for the implementation of these measures are a part of the Waste Discharge Requirements issued by the Regional Board to regulate these operations. Potential effects due to noise and physical presence can be minimized by the selection and use of proper equipment, and, as noted above, timing restrictions to limit disturbance.

3) Monitoring and characterization studies are a requisite part of any implementation strategy to achieve either USEPA's TMDLs or the proposed TMDLs and Action Plans. Monitoring and investigation activities are expected to have minimal impacts on the biota, other than organisms that may be lost to sample collection and analysis.

Any impacts on biological resources due to the implementation of the proposed TMDLs and Action Plans are expected to be limited in scope and duration. Once again, it should be pointed out that the potential biological resources (and other environmental) impacts of the proposed TMDLs and Action Plans would not be different from the potential impacts of implementing the already established USEPA TMDLs.

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There is extensive experience in the Newport Bay watershed with CEQA-compliance, permitting and implementation of large-scale dredging projects (beyond the likely scope of the dredging required to address sediment impairment in the Bay.) Dredging in Newport Bay has previously been carefully coordinated with the CDFW and USFWS to achieve biological restoration and protection goals for the Upper Newport Bay Ecological Reserve. Such coordination could be accomplished elsewhere in the Bay in relation to the needs to address other Bay beneficial uses, such as navigation (NAV). The purpose of the TMDLs and Action Plans is to protect biological resources that are impaired due to Cu, Zn, Hg, As and Cr in water and/or sediments. The implementation of the reasonably foreseeable methods of compliance; therefore, is anticipated to provide a substantially positive impact on biological resources and beneficial uses in the watershed.

b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, and regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?

Answer: b) Less than Significant with Mitigation Incorporated

Discussion: See response to item IV. a (Biological Resources) above.

c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?

Answer: c) No impact.

Discussion: None of the reasonably foreseeable methods of compliance is expected to take place in or otherwise affect wetlands.

d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?

Answer: d) Less than Significant Impact with Mitigation Incorporated

Discussion: See responses to items IV. a (Biological Resources) above.

e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?

Answer: e) No impact

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Discussion: It is not reasonably foreseeable that any project implemented in response to the TMDLs and Action Plans would conflict with relevant local policies or ordinances protecting biological resources. As individual reasonably foreseeable projects are proposed, project level agencies will evaluate the potential for the specific projects to conflict with applicable local policies protecting biological resources. If siting or other conflicts arise, projects will need to be redesigned to conform to the local policies or ordinances, unless variances, if available, are obtained. Future BMP projects would be required to comply with any applicable local policies or ordinances; therefore, no impacts are reasonably foreseeable.

f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?

Answer: f) No impact

Discussion: See response to IV.a. (Biological Resources) above.

None of the reasonably foreseeable methods of compliance with the proposed TMDLs and Action Plans would have an impact on habitat conservation plans.

V. CULTURAL RESOURCES -- Would the project:

a) Cause a substantial adverse change in the significance of a historical resource as defined in § 15064.5?

Answer: a) No impact

Discussion: An historical resource is defined under CEQA Guidelines Section 15064.5 as a "resource listed in, or determined eligible for listing in the California Register." The term historical resource is also defined as "any object, building, structure, site, area, place, record, or manuscript which is historically or archaeologically significant, or which is significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural history of California."[17]

b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to CEQA Guidelines Section 15064.5?

Answer: b) No impact

Discussion: See response to V. a.(Cultural Resources) above.
Archaeological resources may be present above ground or subsurface. Archaeological resources include physical remnants of human activities of an area's pre-historical (aboriginal/Native American) and historical (European or Euro-American) time. Material

[17] California Public Resource Code Section 5024.1, Title 14 California Code of Regulation Section 4850 et seq.

remains may include, but are not limited to: artifacts, densities of artifacts or isolated finds. Archaeological resources are often of cultural or religious importance to Native American groups, particularly if the resource includes human and/or animal burials.

None of the reasonably foreseeable methods of compliance with the proposed TMDLs and Action Plans would have an impact on archaeological resources. Archaeological resources may be present in the watershed but are not expected to be found in the Bay, the focus of the reasonably foreseeable BMPs, given the Bay's highly disturbed nature (as the result of past dredging activities).

c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?

Answer: c) No impact

Discussion: See responses to V. a and b (Cultural Resources) above.

Paleontological resources are fossilized remains and/or traces of prehistoric plant life and animal life (invertebrate and vertebrates), including imprints. Paleontological resources include not only the actual fossil remains, but also the collecting localities, and the geologic formations containing those localities. While fossil remains such as wood, bones, teeth, leaves and shells are the most common fossils, under certain conditions soft tissues, tracks and trails may be preserved as fossils. Paleontological resources tend to exist in sedimentary rock deposits and are usually discovered during grading or excavation operations. Ground-disturbing activities in fossil-bearing soils and rock formations have the potential to damage or destroy paleontological resources that may be present below the ground surface. Portions of the Newport Bay watershed are considered to be paleontologically sensitive; however, given the highly disturbed nature of the Bay due to sediment deposition and dredging activities, the Bay itself is not considered to be paleontologically sensitive..

d) Disturb any human remains, including those interred outside of formal cemeteries?

Answer: d) No impact

Discussion: See responses to V. a, b and c (Cultural Resources) above.

VI. GEOLOGY AND SOILS - Would the project:

a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:

i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for

the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.

ii) Strong seismic ground shaking?

iii) Seismic-related ground failure, including liquefaction?

iv) Landslides?

Answer: (a) (i, ii, iii, iv) No impact

Discussion:
None of the reasonably foreseeable methods of compliance with the proposed TMDLs and Action Plans is expected to have any physical effects on Newport Bay that would result in earthquake/landslide related exposures of human beings.

b) Result in substantial soil erosion or the loss of topsoil?

Answer: b) No impact

Discussion:
None of the reasonably foreseeable methods of compliance with the proposed TMDLs and Action Plans is expected to have any impacts on soil erosion or the loss of topsoil. The reasonably foreseeable methods of compliance are focused on and in Newport Bay itself. Dredging activities have been and continue to be expected to be necessary to remove sediments from the Bay to maintain navigational depths, as well as to address sediment impairment as the result of metals. As described in response IV.a. (Biological Resources), dredging operations may also be coordinated with habitat restoration plans.

c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?

Answer: c) No impact

Discussion: See responses to VI. a and b, (Geology and Soils) above.

d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?

Answer: d) No impact

Discussion: See responses to VI. a, b and c (Geology and Soils) above.

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e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?

Answer: e) No impact

Discussion: None of the reasonably foreseeable methods of compliance with the proposed TMDLs and Action Plans is expected to involve the use of septic tanks or alternative wastewater disposal systems.

VII. GREENHOUSE GAS EMISSIONS - Would the project:

a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?

Answer: a) Less than Significant with Mitigation Incorporated

Discussion: See response to III. c (Air Quality) above.

b) Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?

Answer: b) Less than significant with Mitigation Incorporated

Discussion: See response to III. a and c (Air Quality) above.

Potential Effects of Project on Global Climate Change
The Intergovernmental Panel on Climate Change (IPCC) constructed several emission trajectories of greenhouse gases needed to stabilize global temperatures and climate change impacts. It concluded that a stabilization of greenhouse gases at 400 to 450 ppm carbon dioxide-equivalent concentration is required to keep global mean warming below 2 degrees Celsius (ºC), which in turn is assumed to be necessary to avoid dangerous climate change.

California Governor Arnold Schwarzenegger issued Executive Order S-3-05 in June 2005, which established the following greenhouse gas emission reduction targets:

- 2010: Reduce greenhouse gas emissions to 2000 levels;
- 2020: Reduce greenhouse gas emissions to 1990 levels; and
- 2050: Reduce greenhouse gas emissions to 80 percent below 1990 levels.

Although greenhouse gases (GHG) are not considered a criteria air pollutant, Assembly Bill 32 (AB 32), the California Global Warming Solutions Act of 2006 requires that the California Air Resources Board (CARB) determine what the statewide greenhouse gas emissions level was in 1990, and approve a statewide greenhouse gas emissions limit

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that is equivalent to that level, to be achieved by 2020. CARB has approved a 2020 emissions limit of 427 metric tons of CO_2 equivalent.

The implementation of dredging projects, monitoring and investigations may result in increased emissions of greenhouse gases, principally carbon dioxide (CO_2), as a result of the combustion of any fuel during the dredging activities and in transit to monitoring locations. Additional vehicular/vessel use needed to conduct monitoring and investigations is expected to be minimal; these efforts are expected to be coordinated with monitoring already underway. Depending on the scale and number of dredging projects determined to be necessary, quantifiable amounts of CO_2 would be emitted from the dredge vessel engine, dredge equipment engines, and vehicles associated with trips necessary for operation of the dredge activities. Agencies implementing these dredging projects would need to ensure that the activities would comply with applicable regulations and remediation measures developed pursuant to AB 32.

The impact of increased CO_2 emissions resulting from the implementation of the TMDLs/Action Plans cannot be accurately determined because the relative contribution of project CO_2 emission is miniscule in comparison to worldwide emissions of greenhouse gases. It is generally recognized by leading atmospheric scientists that the earth's atmosphere is warming due to worldwide emissions of greenhouse gasses, including CO_2, which is the principal greenhouse gas emitted directly as a result of anthropogenic activities. The impact that global climate change would have includes increased temperatures, rising sea levels, reductions to the Sierra Nevada snowpack, earlier snowmelt, and varying patterns of precipitation and runoff (CDWR 2005). These impacts may profoundly affect the ability to manage water supplies and other natural resources. Therefore, the CO_2 emissions resulting from the implementation of dredging projects would play an incremental role in exacerbating these projected impacts, many of which may have already begun to occur.

As described in the preceding Air Quality responses, responsible agencies implementing specific projects can reduce the impact of increased emissions due to BMP implementation by (1) complying with all applicable rules and (2) implementing voluntary programs to reduce emissions beyond applicable requirements. This may include employing cleaner technologies and equipment.

It should be noted again that the USEPA TMDLs, including those for copper and zinc, include numeric targets to be achieved in sediment, as well as water column targets. It is likely that dredging operations to remediate sediments that exceed these targets would also be necessary to achieve these TMDL sediment targets. Monitoring/investigation is a requisite part of any implementation strategy to achieve either the USEPA TMDLs or those TMDLs/Action Plans now proposed. Therefore, the proposed TMDLs/Action Plans would not have an increased impact on the environment, including air quality and greenhouse gas emissions, over any potential impact resulting from the implementation of the already established USEPA TMDLs.

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VIII. HAZARDS AND HAZARDOUS MATERIALS – Would the project:

a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?

Answer: a) Less than Significant Impact

Discussion:
Hazardous waste is classified as a waste product or byproduct with properties that make it potentially dangerous or harmful to human health or the environment. Hazardous wastes can be liquids, solids, or contained gases. In regulatory terms, the Department of Toxics Substance Control (DTSC) defines a hazardous waste as a waste that appears on one of the four Resource Conservation and Recovery Act (RCRA) hazardous wastes lists or that exhibits one of the four characteristics of a hazardous waste – ignitability, corrosivity, reactivity, or toxicity, unless specifically exempted[18]. However, materials can be considered hazardous even if they are not specifically listed or don't exhibit any characteristic of a hazardous waste. For purposes of this SED, the term "hazardous material" refers to both hazardous substances and hazardous waste. The conversion of boats from Cu to nontoxic (alternative) AFPs may entail the use or generation of hazardous materials, e.g. solvents and de-greasers and AFPS waste; however, the repainting of boat hulls is a routine part of vessel maintenance. The recommended interim and final compliance schedules for the proposed Cu TMDLs allow conversions from Cu to nontoxic (alternative) AFPs to take place during routine repainting schedules. USEPA's Cu TMDLs also require a significant reduction in Cu loads from boat hulls (92%), which is greater than the 83% reduction required in the proposed Cu TMDLs). This reduction, required by USEPA's Cu TMDLs, can be accomplished in full only by the conversion to nontoxic AFPS (or non-Cu or lower leach rate Cu AFPs in the interim); therefore, the proposed Cu TMDLs would not have a new or increased effect on the environment with respect to hazardous materials.

Dredging activities are not anticipated to involve the direct use of substances that would be considered to be hazardous. These activities would involve the temporary use of equipment and vessels that contain hazardous substances, such as petroleum-based fuels, which could be accidentally released if the equipment or vessels are improperly operated, maintained or damaged. Adherence to requirements to employ established operational practices and safety measures will prevent the accidental release of hazardous materials to the environment. The level of risk associated with the accidental release of hazardous substances under these circumstances is not considered significant.

Reasonably foreseeable levels of hazardous materials and waste associated with the conversion of Cu AFPs to nontoxic (alternative) AFPs on boat hulls and dredging projects are not anticipated to be significant enough to result in a significant hazard to

[18] California Code of Regulations, Title 22 of the California Administrative Code, Sections 66261.21 to 66261.24, 66261.3, and 66261.30 to 66261.35.

the public or the environment through the routine transport, use, or disposal of hazardous materials. Potential hazards associated with the use of hazardous materials can be mitigated with proper handling, storage and disposal procedures. Compliance with applicable federal, state, and local regulations related to handling, storage, transport and disposing of hazardous materials would ensure impacts associated with operation of reasonably foreseeable methods of compliance are reduced to less than significant levels.

b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?

Answer: b) Less than Significant Impact

Discussion: Reasonably foreseeable levels of hazardous materials and waste associated with the reasonably foreseeable methods of compliance are not anticipated to be significant enough to result in a significant hazard to the public or the environment through releases that result from reasonably foreseeable upset and accident conditions. Compliance with applicable federal, state, and local regulations related to handling, storage, transport and disposing of hazardous materials would ensure impacts associated with the risk of upset or accident would be reduced to less than significant, levels.

c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?

Answer: c) No impact

Discussion: Neither conversions from Cu to nontoxic AFPs on boat hulls nor dredging projects are expected to take place within one-quarter mile of an existing or proposed school.

d) Be located on a site, which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?

Answer: d) No impact

Discussion: It is not reasonably foreseeable that any of the reasonably foreseeable methods of compliance would be located on a site location that is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5, given the likely need for and cost of remedial actions at such sites. Should any BMP be located on a listed site, project proponents would be required to mitigate all hazardous

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risk to below hazardous levels established by Title 22 of the California Code of Regulations.

e) **For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?**

Answer: e) No impact

Discussion: The implementation of reasonably foreseeable methods of compliance with the proposed TMDLs and Action Plans is expected to take place in or adjacent to Newport Bay. For this reason, no impacts related to air traffic or airport access are reasonably foreseeable.

f) **For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?**

Answer: f) No impact

Discussion: No active operational private airstrips are located within the Newport Bay watershed. Therefore, reasonably foreseeable BMPs would not be located within the vicinity of a private airstrip. Therefore, no impact would occur.

g) **Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?**

Answer: g) No impact

Discussion: The implementation of reasonably foreseeable BMPs to comply with the proposed TMDLs and Action Plans is expected to take place in or adjacent to Newport Bay. For this reason, no impacts related to emergency response/evacuation is reasonably foreseeable.

h) **Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?**

Answer: h) No impact

Discussion: The implementation of reasonably foreseeable methods of compliance with the proposed TMDLs/ and Action Plans is expected to take place in or adjacent to Newport Bay. For this reason, no impacts related to wildland fires are reasonably foreseeable.

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IX. HYDROLOGY AND WATER QUALITY – Would the project:

a) Violate any water quality standards or waste discharge requirements?

Answer: a) Less than Significant Impact

Discussion: None of the reasonably foreseeable methods of compliance is expected to violate water quality standards or waste discharge requirements (WDRs), and the effects of dredging will be limited in duration and spatial extent.

Dredging operations have the potential to cause increases in some water quality parameters, such as turbidity or dissolved oxygen, that may occur from the removal of sediment. Dredging could also cause some pollutants to be released into the water column during dredging; however, the use of silt curtains and other dredging requirements will limit spatial exposure and reduce the risk of violating water quality standards and WDRs,

Specific dredging projects would be reviewed and approved by the ACOE and the Regional Board (for consideration of Clean Water Act Section 401 water quality standards certification and regulation under waste discharge requirements). These agencies would disallow or require modification of projects that would result in significant adverse impacts to water quality.

The potential adverse effects of dredging operations on water quality would be short-term in nature and can be reduced to less than significant by the implementation of standard BMPs, such as silt curtains. Requirements for the implementation of these measures are a part of the WDRs issued by the Regional Board to regulate these operations.

b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?

Answer: b) No impact

Discussion: None of the reasonably foreseeable methods of compliance is expected to have an effect on groundwater supplies or interfere with groundwater recharge.

c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation on-site or off-site?

Answer: c) No Impact

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Discussion: None of the reasonably foreseeable methods of compliance is expected to substantially alter the existing drainage patterns.

d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?

Answer: d) No Impact

Discussion: None of the reasonably foreseeable methods of compliance is expected to have any effect on the existing drainage patterns.

e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?

Answer: e) No Impact

Discussion: None of the reasonably foreseeable methods of compliance is expected to create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff.

f) Otherwise substantially degrade water quality?

Answer: f) Less than Significant

Discussion: See response to IX. a. HYDROLOGY AND WATER QUALITY, above.

g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?

Answer: g) No impact

Discussion: None of the reasonably foreseeable methods of compliance will have any effect on housing.

h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?

Answer: h) No impact

Discussion: None of the reasonably foreseeable methods of compliance is expected to require the placement of structures that would impede or redirect flood flows.

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i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?

Answer: i) No impact

Discussion: None of the reasonably foreseeable methods of compliance is expected to result in or necessitate physical changes that would expose people or structures to flooding.

j) Expose people or structures to a significant risk of loss, injury or death involving inundation by seiche, tsunami, or mudflow?

Answer: j) No impact

Discussion: None of the reasonably foreseeable methods of compliance is expected to result in or necessitate physical changes that would expose people or structures to inundation by seiche, tsunami, or mudflow.

X. LAND USE AND PLANNING - Would the project:

a) Physically divide an established community?

Answer: a) No impact

Discussion: The implementation of reasonably foreseeable methods of compliance is expected to take place in or adjacent to Newport Bay. For this reason, no impacts related to established communities are reasonably foreseeable.

b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?

Answer: b) No impact

Discussion: The implementation of reasonably foreseeable methods of compliance would not result in or necessitate changes to applicable land use plans, policies or regulations, whether or not adopted to avoid or mitigate an environmental effect.

c) Conflict with any applicable habitat conservation plan or natural community conservation plan?

Answer: c) No impact

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Discussion: The reasonably foreseeable methods of compliance would be implemented in and adjacent to Newport Bay. Upper Newport Bay includes an Ecological Reserve and Nature Preserve. Dredging activities in the Bay have been extensively coordinated with habitat planning and needs in the Reserve. Future dredging activities could likewise be coordinated with habitat conservation/natural community conservation efforts. The reasonably foreseeable methods of compliance would not affect habitat conservation plans established in the Newport Bay watershed.

XI. MINERAL RESOURCES -- Would the project:

a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?

Answer: a) No impact

Discussion: The reasonably foreseeable methods of compliance would have no effect on known mineral resources.

b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?

Answer: b) No impact

Discussion: See response to XI. a (Mineral Resources) above.

The reasonably foreseeable methods of compliance would have no effect on known mineral resources.

XII. NOISE -- Would the project result in:

a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?

Answer: a) No impact

Discussion: The reasonably foreseeable methods of compliance include dredging activities to remove sediment impaired by Cu, Zn and Hg. These operations may result in temporary increases in noise levels as the activities are conducted. Such effects would be limited in scope and duration. Moreover, these operations would not be significantly different, if at all, from those that would be required to meet the sediment numeric targets in the established USEPA TMDLs.

b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?

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Answer: b) No impact

Discussion: The reasonably foreseeable methods of compliance would not result in or contribute to groundborne vibration or noise.

c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?

Answer: c) No impact

Discussion: See response XII. a. (Noise), above.

d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?

Answer: d) Less than significant

Discussion: See response XII. a (Noise), above.
The reasonably foreseeable methods of compliance (specifically, dredging operations) have the potential to result in limited (spatially and temporally) increases in ambient noise levels in the vicinity of the operations. These impacts are not considered significant.

e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?

Answer: e) No impact

Discussion: See response XII. a (Noise), above.
The reasonably foreseeable methods of compliance (specifically, dredging operations) have the potential to result in limited (spatially and temporally) increases in ambient noise levels in the vicinity of the operations. These impacts are not considered significant and would have no effect on people residing or working in the vicinity of any airport.

f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?

Answer: f) No impact

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Discussion: See response XII. e (Noise), above.

XIII. POPULATION AND HOUSING - Would the project:

a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?

Answer: a) No impact

Discussion: The implementation of the reasonably foreseeable methods of compliance will have no effect, either direct or indirect, on population growth.

b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?

Answer: b) No impact

Discussion: The implementation of reasonably foreseeable methods of compliance will have no effect on existing housing.

c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?

Answer: c) No impact

Discussion: The implementation of reasonably foreseeable methods of compliance will have no effect on the numbers or distribution of the population

XIV. PUBLIC SERVICES Would the project:

a) Result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:

Fire protection?

Police protection?

Schools?

Parks?

Other public facilities?

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Answer: a) No impact

Discussion: The implementation of reasonably foreseeable methods of compliance will require no construction for new or altered governmental facilities.

XV. RECREATION - Would the project:

a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?

Answer: a) No impact

Discussion: The implementation of reasonably foreseeable methods of compliance would have no effect on the use of existing neighborhood or regional parks.

b) Include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?

Answer: b) No impact

Discussion: The implementation of reasonably foreseeable methods of compliance would have no impact on recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment.

XVI. TRANSPORTATION/TRAFFIC -- Would the project:

a) Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?

Answer: a) No impact

Discussion: The reasonably foreseeable methods of compliance would have no impact on transportation/transportation systems.

b) Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other

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standards established by the county congestion management agency for designated roads or highways?

Answer: b) No impact

Discussion:
See response to XVI. a (TRANSPORTATION/TRAFFIC), above.

c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?

Answer: c) No impact

Discussion: The implementation of reasonably foreseeable methods of compliance would have no effect on air traffic.

d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?

Answer: d) No impact

Discussion:

The implementation of reasonably foreseeable methods of compliance would not result in physical changes that would substantially increase hazards or incompatible uses.

e) Result in inadequate emergency access?

Answer: e) No impact

Discussion: See responses to XVI. a and b(TRANSPORTATION/TRAFFIC), above.

f) Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance of such facilities?

Answer: f) No impact

Discussion: See responses to XVI. a, b and e (TRANSPORTATION/TRAFFIC), above.

XVII. UTILITIES AND SERVICE SYSTEMS – Would the project:

a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?

Answer: a) No impact

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Discussion: The reasonably feasible methods of compliance are not expected to result in waste discharges that would affect compliance with requirements imposed by the Regional Board on publicly-owned treatment works.

b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?

Answer: b) No impact

Discussion: The implementation of reasonably foreseeable methods of compliance do not require or will result in the construction of new water or wastewater treatment facilities or expansion of existing facilities.

c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?

Answer: c) No impact

Discussion: The implementation of reasonably foreseeable methods of compliance do not require or will result in the construction of new storm water drainage facilities.

d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?

Answer: d) No impact

Discussion: The implementation of reasonably foreseeable methods of compliance have sufficient water supplies.

e) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?

Answer: e) No impact

Discussion: See response to XVII. b (UTILITIES AND SERVICE SYSTEMS), above.

f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?

Answer: f) Less than Significant with Mitigation Incorporated

Discussion: Waste products may be produced as the result of the implementation and operation of reasonably foreseeable methods of compliance. Dredging activities would result in the need to dispose of dredge spoils, likely at an offshore disposal site in the

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Pacific Ocean. Use of the hull cleaning container /filter method is expected to generate relatively small amounts of waste that would need to be disposed of in a landfill. In both cases, the suitability of the waste materials for disposal and the capacity of the disposal sites would need to be confirmed in advance. Compliance with established state and local waste reduction programs and policies would reduce the volume of solid waste entering landfills. All projects would be required to comply with hazardous waste disposal regulations.

g) Comply with federal, state, and local statutes and regulations related to solid waste?

Answer: g) No impact

Discussion: The implementation of reasonably foreseeable methods of compliance will be required to comply with applicable solid waste statutes and regulations. Compliance with these statutes and regulations would be evaluated at the project level when more is known about the specific project characteristics, needs, and magnitude.

XVIII. MANDATORY FINDINGS OF SIGNIFICANCE

a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?

Answer: a) Less than Significant with Mitigation Incorporated

Discussion: As identified in the preceding analysis, the implementation of reasonably foreseeable methods of compliance has the potential to affect the quality of the environment with respect to air quality and greenhouse gas emissions, and biological resources; however, in each case, these potential impacts can be mitigated to less than significant levels. The goal of the proposed TMDLs and Action Plans is to improve the quality of the environment to protect biological resources. As site-specific projects are proposed and subjected to CEQA analysis, appropriate mitigation measures, including alternative BMP selection, alternative siting, redesign, etc., can and should be identified and required by the local agencies/project proponents.

b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?

Answer: b) No impact

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Discussion: The implementation of reasonably foreseeable methods of compliance would not be expected to have considerable cumulative impacts. The potential environmental impacts of these methods are expected to be of limited duration and spatial extent, and would not contribute to the effects of other projects, past, current or future.

c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?

Answer: c) Less than Significant Impact

Discussion: See response XVIII. a. The implementation of reasonably foreseeable methods of compliance may result in environmental effects on air quality and noise that could affect human beings. However, these impacts are expected to be limited in duration and spatial extent, and are not expected to cause substantial adverse long-term effects on human beings either directly or indirectly.

5.0 PROGRAM LEVEL ALTERNATIVES

Regulations implementing CEQA require an analysis of reasonably foreseeable alternative means of compliance with the TMDLs and Action Plans that would avoid or eliminate reasonably foreseeable environmental impacts[19]. In addition, pursuant to the State Boards' CEQA regulations, this environmental review must include an analysis of reasonable alternatives to the proposed adoption of the Basin Plan amendments to include the proposed Cu TMDLs and Zn, Hg, As and Cr Action Plans for Newport Bay. The Regional Board must consider whether there are reasonable alternatives to the proposed Basin Plan amendments that would fulfill the underlying purpose of the proposed amendment to achieve water quality standards, but would minimize or eliminate the potential adverse environmental effects discussed above.

The alternatives evaluated include:

1) No action. Do not adopt the proposed Cu TMDLs and Zn, Hg, As and Cr Action Plans. This would leave USEPA's TMDLs in place, and would require regulatory actions and actions by responsible parties required to implement the established USEPA TMDLs for Cu, Cd, Zn and Pb that apply to both Newport Bay and San Diego Creek.

2) Adopt modified Cu TMDLs and Zn, Hg, As and Cr Non-TMDL Action Plans, (e.g. to specify different numeric targets, allocations, or implementation strategies, or a modified strategy to address impairment by Cu, Zn, As and Cr) that would entail a different combination of TMDLs and Non-TMDL Action Plans (or other alternative restoration approaches).

[19] 14 CCR § 15187(c)(3)

3) Recommended alternative. Adopt the proposed Cu TMDLs and Zn, Hg, As and Cr Action Plans as presented.

5.1 No Project Alternative

Pursuant to this alternative, the Regional Board would not act to adopt the proposed Cu TMDLs and Zn, Hg, As and Cr Action Plans for Newport Bay. USEPA's 2002 TMDLs for Cu, Cd, Zn and Pb for Newport Bay would remain in effect. The Regional Board would be obligated to take regulatory actions, including the issuance and enforcement of waste discharge requirements to implement USEPA's Cu, Cd, Zn and Pb TMDLs. Dischargers would be required to implement tasks & schedules to achieve compliance with the Board's discharge requirements and USEPA's TMDLs. The methods of compliance that would likely be implemented in response to USEPA's TMDLs are expected to be the same as or similar to the reasonably foreseeable tasks and schedules identified for the proposed Cu TMDLs and Zn, Hg, As and Cr, and evaluated in this SED; however, this alternative would also include implementation of the USEPA's Zn, Cd and Pb TMDLs (which are not included in the recommended alternative). The No Action alternative, therefore, would not alleviate the potential environmental effects identified in this SED, and would have greater potential to increase the environmental effects.

Since USEPA's TMDLs do not include an implementation plan, and therefore do not include a compliance schedule, compliance with discharge requirements and the USEPA's TMDLs is expected to be achieved immediately. Since such immediate compliance is generally infeasible, the Regional Board would likely be compelled to issue enforcement orders to provide time for dischargers to come into compliance. This would not alleviate the potential environmental effects of the implementation of reasonably foreseeable methods of compliance, but merely extend the allowable period for tasks and schedules of implementation.

5.2 Modified TMDLs and Action Plans, Modified Regulatory Approach

Regional Board staff's updated Metals Impairment Assessment (see Staff Report, Section 4) identified impairment due to Cu, Zn, Hg, As and Cr in Newport Bay. Board staff carefully considered the appropriate regulatory tools to address each of these metals impairments, whether by TMDL(s) or an alternative restoration approach that is consistent with USEPA's new Vision Framework for addressing impaired waters on the Clean Water Act Section 303(d) list.

Based on the Impairment Analysis, Board staff concluded that Cu impairment could and should be addressed through TMDLs. Zn, Hg, As and Cr should be addressed with Action Plans for the following reasons: Zn and Hg impairment in sediments could and should be addressed with the removal of sediments impaired due to Cu (required in the Cu TMDLs); and, a comprehensive source analysis is needed for As and Cr before

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TMDLs can be developed.. Accordingly, Action Plans are being recommended for these metals.

Board staff also considered various alternatives for the calculation of the Cu TMDLs and allocations, taking into account information concerning the numbers and sizes of boats in the Bay, leach rates of Cu AFPs, etc.

Board staff believe that in each case, the recommended Cu TMDLs and Zn, Hg, As and Cr Action Plans are the most scientifically and technically defensible approach. Future refinements to the TMDLs and Action Plans are expected as data and information are collected during implementation. Such data and information may result in future recommendations to replace one or more Action Plans with TMDLs, and/or to implement alternative Action Plans.

5.2 Recommended Alternative

The recommended alternative is the adoption of the proposed Cu TMDLs and Zn, Hg, As and Cr Action Plans evaluated in this SED. As stated in Section 5.2, the proposed TMDLs and Action Plans themselves reflect extensive consideration of alternatives, including allocation approaches, implementation strategies, and compliance schedules. As discussed above, the environmental effects of the implementation of reasonably feasible methods of compliance with the proposed TMDLs and Action Plans are expected to be less than significant when standard, available mitigation measures are required and implemented during task implementation. In addition, the proposed TMDLs and Action Plans would require less reduction of Cu loads from Cu AFPs on boat hulls (83%) compared to the USEPA's Cu TMDLs (92%), *and* no allocations are required by the Zn, Hg, As and Cr Action Plans.

If the Regional Board does not adopt the proposed Cu TMDLs and Zn, Hg, As and Cr Action Plans (the no action alternative), implementation of the 2002 USEPA Cu, Cd, Zn and Pb TMDLs would be required. USEPA's TMDLs were based on an impairment assessment by USEPA that evaluated data older than that used in Board staff's Metals Impairment Assessment, and USEPA also used sediment guidelines that are not used by State and Regional Boards to determine impairment.

For Newport Bay, USEPA's TMDLs rely on the saltwater CTR criteria for dissolved metals, and TELs and toxicity to determine sediment impairment. In the current Impairment Assessment, the saltwater CTR criteria for dissolved metals is still used to determine impairment in water; however, ERMs rather than TELs are used to determine sediment impairment. This resulted in no sediment impairment for Cd or Pb, and USEPA's TMDLs for Cd and Pb should be depromulgated. In addition, sediment impairment for Zn was only found in limited parts of the Lower Bay, but not in the Upper Bay, and this impairment should be remediated when sediment Cu is remediated by tasks required in the Cu TMDLs; therefore, USEPA's Zn TMDLs should also be depromulgated.

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In addition, the recommended TMDLs and Action Plans reflect the best available science concerning appropriate numeric targets, that, when attained, will ensure the protection of beneficial uses. For these reasons, reliance on USEPA's Cu, Cd, Zn and Pb TMDLs is no longer scientifically defensible and has the potential to result in unnecessary implementation of tasks and schedules that will use limited resources to achieve unnecessary requirements. This is not in the public interest.

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Comment and Response Summary for CEQA Meetings to Consider Draft Copper TMDLs and Non-TMDL Action Plans for Zinc, Mercury, Arsenic and Chromium

Agency	*Date of Comment Letter*	*Date of Response Letter*
1 - City of Newport Beach	*July 16, 2015*	*September 24, 2015*
2 - Marina Recreation Association (MRA)	*July 23, 2015*	*October 6, 2015*
3 - GEI Consultants (representing the Copper Development Association (CDA))	*July 22, 2015*	*December 1, 2015*
4 - Recreational Boaters of California (RBOC) (approx. 65 form letters received) (list of responders in attachment to responses)	*August 2015*	*October 6, 2015*
(28 form letters received) (list of responders in attachment to responses)	*April, May 2016*	*Appendix to Oct. 6, 2015 letter*
5 – Orange County Coastkeeper	*September 23, 2016*	*November 6, 2015*

City of Newport Beach
Comment 1 - "Over the course of many years, the City of Newport Beach ("City") has been working closely with the Santa Ana Regional Water Quality Control Board (Board) and its staff to proactively address a wide range of water quality related issues ... Water quality monitoring studies performed by Board and City show that these efforts have been effective in bringing much of the harbor into compliance with the California Toxic Rule (CTR) standard for copper and lowering copper concentrations in the remainder of the harbor to within 1-3 ppb of CTR."
Response 1 - The Regional Board and Regional Board staff recognize and commend the City for its significant efforts to improve water quality and protect beneficial uses in Newport Bay. As Board staff discussed at the July 24, 2015 Regional Board meeting, and at the two CEQA seeping meetings held on July 23, 2015, water quality monitoring data demonstrate that copper (Cu) concentrations in the Bay continue to exceed the saltwater Cu CTR criterion; therefore, the finding of Cu impairment of the Bay is still appropriate. This finding of impairment is based on data from the Cu-Metals Marina Study (2007) and monitoring data from the County of Orange in Upper and Lower Newport Bay (2002-2012). These data show Cu exceedances of the CTR criterion in both marina and open Bay waters. The evaluation of these studies is part of Board staff's Metals Impairment Assessment, and a requisite part of our ongoing work to consider appropriate revisions to the Cu and other Metals TMDLs promulgated by USEPA in 2002.
Comment 2 - "Based on recommendations by the California Department of Pesticide Regulation (DPR) to ban copper-based antifouling paints (AFP) with high leach rates, it is now reasonable for us all to expect that the remaining areas in the harbor will also come into compliance with CTR." (para. 2)
Response 2 - We disagree with this conclusion. First, DPR has determined that the maximum leach rate alone will not achieve compliance with the CTR; BMPs and other DPR recommendations are built into the determined leach rate and must be implemented. Second, DPR has acknowledged that the maximum leach rate and implementation of their BMP recommendations will not achieve compliance in highly impaired waters, including Newport Bay, unless at least 12% of the boats are converted from Cu to non-Cu paints. Finally, the reduction of Cu loading with the implementation of the maximum leach rate is dependent on the leach rates of the Cu AFPs now in use. Data regarding the leach rates of Cu AFPs now in use in Newport Bay must be collected and evaluated to determine the potential Cu load

reduction from DPR's maximum leach rate. These points are addressed in greater detail below and in the Attachments.

It is critical to understand that the implementation of DPR's maximum allowable leach rate alone will not achieve water quality compliance for Cu. as BMPs for hull cleaning are an inherent part of DPR's leach rate calculations for all marinas. This means that in smaller marinas (<1270 boats) the maximum leach rate WITH BMPs for hull cleaning is expected to achieve CTR compliance. In larger marinas (>1270 boats), the maximum leach rate WITH BMPs for hull cleaning AND the conversion of boats from Cu to nontoxic paints must be implemented to achieve CTR compliance (See Attachments 1,2,3). (Note also that DPR's analysis speaks to compliance within a marina rather than a harbor. As you know, Newport Bay includes a number of marinas and a very high density of vessels. It is necessary to achieve CTR compliance both within these marinas and throughout the Bay.)

BMPs for hull cleaning include cleaning with soft cloths and/or slip liner hull cleaning methodology. Per DPR's analyses, larger marinas (>1270 boats) must also convert a minimum of 12% of the boats from Cu to non-Cu paints to achieve compliance with the CTR. Board staff's draft implementation recommendations include the same measures that DPR recommends: boat conversions from Cu to nontoxic paints, and the required use of BMPs such as soft cloths or slip liner cleaning methodology.

Whether or not DPR's maximum leach rate will reduce Cu loading also depends on the Cu paints actually in use in a particular water body (i.e., if boaters currently use Cu paints with leach rates higher than DPR's maximum leach rate, there will be some reduction in Cu loading with the use of DPR-compliant Cu paints; however, if boaters are already using Cu paints with leach rates below DPR's maximum leach rate, then no reduction in Cu loading will occur. In addition, implementation of DPR's leach rate and the shelf removal and replacement of Cu paints with higher leach rates will likely take a number of years.

Comment 3 - "Notwithstanding this significant and costly effort undertaken by the City to improve water quality, we acknowledge that Board staff is developing a Basin Plan amendment to incorporate a revised copper Total Maximum Daily Load (TMDL) for Newport Bay. Board staff has confirmed that compliance may likely require the City to restrict or ban the use of legally available copper-based AFP in Newport Harbor."

Response 3 - First, we appreciate the City's recognition that Board staff is developing a revised Cu TMDL. A Cu TMDL for Newport Bay is already in place as part of USEPA's Toxics TMDLs (promulgated in 2002). USEPA's Cu TMDL shows that Cu paints on boat hulls are the largest source of Cu to the Bay, and requires a 90% reduction in Cu loading from boats.

Board staff's proposed revised Cu TMDL (based on data since 2002) shows that Cu discharges from Cu paints on boat hulls are still, by far, the largest source of Cu to Newport Bay (approx. 36,000 lbs/yr), but our revised Cu TMDL requires a lower reduction in Cu loading from boats (83%) compared to USEPA's required reduction (90%).

In the absence of an approved revised Cu TMDL for the Bay, the Regional Board will need to require responsible dischargers, including the City of Newport Beach, to take action to meet USEPA's Cu TMDL, which, as noted, requires a greater reduction of Cu discharges from boat hulls than that identified in Board staff's revised Cu TMDL. Regulatory options available to the Board to compel compliance with the USEPA's Cu TMDL, and the revised Cu TMDL when and if approved, include the issuance of waste discharge requirements and the prohibition of Cu discharges to the Bay. (In addition, dischargers will have to meet reduction requirements for zinc (Zn), lead (Pb) and cadmium (Cd) in the Bay identified in USEPA's Zn, Pb and Cd TMDLs, while Board staff found no impairment for these metals except for Zn in

the Lower Bay.)
Second, we do not dispute that Cu AFPs are legally available, and that the City cannot ban the use of such Cu paints. Neither can the Regional Board. DPR controls the sale and use of Cu AFPs; however, the Regional Board can and must restrict the discharge of Cu from Cu AFPs to waters of the state to ensure that the saltwater Cu CTR criterion is achieved. Recognizing differences in the legally specified roles and responsibilities of DPR and the Water Boards, the State Water Resources Control Board and Regional Boards have endeavored to work with DPR to coordinate our respective obligations so as to ensure that any restrictions imposed by DPR are sufficient to meet the Water Board's legal requirements under the California Water Code and federal Clean Water Act. We have identified our concerns regarding DPR's recent determination of a maximum leach rate and their BMP recommendations in a letter to DPR dated August 15, 2014 (Attachment 3). We will continue to work with DPR, and USEPA, which also has pesticide regulatory authority, to identify appropriate measures that will ensure that water quality objectives will be achieved. We encourage the City to join in those efforts.

The California Water Code precludes the Regional Board from dictating the method or manner of compliance with its regulations, including TMDLs. The draft implementation plan for the Cu TMDLs, which we have shared with City staff for early review and comment, envisions that the responsible dischargers, including the City, will develop proposed strategies whereby the necessary reduction in Cu discharges from Cu AFPs would be achieved. We recommend that these strategies include requirements for 1) the conversion of boats from Cu to nontoxic paints, 2) the use of BMPs for hull cleaning (i.e., the use of soft cloths by all divers and/or hull cleaning in slip liners/containers), and 3) boater education programs to educate boaters and boatyards on the need to reduce Cu discharges from Cu AFPs and the use of alternative paints and hull cleaning BMPs.

We agree with DPR that the implementation strategies must include conversions from Cu-based paints to nontoxic paints. If the proposed revised Cu TMDL and implementation plan are approved, the City and other responsible dischargers will need to find ways to accomplish those paint conversions, such as increased slip fees for boaters using Cu paints, and/or incentive program(s) for boaters who convert from Cu to nontoxic paints. While the Regional Board cannot specify the method of compliance, we will review the strategies proposed by the City and require their implementation upon Board approval.

We note that the City has already passed a resolution encouraging boaters to use copper -free boat paints (Resolution 201 0-53). We commend that action.

Comment 4 - "Additionally, as more fully set forth in the attached document entitled "History of Copper Paint Regulation", and as we have previously advised staff, we believe that the staff's recommendation is precluded by doctrine of preemption as DPR is the exclusive regulator of pesticides, including copper-based AFPs." ....

"Quite simply, we believe that the local regulation proposed by the implementation plan is both unenforceable and an end run around DPR notwithstanding the fact that the State of California, DPR, has already established standards under which copper-based AFP may be lawfully used and DPR is the exclusive authority to regulate pesticides "to the exclusion of all local regulation." (Cal. Food & Agric. Code, §11501.1.)"

Response 4 - We recognize that DPR (and US EPA) regulate the sale and use of pesticides, including Cu AFPs; however, the Regional Board has the duty and authority to regulate the discharge of waste, including Cu discharges from Cu AFPs, to waters of the state. These are distinct responsibilities. As described above, the State and Regional Board staff have attempted to work with DPR to coordinate these responsibilities, but where DPR's restrictions and recommendations are not sufficient to protect

water quality, the State and Regional Boards must take or require appropriate action. The proposed implementation plan for the revised Cu TMDL identifies those actions.
Comment 5 - "We respectfully request that you reject this proposal. We say this again acknowledging the fine work of your staff, whom we respect very much."
Response 5 - The Regional Board and Board staff sincerely appreciate the productive and respectful relationship that the Board and its staff have enjoyed in joint efforts with the City to improve and protect water quality. We hope that this relationship will continue. The draft TMDL and implementation plan will be widely distributed for public and agency comment, and revisions will be considered on the basis of those comments before this matter is brought to the Regional Board for adoption consideration at a public hearing.
Comment 6 - "We suggest that the Board recognize DPR's prohibition on very high leach rate copper-based AFPs that exceed the leach rate thresholds set by DPR in 2014 in lieu of requiring our one community and harbor to be more restrictive than the DPR mandate. Complying with DPR's maximum leach rates will serve the intent of any Basis [Basin] Plan Amendment and, as confirmed by DPR, should dramatically reduce the use of copper in anti-fouling paints. (Determination of Maximum Allowable Leach Rate and Mitigation Recommendations for Copper Antifouling Paints Per AB 425 ("Determination", p.3). In addition to respecting DPR's preemptive role, our suggested alternative provides the benefit of allowing the industry to react to the newly-established leach-rate thresholds so that the success of product reformulation can be adequately assessed." "It allows the boating community - especially the local boating community- to more thoughtfully react to these important changes to time-tested ways of doing things."
Response 6 - Please see the responses above concerning the respective responsibilities and authorities of DPR and the Regional Board, and the potential effects of DPR's maximum leach rate. It should be noted that the proposed Cu TMDL implementation plan calls for an extended compliance schedule (a maximum of 15 years), which is expected to allow boats to be repainted with nontoxic or non-Cu based AFPs over time, consistent with current maintenance/repainting schedules. This compliance schedule provides time to assess whether and to what extent DPR's leach rate and recommendations result in any appreciable Cu load reductions, and whether changes to the Cu TMDL and/or implementation plan should be considered on the basis of those findings.
Comment 7 - "Additionally, the City of Newport Beach strongly believes any such monitoring, enforcement, testing, etc. for compliance with DPR regulation associated with AFP's must be applied on a Statewide basis, by the State. The monitoring of vessels for compliance to State or Federal regulations should be looked at in the same way the States and Federal governments monitor and regulate land based vehicles through the control of the various products used in their assembly and upkeep (such as tires, ·brake pads, oils and fuel). The compliance monitoring for such items like DPR's AFP standards should be done through a required testing program prior to obtaining vessel registration, similar to the SMOG check compliance program for vehicles."
Response 7 - While a statewide registration for boats might be a helpful option, this would likely take years to put in place and implement, and it's not clear that it would succeed in meeting this Cu TMDL. Furthermore, not all marinas in the state are impaired for Cu. The most impaired marinas for Cu from Cu AFPs on boat hulls, are found in southern California (Newport Bay, Shelter Island, Marina del Rey). We have discussed with DPR the possibility of a regional (southern California) ban on the sale and use of Cu-based AFPs; however, to date, DPR has declined to pursue this approach. We would welcome the City's efforts to work jointly with us and other southern California Regional Boards to encourage DPR (and USEPA) to pursue further restrictions (lower allowable leach rates or possibly a regional ban) on Cu AFPs in southern California.
Comment 8 - "We do not believe such responsibilities should be delegated to the local or county

government, nor should it be applied to one, or a few, particular harbors. We are ill-equipped to do this work. Further, a piecemeal approach to regulation creates a ready market to move vessels around to other locations for AFP. Expecting a municipality to track the ins and out of vessels and their AFP work is unreasonable.
Response 8 - Please see the preceding response. We would be pleased to work with the City to encourage DPR to pursue further restrictions (lower allowable leach rates or possibly a regional ban) on Cu AFPs in southern California; however, without a ban on Cu AFPs in southern California (which is unlikely), DPR itself states that to achieve compliance with the saltwater Cu CTR criterion, <u>BMPs and conversions to non-Cu AFPs must be implemented in addition to the implementation of the maximum leach rate</u>. (City-instituted public education and requirements imposed by the City that hull cleaners must employ BMPs are reasonable steps, under any circumstances, to reduce the discharge of Cu from Cu AFPs to surface waters. Given its tidelands grant by the State, it is reasonable to expect that the City will employ its authorities and execute its responsibilities to address activities that take place on lands under the control of the City to prevent the discharge of pollutants, including Cu from Cu AFPs.)
Comment 9 - "As we have noted, if the City of Newport Beach prohibits or restricts the application of DPR approved copper-based paint in Newport Beach alone, someone a short distance away in Long Beach, Huntington Beach or Dana Point would not be restricted. As a store in any of these communities could sell paint banned in Newport Beach, such a pervasive conflict requires that state law predominate. Otherwise, the result will be an unnecessary confusion and uncertainty as different localities attempt to enforce different rules. A patchwork of varying restriction on paint would be extremely costly and nearly impossible to enforce, especially in Orange County with our multiple harbors and marine paint vendors."
Response 9 - Please see preceding responses. We agree that a regional ban on the use of Cu-based AFPs would simplify the regulatory response necessary to achieve Cu discharge reductions from Cu AFPs. We have thus far been unable to persuade DPR of the merits of this approach and would welcome the City's supporting voice in this conversation; however, as stated above, DPR is not amenable to a regional ban on Cu AFPs at this time. Absent such a regional ban on the sale and use of Cu-based AFPs, the Regional Board must ensure that suitable and effective actions are taken by responsible parties, including the City of Newport Beach, to achieve the requisite Cu loading reductions from Cu AFPs. This is true whether USEPA's Cu TMDL remains in effect or is superceded by the revised Cu TMDL developed by Regional Board staff. In addition, it would be useful to work with USEPA to add leach rate designations to Cu AFP labels so that boaters and boatyards can choose Cu AFPs with lower leach rates.
Comment 10 - "If the State of California (and any of its departments or agencies as each are considered the State in our eyes) approves the use of a particular product(s) for sale and use, in this case AFPs, that include a known and expected discharge rate of a particular substance, in this case copper, then there is an implied and expected understanding that that product is acceptable although it causes an associated exceedance of another rule, in this case CTR. If the Regional Quality Control Board disagrees with DPR (its sister State agency) on the use of this product, then we respectfully suggest that the onus is on the Regional Water Quality Control Board and DPR as the appropriate parties to come to a joint agreement so that California speaks with one voice, and its individual departments do not to look to local government to decipher conflicting messages."
Response 10 - While Regional Board staff would have liked DPR to issue a lower maximum leach rate, we do not disagree with DPR's conclusions that achieving compliance with the Cu CTR criterion will take the maximum leach rate WITH BMPs for hull cleaning in the smaller marinas (<1270 boats), and the maximum leach rate WITH BMPs for hull cleaning AND boat conversions from Cu to nontoxic paints in larger marinas (>1270 boats). There is no disagreement with DPR. Again, we would welcome the City's support in encouraging DPR (and USEPA) to pursue further restrictions (lower allowable leach rates or possibly a regional ban) on Cu AFPs in southern California and in working with USEPA to add leach rate

designations to Cu AFP labels.
Comment 11 - "For all of these reasons, and based on the provisions of the Business and Professions Code, the Food and Agriculture code, case law, and recent legislative action outlined in this attachment, we just don't think this is wise or will work. It is clear that DPR is the preemptive regulating and enforcement agency with regard to the use of anti-fouling paints. Requiring the City of Newport Beach to restrict the use of legally-available paint likely interferes with state law and the intent of the California Legislature. A requirement imposed in Newport Harbor would directly interfere with the power vested in DPR to regulate the use of pesticides. We respectfully suggest that you not adopt these new requirements on our community and harbor, instead working with DPR to implement, measure and test the success of DPR's new obligations.
Response 11 - As stated in the preceding responses, and as reflected in more detail in the Attachments to this letter, Regional Board staff do not dispute DPR's authority to regulate the sale and use of pesticides such as Cu-based AFPs; however, we disagree that DPR's adoption of a maximum Cu leach rate for Cu-based AFPs somehow pre-empts the Regional Board from exercising its state and federal authority to regulate discharges of copper to Newport Bay and to adopt and implement a revised Cu TMDL that addresses Cu impairment in the Bay. In setting a maximum Cu leach rate and making other recommendations, DPR has considered what is necessary to achieve the CTR criterion, recognizing the Regional Board's obligation to ensure that water quality and beneficial uses are not adversely affected as the result of Cu discharges from the use of Cu AFPs sanctioned by DPR. As stated above, DPR has acknowledged that in the larger, most impaired marinas, the maximum leach rate must be coupled with the implementation of hull cleaning BMPs AND the conversion of some percentage of vessels from Cu-based AFPs to nontoxic (or non-Cu) AFPs. As reflected in this letter and in Attachments 1, 2 and 3, we agree with this conclusion. The proposed TMDL and implementation plan provide an extended compliance schedule that will allow the City, and other responsible parties, to identify proposed strategies to achieve the requisite paint conversions and reductions in Cu discharges. Regional Board staff's expectation is that the proposed strategies will include identification of the leach rates of Cu AFPs now in use in the Bay to determine whether and to what extent DPR's maximum leach rate will reduce Cu loading to the Bay. The implementation strategies should also include requirements for the use of BMPs by hull cleaners and public education. Finally, we again strongly encourage the City to work with us to encourage DPR (and USEPA) to pursue further restrictions (lower allowable leach rates or possibly a regional ban) on Cu AFPs in southern California and to work with USEPA to add leach rate designations to Cu AFP labels. We respectfully remind the City of the need to reduce Cu discharges to meet both the already established USEPA TMDL and Regional Board staff's revised Cu TMDL now being drafted.
Summary of Responses - The water quality monitoring data demonstrate that Cu concentrations in the Bay continue to exceed the saltwater Cu CTR criterion and the finding of continued impairment of the Bay is justified. USEPA's Metals TMDLs for Newport Bay, including Cu, are already in place, and if the proposed revised Cu TMDL is not adopted, USEPA's Metals TMDL will be implemented. There are several issues, however, with USEPA's Metals TMDLs: 1) The data on which those TMDLs rely are pre-2002, and methods of determining compliance developed prior to the adoption of California's State Listing Policy (2004) are outdated; 2) USEPA's Cu TMDL requires a 90% reduction in Cu loading from boats, which is larger than the revised Cu TMDL requirement of 83% reduction in Cu loading from boats; and, 3) USEPA's TMDLs include requirements for zinc (Zn), lead (Pb) and cadmium (Cd). If Board staff's revised Cu TMDLs and recommendations for other metals are not adopted, then USEPA's Metals TMDLs will remain in place

and all metals requirements must be implemented. Note that in addition to USEPA's Cu TMDL for Newport Bay, Cu TMDLs have been adopted in Shelter Island (San Diego) and Marina del Rey (Los Angeles) with boats shown to be the main contributor of Cu to those water bodies.

We thank the City for your work in Newport Bay, and we look forward to our continued work together to achieve water quality compliance in the Bay, especially with respect to Cu. We strongly encourage the City to begin development of an implementation plan with strategies to reduce Cu in Newport Bay. These strategies should include recommendations for converting boats from Cu to non-Cu AFPs, using BMPs for hull cleaning, such as soft cloths or slip liner cleaning methodology, and conducting education programs for boaters and boatyards regarding Cu issues.

Marina Recreation Association (MRA)

Comment 1 - Use of the California Taxies Rule (CTR) criteria for metals "Our primary concern is the utilization of the California Toxic Rule (CTR) to establish numeric target values. The CTR copper value is overly conservative, does not use the best science, and therefore will potentially initiate the wrong implementation strategy. The USEPA acknowledges the CTR copper value is overprotective."

Comment 1.1 - "The CTR copper value is overly conservative ... "

Response 1.1 - Board staff agree that the California Toxics Rule (CTR) copper (Cu) criteria may be overprotective for some water bodies but these Cu criteria are not overprotective for Newport Bay. The CTR chronic Cu criterion may also be overprotective at times when the dissolved organic carbon (DOC) concentrations are high, but it is not overprotective when DOC concentrations are low (below 1mg/L). This is shown for Newport Bay in a Biotic Ligand Model (BLM) analysis of data from a Cu-Metals Marina study in the Bay. Samples were collected in May, August and December (2006) and analyzed for Cu (and other metals), DOC, and other water quality parameters such as pH and salinity. The DOC varied seasonally (for one year's data). Board staff then ran the BLM with the Cu and DOC data and found that when the DOC concentrations were below 1mg/L, the Cu BLM criteria were close to the CTR acute Cu criterion (4.8µg/L); when the DOC concentrations were below 0.5mg/L, the Cu BLM criteria were close to the CTR chronic Cu criterion (3.1µg/L). DOC data from Newport Bay, collected by the County of Orange, were also highly variable.

Since the DOC concentrations are variable in the Bay, we must use the lower DOC concentrations in determining a Cu BLM criterion to be protective of this water body under all DOC concentrations, and the lower DOC data yield Cu BLM criteria nearly equal to the CTR chronic Cu criterion; therefore, the CTR Cu criterion of 3.1µg/L is an appropriate water quality objective. Based on the above evaluation, the saltwater CTR Cu criteria are not overly conservative for Newport Bay.

Comment 1.2 - "The CTR copper value ... does not use the best science ... "

Response 1.2 - The MRA letter does not specify the basis for this assertion. The saltwater CTR Cu criteria, including the acute and chronic Cu criteria, were derived by USEPA using the best available science. The CTR acknowledges that site-specific criteria for certain metals, including Cu, may be appropriate, and provides for the development of a Water Effects Ratio (WER) to justify revisions to the CTR Cu criteria. Furthermore, USEPA is now considering the publication of the Saltwater Cu BLM to determine the Cu criteria for a water body. As discussed in the previous response, Board staff's use of the BLM to determine Cu BLM criteria confirms the appropriateness of the current CTR chronic Cu criterion (3.1µg/L). The proposed revised Cu TMDL allows for revisions of the applicable water quality objectives based on WER studies (or Saltwater Cu BLM criteria determinations, if the Saltwater Cu BLM is approved by USEPA), should one or more parties elect to pursue WER studies or BLM determinations.

See also Attachment 1 [to response letter to MRA – on RB website] (an excerpt of testimony by Dr.

Cindy Lin, US EPA, to the Los Angeles Regional Board as part of the consideration of the revised Marina del Rey Toxics TMDLs including a Cu TMDL), in which Dr. Lin notes the appropriateness of the CTR Cu criteria. Board staff agree that the best available science should be used to develop this Cu TMDL and we strive to use the most current criteria and methodology, which currently includes the CTR Cu criteria. We have also recalculated the Cu input from Cu AFPs on boat hulls based on Earley et al's study (2013) which is the latest study on Cu loading from boats. In addition, a separate model was used to determine the total allowable Cu that the Bay can assimilate and still remain below the CTR chronic Cu criterion, and Cu allocations for each source were calculated from the total allowable Cu.
Comment 1.3 - "The CTR copper value ... will initiate the wrong implementation strategy"
Response 1.3 - The CTR Cu criteria are the legally applicable water quality criteria and will not "initiate the wrong implementation strategy". The CTR chronic Cu criterion (3.1µg/L) is a national criterion and is based on species and sites that are reflective of sites throughout the nation, including Newport Bay. The dischargers always have the option of conducting a WER to determine whether a site-specific criterion for Cu is appropriate; however, the CTR Cu criteria are the legally applicable criteria unless a site-specific criterion is developed and adopted.
Comment 1.4 - "The USEPA acknowledges the CTR copper value is overprotective."
Response 1.4 - The CTR, promulgated by USEPA, provides for site-specific adjustments to the CTR Cu criteria, acknowledging that under certain water quality conditions, the resulting site-specific Cu criteria may be either overprotective or underprotective. See Response 1.2.
Comment 2 - *The CTR does not reflect true toxicity in a water body.* "Not only did the USEPA recommend developing site-specific targets for copper, they wrote guidance to develop site-specific criteria: From USEPA's Aquatic Life Criteria Table for Copper: "When the concentration of dissolved organic carbon is elevated, copper is substantially less toxic and use of Water-Effects Ratios (WERs) might be appropriate ... Simply stated, MRA's concern is that it is widely understood that CTR does not reflect the true toxicity in a specific water body."
Response 2 - We agree that the CTR does not reflect the toxicity in a specific water body since it is designed to be a protective value for all water bodies in the state of California rather than a threshold at which toxicity occurs. In other words, the CTR criteria are water quality standards established to protect water quality and prevent toxicity, rather than a measurement of toxicity, and the CTR Cu criteria were set to address Cu concentrations before they reach toxic concentrations.
Comment 3 - *The use of site-specific objectives* "From 2002 Newport Bay Copper TMDL: "…Metals criteria calculation protocols are nearing completion which may enable States to calculate metals standards that more accurately represent the bioavailable portion of total metals loading through consideration of WERs. It may be relatively straightforward recalculate *(sic)* metals criteria based on local hardness and organic carbon data and revised WER equations. In light of the potential cost of extensive actions to further control metals loading from urban runoff in the watershed, EPA believes it may be reasonable to consider whether newly emerging criteria calculations methods would result in protective but easier-to-implement standards." MRA supports the utilization of site-specific criteria.
Response 3 - It appears that this passage from USEPA's Cu TMDL relates to metals in freshwater as it discusses "control[ing] metals loading from urban runoff in the watershed" and the use of "local hardness and organic carbon data" with revised WER equations (hardness is used to determine metal concentrations only in freshwater). It appears, however, that the point that MRA is making is that MRA is in favor of the use of site-specific criteria.

While Water Effects Ratios (WERs) have not been evaluated in Newport Bay to determine a site-specific objective, the BLM was run with data from the Bay to derive Cu BLM criteria (see Response 1). The Cu BLM criteria are significantly related to the DOC concentrations in saltwater. Since a Cu BLM criterion is generated for each sample analyzed, Board staff were able to determine that when DOC concentrations are below 0.5 mg/L, the Cu BLM criteria are at or close to the CTR chronic Cu criterion of 3.1µg/L; therefore, the CTR Cu criterion is appropriate for use in Newport Bay.

Dischargers do have the option of conducting a WER for any water body; however, in the case of Newport Bay, the CTR Cu criteria must be met unless a site-specific criterion is developed and adopted. See Response 1.

Comment 4 - *The use of Site-Specific Objectives*

Comment 4.1 - Lessons learned from Shelter Island Cu TMDL

"In your Staff's report before you, they refer to the Copper TMDL's *(sic)* that have been adopted for Shelter Island Yacht Basin and Marina del Rey. It is important that future Copper TMDL's build upon those that precede them. In this regard, we request that you pay particular attention to the lessons learned by the Port of San Diego regarding the development and implementation of the Shelter Island Yacht Basin TMDL. For your convenience, I have attached their writing to the Los Angeles Regional Water Control Board in response to their draft Copper TMDL regarding Marina del Rey. Of particular importance is their lesson learned of the value of utilizing site-specific criteria."

From Attachment to MRA letter: "Comment and Summary Response on November 5, 2013 Draft: Reconsideration of the Total Maximum Daily Load for Toxics Pollutants in Marina del Rey Harbor" comments from Karen Holman, Port of San Diego - Consider Site-Specific Water Quality Objectives (15.3)

"The District [San Diego Unified Port District] recognizes the importance of considering site-specific factors when developing TMDLs. The Shelter Island TMDL did not use site-specific objectives in the technical methodology; however, there is an increasing body of evidence suggesting that the current water quality objective of 3.1 µg/L may be overly protective of the beneficial uses in the Shelter Island Yacht Basin. For the District and other stakeholders subject to the Shelter Island TMDL, re-opening the TMDL for Shelter Island to consider site-specific water quality objectives will be a lengthy and expensive process for both the regulated parties and the Regional Board.

As one of the parties implementing various copper reducing activities to meet the 3.1 µg/L water quality objective in the Shelter Island TMDL, the District would encourage the use of site-specific water quality objectives at the onset of the TMDL process. Because the Marina del Rey TMDL Amendment has not yet been adopted, it may be beneficial to 1) consider extending the amendment hearing until a site-specific study can be completed, or 2) include appropriate language in the TMDL resolution to enable site-specific objectives to be easily incorporated, once data is collected without another re-opener process."

Los Angeles Regional Board (LARB) staff Response to Port comments. "The TMDL may be revised at any time to incorporate the results of new scientific study, including a site-specific objective if appropriate. The potential water column impairment due to copper in the water column was discussed in the Staff Report for the original Marina del Rey Harbor Toxic Pollutants TMDL. As no special studies have been conducted investigating a potential site-specific objective since the original TMDL became effective in 2006, water quality objectives promulgated by the California Toxics Rule are the appropriate water quality criteria for copper in the water column of Marina del Rey Harbor."

Response 4.1 - Board staff agree that future copper TMDLs should consider and, where appropriate, build upon other established Cu TMDLs. It is for this reason that we regularly communicate with LA

Regional Board and Port of San Diego staff to discuss Cu TMDL issues, including the effectiveness of implementation strategies. In addition, a number of agencies (including the Regional Boards, the State Board, the Port of San Diego, the Port of Los Angeles, the Department of Pesticide Regulation (DPR), the U.S. Navy and others) meet quarterly to discuss marina issues with an emphasis on Cu. At this time, the CTR Cu criteria are the applicable water quality criteria for Cu. Data from Newport Bay were run in the BLM, and when DOC concentrations are below 0.5 mg/L, the Cu BLM criteria are at or close to the CTR chronic Cu criterion of 3.1µg/L. In addition, the Cu TMDL may be revised at any time to incorporate the results of new scientific site-specific studies, and Board staff will consider recommendations for a site-specific objective if it is shown to be appropriate by new data (see Response 2).
Comment 4.2 - *Use of site-specific objectives for Marina del Rey* "The importance of site-specific criterial [criteria] was also underscored during the process of establishing the Copper TMDL for Marina del Rey. The State and Los Angeles Regional Water Quality Control Boards recognized the value of site-specific modeling, including Biotic Ligand Model (BLM). In that Copper TMDL, provisions were made for site-specific modeling including WERs and BLM. The County of Los Angeles is currently conducting site-specific modeling."
Response 4.2 - The proposed revised Cu TMDL for Newport Bay includes provisions that allow the dischargers to conduct site-specific studies. If the results of those investigations show that a Cu criterion different from the CTR chronic Cu criterion is appropriate, and if the revised Cu criterion is approved, then the TMDL can be reopened and revised. Note that a site-specific Cu criterion may be higher <u>or</u> lower than the CTR Cu criteria (see Response 2). In addition, it is our understanding that the County of Los Angeles is only in the preliminary stages of submitting a plan to LA Regional Board staff for site-specific sampling and analysis, and is not yet conducting site-specific modeling.
Comment 4.3 - *Adoption of site-specific objectives for San Francisco Bay* "The San Francisco Bay Regional Water Quality Control Board has adopted the use of site-specific models in determining target values."
Response 4.3 - The San Francisco Regional Board has adopted site-specific objectives for San Francisco Bay. Note that the largest source of Cu to San Francisco Bay was determined to be Cu from Delta tributary inflows rather than Cu from Cu AFPs on boats.
Comment 5 - *Successful TMDL implementation requires support from the regulated community.* "In closing…Karen Holman [wrote] to the Los Angeles Regional [Water] Quality Control Board on behalf of the Port of San Diego, "Our experience has taught us that working through the TMDL adoption process and having success in implementing pollutant reducing activities requires support from the regulated community." It is our contention that utilizing best available scientific tools in establishing target values is a critical component in obtaining support from those being regulated."
Response 5 - Board staff agree that the success of the TMDL adoption process and the implementation of pollutant reducing activities requires support from the regulated community. This is part of the reason that we conduct public workshops and solicit comments/concerns from stakeholders for proposed regulatory actions. We also agree that utilizing the best available science in establishing water quality objectives is a critical component in obtaining support from those being regulated. As previously stated, the CTR Cu criteria upon which the proposed revised Cu TMDL relies are based on the best available science. Once again, this proposed revised Cu TMDL provides for the development of site-specific Cu criteria, if justified by site-specific investigations.

Comment 6 - *Comments/concerns expressed in Attachment to MRA letter: California Toxic Rule Copper Value tear sheet.* This attachment expresses similar concerns to those expressed in the MRA letter. Comment 6.1 - "The CTR copper value is overly conservative, does not use the best science, and therefore will initiate the wrong implementation strategy."
Response 6.1 - See Response 1.1.
Comment 6.2 - "The USEPA acknowledges the CTR copper value is overprotective."
Response 6.2 - This assertion may be true for some water bodies, especially where DOC concentrations are high, but it is not true for all water bodies in California. Based on Board staff's use of the BLM to develop Cu BLM criteria, the CTR Cu criteria are not overprotective for Newport Bay. See Responses 1.1 and 1.4.
Comment 6.3 - "From USEPA's Aquatic Life Criteria Table for Copper "When the concentration of dissolved organic carbon is elevated, copper is substantially less toxic and use of Water-Effect Rations (WERs) might be appropriate." "
Response 6.3 - Board staff agree with MRA's statement above; however, the reverse is also true –when the dissolved organic carbon is low (less than 0.5mg/L), Cu may be more toxic, and Board staff must use Cu criteria that are protective of water quality. See Response 1.1.
Comment 6.4 - "From 2002 Newport Bay Copper TMDL "Metals criteria calculation protocols are nearing completion…It may be relatively straightforward [to] recalculate metals criteria based on local hardness and organic carbon data and revised WER equations.""
Response 6.4 - This statement must refer to freshwater since it discusses hardness measurements. See Response 2.
Summary Response - 1) The CTR Copper (Cu) criteria are the applicable water quality criteria for Cu. The CTR chronic Cu criterion (3.1 µg/L) is a national criterion and is based on species and sites that are reflective of sites throughout the nation, including Newport Bay. 2) Board staff agree that utilizing the best available science is a critical component in establishing water quality objectives and in developing this Cu TMDL. The proposed revised Cu TMDL employs the best available science. 3) The dischargers always have the option of conducting a WER; however, the CTR Cu criteria are legally applicable unless a site-specific criterion is developed and adopted. . Accordingly, actions to achieve the CTR Cu criteria are required at this time. 4) The use of the Biotic Ligand Model (BLM) has also been discussed, though it has not yet been published by USEPA. Board staff did, however, run the BLM with data from Newport Bay and when the dissolved organic carbon (DOC) concentrations are below 0.5 mg/L, the BLM criteria are close to the CTR chronic Cu criterion of 3.1 µg/L. 5) As Board staff discussed at the July 24, 2015 Regional Board meeting and the two CEQA scoping meetings held on July 23, 2015, our data assessment demonstrates that Cu concentrations in the Bay continue to exceed the CTR saltwater chronic Cu criterion and the finding of continued impairment of the Bay due to Cu is justified. This Metals Impairment Assessment should be released as part of the draft staff report for the metals TMDLs in a few months. 6) In addition, a Cu TMDL for Newport Bay is currently in place and was promulgated by USEPA in 2002. Board staff are proposing a revised Cu TMDL that requires a lower reduction for Cu from boats (86%) compared to USEPA's reduction requirement (90%).
GEI Consultants (representing the Copper Development Association (CDA))
Comment 1 - "Because it represents the most rigorous and up-to-date approach for assessing the potential for risks to marine aquatic life due to copper exposure, CDA would like to urge the SARWCQB

to incorporate the saltwater BLM into the Newport Bay TMDL process."
Response 1 - Regional Board staff agree that the best available science should be, and was, used in developing the revised Cu TMDL and implementation strategies. The saltwater CTR Cu criteria, including the acute and chronic Cu criteria, were derived by USEPA using the best available science. As you know, the CTR acknowledges that site-specific criteria for certain metals, including Cu, may be appropriate, and provides for the development of a Water Effects Ratio (WER) to justify revisions to the CTR Cu criteria. We are well aware that USEPA is now considering the publication of the Saltwater Copper Biotic Ligand Model (Cu BLM) as another tool that could be employed to determine adjustments to the Cu criteria for a water body. Indeed, Board staff ran the Cu BLM with Cu and DOC data from the Lower Newport Bay Copper/Metals Marina Study (Cu-Metals Marina Study) and found that *when the DOC concentrations were below 1mg/L, the Cu BLM criteria were close to the CTR acute Cu criterion (4.8µg/L); when the DOC concentrations were below 0.5mg/L, the Cu BLM criteria were close to the CTR chronic Cu criterion (3.1µg/L).* DOC data from Newport Bay, collected by the County of Orange, were also highly variable. A conservative approach is therefore needed to calculate a Cu BLM criterion that will protect water quality throughout the year. Board staff's use of the Cu BLM to determine Cu BLM criteria confirms the appropriateness of the current CTR chronic Cu criterion (3.1µg/L). USEPA also commented on the appropriateness of the CTR criteria in their statement at the Los Angeles Regional Board hearing for the adoption of the Marina del Rey revised Toxics TMDLs, including Cu. (See Attachment 1). [Attachment 1 to Response letter to GEI.] While our application of the Cu BLM would be conservative and result in the use of a Cu BLM criterion similar to the CTR chronic Cu criterion, the extended compliance schedule proposed for the Cu TMDL allows for revisions of the applicable water quality objectives based on WER studies (or Saltwater Cu BLM criteria determinations if and when the Saltwater Cu BLM is approved by USEPA), should one or more parties elect to pursue WER studies or Cu BLM determinations. Note that the Metals Impairment Assessment will be released as part of Board staff's Metals TMDLs staff report, which will include a thorough and well documented discussion of the science and reasoning behind this revised Cu TMDL and proposed Non-TMDL Action Plans for other metals, including zinc, mercury, chromium and arsenic.
Comment 2 - "We understand the TMDL process has, in large part, been triggered by surface water and sediment porewater exceedances of the CTR acute and chronic copper water quality standards in Newport Bay, based on the 2007 study conducted by Orange County Coastkeeper" (1). *(1) Lower Newport Bay Copper/Metals Marina Study (OC Coastkeeper and Candelaria, 2007)* "• However, the 2007 Coastkeeper [Cu-Metals Marina] study also indicates that no significant toxicity to sensitive species was observed in water and sediment porewater samples collected from Newport Bay during their study."
Response 2 - First, it is important to point out that USEPA first promulgated TMDLs for metals, including Cu, in Newport Bay in 2002 (2). These TMDLs were based on USEPA's impairment assessment, which found that the CTR acute and chronic Cu criteria in saltwater were exceeded in both Upper and Lower Newport Bay. (USEPA's finding of impairment in the Bay due to Cu precedes the Cu-Metals Marina Study.) *(2) TMDLs for Toxic Pollutants in San Diego Creek and Newport Bay, USEPA 2002.* Currently, Board staff are developing a revised Copper (Cu) TMDL and Non-TMDL Action Plans for zinc (Zn), mercury (Hg), chromium (Cr) and arsenic (As), based on an updated Metals Impairment Assessment that evaluated data from 2002 to 2012. As noted above, the updated Impairment Assessment will be included in the staff report that will support the proposed Cu TMDL and Non-TMDL Action Plans for

other metals. Board staff's updated Impairment Assessment shows that Cu continues to exceed the saltwater CTR acute and chronic Cu criteria. This assessment is based on monitoring data from the County of Orange, in addition to the Cu-Metals Marina Study. Per the State Water Board's 303(d) Listing Policy, if exceedances of applicable criteria/guidelines are present in water, the water body is considered to be impaired *whether or not toxicity is present in water.* In addition, Cu exceeds the sediment ERM (Effects Range Median) guidelines and sediment toxicity is present. Note again that both Upper and Lower Newport Bay were first listed as impaired for metals in 1998, and listed explicitly for Cu in 2006 (3), prior to the Cu-Metals Marina Study. *(3) The State Water Board assessed individual metals in Newport Bay in 2006* Board staff's impairment assessment and recommendations for metals actions are also based on the comparison of available data to fish tissue guidelines for human health, from the California Office of Environmental Health Hazard Assessment (OEHHA) and USEPA, and fish tissue guidelines for the protection of wildlife (developed from the literature by Board staff and the US Fish and Wildlife Service (USFWS)).
Comment 3 - "•The data summarized in that report (1) also suggest that, were the saltwater BLM used to estimate toxic effect levels, concentrations in Newport Bay would, in fact, not exceed these site-specific predictions most of the time, which is more consistent with the observed toxicity than that suggested by the CTR criteria. • The saltwater BLM was also able to more accurately predict toxicity than the CTR criteria in the Shelter Island Yacht Basin of San Diego Bay."
Response 3 - The GEI/CDA letter does not specify the basis for this assertion. The data from the Cu-Metals Marina Study were run with the Cu BLM and the results do not agree with your conclusion. (See Response 1.) With respect to the Cu BLM use in Shelter Island (San Diego Bay), the data used to develop the Cu BLM criteria there were limited. In addition, the DOC concentrations were not characterized throughout the year, which is critical to the development of an accurate Cu BLM criterion.
Comment 4 - "Because these field toxicity measurements and BLM results raise significant uncertainties regarding the basis for this TMDL action, we hope the SARWQCB will derive site-specific criteria using a bioavailability-based approach and consider those criteria when making the final determination on what source control measures, if any, are needed to protect aquatic life in Newport Bay."
Response 4 - The Saltwater Cu BLM has not yet been published by USEPA; however, as stated in Response 1, the Cu BLM was run by Board staff using Newport data (Copper-Metals Marina Study). When the DOC concentrations were below 0.5mg/L, the Cu BLM criteria were close to the CTR chronic Cu criterion (3.1µg/L). These results confirm the appropriateness of the current CTR chronic Cu criterion (3.1µg/L). As indicated in Response 1, the proposed TMDL includes a compliance schedule that would allow affected parties to conduct a WER (or, if approved, Cu BLM) studies in order to demonstrate the propriety of site-specific objectives. If site-specific objectives were developed and approved, appropriate revisions to the Cu TMDL would be considered.
Comment 5 - "BLMs have also been developed for other metals and media (such as zinc and nickel in freshwater and copper in soils) and CDA and its other metals association partners would be happy to provide more information if the SARWQCB would find it useful for its work on the non-TMDL action plans or other activities underway."
Response 5 - USEPA has published a Freshwater BLM. Board staff are not aware of a BLM for copper in soils. In any case, a BLM for copper in soils would not be appropriate to use for sediments.
Comment 6 - "CDA and its contractors would be happy to participate collaboratively with the

SARWQCB in any discussions on this matter, either on their own or as part of a stakeholder group, if such a group is formed."
Response 6 - This offer is acknowledged. To date, a stakeholder group has not been formed to address metals in Newport Bay; however, the proposed implementation plan encourages a collaborative approach to identify and implement control measures.
Comment 7 - "Since the saltwater BLM is not currently publicly available, CDA is also willing to facilitate access to the modeling software and provide training if desired (4)" *(4) In advance of USEPA's 2016 release of its draft update of the copper saltwater national recommended water quality criteria for public comment, a manuscript for peer-reviewed publication, discussing the scientific basis for the update, is now in preparation. Further, a trial version of the saltwater BLM software is being prepared.*
Response 7 - Once again, this offer is acknowledged. As a matter of information, Board staff worked with the creators of the Cu BLM in running the data from Newport Bay. (See Response 1.)
Comment 8 - "Ultimately, use of bioavailability approaches such as the BLM, represents not only the current state of the science, but also the growing state of regulatory practice across the U.S., and in fact the world, for metals in the aquatic environment. We urge the SARWCQB to use the latest scientific and regulatory tools for this important matter that will influence many in the Newport Bay watershed. Thank you for the opportunity to provide these comments."
Response 8 - Board staff would like to reiterate our commitment to the use of the best available science in our TMDL development. (See Response 1.)
Summary Comments - 1) The CTR Copper (Cu) criteria are the applicable water quality criteria for Cu. The saltwater CTR chronic Cu criterion (3.1 µg/L) is a national criterion and is based on species and sites that are reflective of sites throughout the nation, including Newport Bay. 2) Board staff agree that utilizing the best available science is critical in establishing appropriate water quality objectives and in developing this Cu TMDL. The proposed revised Cu TMDL employs the best available science. 3) The dischargers always have the option of conducting a WER; however, the CTR Cu criteria are legally applicable unless a site-specific criterion is developed and adopted. Accordingly, actions to achieve the CTR Cu criteria are required at this time. 4) The use of the Saltwater Copper Biotic Ligand Model (Cu BLM) was also discussed, and though it has not yet been published by USEPA, Board staff did run the Cu BLM with data from Newport Bay. When the dissolved organic carbon (DOC) concentrations are below 0.5 mg/L, the Cu BLM criteria are close to the CTR chronic Cu criterion of 3.1 µg/L. 5) As Board staff discussed at the July 24, 2015 Regional Board meeting and the two CEQA scoping meetings held on July 23, 2015, our Metals Impairment Assessment (based on data after 2002) demonstrates that Cu concentrations in the Bay continue to exceed the saltwater CTR chronic Cu criterion and the finding of continued impairment of the Bay due to Cu is justified. This Metals Impairment Assessment will be released as part of the draft staff report for the metals TMDLs in the near future.
Recreational Boaters of California (RBOC)
Comment 1 - RBOC members "urge that the board delay a revised total maximum daily load [TMDL] for copper that would impact the use of copper-based anti-fouling paints on boat hulls in Newport Bay until the following essential actions take place:" "until…A site specific study of Newport Bay has been conducted. This will provide detailed information that is accurate and can serve as the basis for informed scientific decisions."
Response 1 - A number of site specific studies and monitoring have been conducted in Newport Bay, and metals monitoring by the County of Orange is ongoing. 1) Regular Monitoring. The County of Orange conducts annual stormwater and Bay monitoring on copper (Cu) and other metals http://ocwatersheds.com/rainrecords/waterqualitydata

2) Lower Newport Bay Copper-Metals Marina Study. This study analyzed water and surface sediment samples for copper and other metals from a subset of marinas in the Bay. http://www.waterboards.ca.gov/santaana/water_issues/programs/tmdl/tmdl_metals.shtml
3) Metals Sediment Study in Lower Newport Bay (Post-dredging). This study analyzed surface sediment samples in post-dredged areas in the Lower Bay and in some marinas evaluated in the Lower Bay Copper-Metals Marina Study. Water and sediment samples were analyzed for metals. http://www.waterboards.ca.gov/santaana/water_issues/programs/tmdl/tmdl_metals.shtml

In addition, the Biotic Ligand Model (BLM) was run with site-specific data from the Bay (Lower Newport Bay Copper-Metals Marina Study) to derive Copper (Cu) BLM criteria. The Saltwater Cu BLM criteria are significantly related to the dissolved organic carbon (DOC) concentrations in saltwater. Note that the DOC concentrations varied seasonally in Newport Bay during the study. Since a Cu BLM criterion is generated for each sample, we were able to determine that when the DOC concentrations were below 1mg/L, the Cu BLM criteria were close to the CTR acute Cu criterion (4.8µg/L); when the DOC concentrations were below 0.5mg/L, the Cu BLM criteria were close to the CTR chronic Cu criterion (3.1µg/L). DOC data from Newport Bay, collected by the County of Orange, were also highly variable.

Comment 2 - "until…The USEPA approves the Biotic Ligand Model [BLM] for determining copper toxicity in salt water. This approval is forthcoming and would facilitate accurate site-specific information regarding Newport Bay."

Response 2 - The Saltwater Cu BLM has already been run with data from Newport Bay. When the DOC is below 0.5mg/L, the Cu BLM criterion is at or below the Cu CTR criterion of 3.1ug/L. (See Response 1.)

Comment 3 - "until…Alternatives to copper-based anti-fouling paints are available, affordable and effective. It is critical that recreational vessels have anti-fouling surfaces on their hulls for effective operation and prevention of invasive species."

Response 3 - Some alternatives to Cu antifouling paints are available, affordable and effective. The Port of San Diego conducted an alternative paint study, "Safer Alternatives to Copper Antifouling Paints", to determine whether alternative paints were available, viable and economical. They determined that there were a number of alternative paints that fit the criteria. https://www.portofsandiego.org/environment/environmental-downloads/cat_view/157-environment/285-alternative-hull-paint.html

In addition, the Port received a 319(h) grant from USEPA to reduce Cu paints in Shelter Island Harbor to meet requirements of the Shelter Island Cu TMDL. They initiated a Cu reduction program to financially assist boaters to convert boats from Cu to nontoxic paints, a diver certification program to ensure that divers used best management practices (BMPs) for hull cleaning, and developed a matrix to help boaters to determine what nontoxic or non-Cu paint to use on their particular boat. https://www.portofsandiego.org/environment/environmental-downloads/cat_view/157-environment/438-copper-reduction-program.html

Board staff acknowledge that the initial cost of converting from Cu to nontoxic paints may be more expensive than repainting with Cu paints. The higher initial cost is due to the necessity of the stripping of Cu paints and the spraying on, rather than rolling on, of nontoxic paints; however, most nontoxic paints last longer (5-7 years) than Cu paints (2-3 years). Because of this additional initial cost, Board staff worked with Orange County Coastkeeper to acquire a 319(h) grant to reduce Cu from boats in Newport Bay. This grant included a financial incentive program to assist boaters in converting from Cu to nontoxic paints. This grant was successful in that the City of Newport Beach passed a resolution encouraging boaters to use non-Cu paints in place of Cu paints, and a boater education program was established to educate boaters on Cu problems in Newport Bay and the availability of nontoxic paints.

Some boats were converted to nontoxic coatings.
Comment 4 - Based on statements made at the July 28 *(sic)* [July 23, 2015] scoping meeting held by the regional board, there is a significant absence of accurate information regarding Newport Bay, boats in the bay, and copper paint alternatives. The requested actions are essential to provide the information that will inform decisions that will protect the environment and preserve recreational boating.
Response 4 - Board staff agree that accurate information is essential in the development of a Cu TMDL for Newport Bay; however, we do not agree that "there is a significant absence of accurate information regarding Newport Bay, boats in the bay, and copper paint alternatives". 1) A number of site-specific studies and monitoring have been conducted in Newport Bay and monitoring by the County of Orange is ongoing. (See Response 1.) 2) Board staff have consulted with the City of Newport Beach regarding the number of slips/boats in Newport Bay. 3) Some alternative paints are available, viable and economical compared to Cu paints, and the Port of San Diego has been conducting a 319(h) study in which boats in Shelter Island are being converted from Cu to nontoxic paints. (See Response 3.) In addition, USEPA promulgated a Cu TMDL for Newport Bay in 2002, and this Cu TMDL is <u>still in place and must be implemented</u>. USEPA's Cu TMDL requires a 90% reduction in Cu loading from Cu paints on boat hulls, while the proposed revised Cu TMDL has a lower reduction requirement of 86%. If the revised Cu TMDL that Board staff are proposing is not adopted, then Board staff will be required to implement USEPA's Cu TMDL with the higher Cu reduction requirement.
Orange County Coastkeeper
Comment 1 - "The proposed timeline for compliance is too long. The project summary proposes a fifteen year timeline for compliance. This is unnecessarily long. The recently approved Marina Del Rey Copper TMDL has a ten year timeline, the Shelter Island Copper TMDL has a ten year timeline (after a five year voluntary compliance period) and ten years is long enough for Newport Bay. Copper paint is replaced at an interval of three years. A ten year time period means that there are three opportunities for the average boater to switch to alternative boat bottom paints. Even using a five year operational life for copper bottom paint means that every boat in Newport Bay will replace its bottom paint twice in a ten year time frame. The fact is that alternatives to copper boat bottom paint and the boatyard capacity to apply them exist now. The TMDL being developed should not have more than a ten year time frame."
Response 1 - The Los Angeles Regional Board recently adopted a Copper (Cu) TMDL for Marina del Rey (February 2014) that has a ten year timeline for the reduction of Cu. Like Newport Bay, the largest source of Cu to Marina del Rey is Cu AFPs on boat hulls, and implementation of the ten year timeline includes the conversion of a number of boats from Cu to nontoxic paints. The Cu TMDL for Marina del Rey assumes approximately 4,750 slips in the marina. The Cu TMDL for Newport Bay assumes 10,000 slips. Regional Board staff believe a fifteen year time period for the reduction of Cu in the Bay is appropriate due to the significantly larger number of slips.
Comment 2 - "The graphic in the TMDL project summary shows the compliance deadline for the TMDL will begin after the approval of the TMDL by the California Office of Administrative Law. This is unnecessary and adds delay to the implementation of the TMDL and confusion over the actual compliance deadlines. The TMDL being developed should include a specific start date, reporting deadlines and an end date as in the Marina Del Rey TMDL."
Response 2 - The date for the compliance deadline is actually fifteen years from the approval of the Basin Plan Amendment by USEPA. USEPA approval is required for the TMDL to become effective for regulatory purposes. Regional Board staff believe that it is appropriate to base the compliance deadline on the effective date of the TMDL.

Comment 3 - "It is important that the TMDL recognize that Upper Newport Bay is designated both as a State Marine Conservation Area and Ecological Reserve. These designations were created because of the critical ecological functions of the Upper Bay and its significance to the state and local community. It needs and deserves the highest level of protection from all forms of pollution. The TMDL being developed should specifically address this issue and the boats in the upper bay should be prioritized for copper reduction activities."
Response 3 - Regional Board staff are aware that Upper Newport Bay is designated as a State Marine Conservation Area, and that the upper part of the Upper Bay is an Ecological Reserve. Both Upper and Lower Newport Bay are high priority water bodies in the Santa Ana Region; however, we also note that the majority of the boats are located in the Lower Bay. Since the Bay is tidally influenced and since the largest source of Cu to the Bay is from Cu AFPs on boat hulls, it is likely that at least some of the Cu in the Upper Bay comes from boats in the Lower Bay. It is also likely that when boats in the Lower Bay (and lower Upper Bay) are converted from Cu to nontoxic paints, Cu should be reduced in the Upper Bay. The details of the locations and schedule of boat conversions are expected to be outlined in the implementation strategies proposed by the stakeholders for this Cu TMDL.
Comment 4 - "The Non TMDL Action Plan for zinc should be developed along with the Copper TMDL. Zinc is a component of many alternative boat bottom paints and it is likely that these paints will be used as an interim measure as more non-biocide boat bottom paints are developed. Zinc is already found at elevated levels in sediment and fish tissue in Newport Bay. The Non TMDL Action Plan for zinc should work with the Copper TMDL to insure zinc concentrations to not increase as a result of the use of alternative boat bottom paints."
Response 4 - Regional Board staff agree that other metals, such as zinc (Zn), should be addressed along with Cu. Note, however, that only dissolved Cu exceeds the CTR criteria in water, and Board staff are recommending the conversion of boats from Cu AFPs to <u>nontoxic paints</u> *not* paints containing Zn or other biocides. In addition, sediment Zn and mercury (Hg), along with Cu, exceed the sediment ERM (Effects Range Median) guidelines in parts of Lower Newport Bay; therefore, implementation strategies to reduce sediment Cu (such as dredging) should also reduce sediment Zn and Hg.
Comment 5 - "The TMDL should clearly show the use of the best available science for the development of compliance standards. While there is ample evidence of the impacts of copper to marine life, there remains confusion about the use of various methods to determine the appropriate compliance standard for Newport Bay. The TMDL development process should include a through and well documented discussion of the various alternatives available for the development of the TMDL compliance standard and why the resulting standard was used."
Response 5 - Regional Board staff agree that the best available science should be (and was) used in developing this Cu TMDL and implementation strategies. This is demonstrated in this Cu TMDL by Cu loading calculations based on data from a recent Cu hull paint loading study (Earley et al, 2013) and the use of the maximum allowable leach rate for Cu paints, set by the Department of Pesticide Regulation (DPR) in February 2014. The Metals Impairment Assessment documents the criteria used to assess the metals, including the saltwater CTR criteria for dissolved metals and the ERM sediment guidelines for sediment metals (outlined in the State Listing Policy). Fish tissue guidelines for human health were from OEHHA and USEPA, and fish tissue guidelines for wildlife were developed from the literature by Board staff and USFWS staff. The Metals Impairment Assessment will be released as part of Board staff's Metals TMDLs report. In addition, Board staff's report includes a through and well documented discussion of the science and reasoning behind this revised Cu TMDL and the proposed Non-TMDL Action Plans.

Attachment 1 - List of stakeholders who sent letters as part of the RBOC campaign. (August 2015)

Mark Rinkel	8/11, 8/14/15	Orangevalle, CA
Patti Mangan	8/11	San Francisco, CA
Eric Hardt	8/11	Redondo Beach, CA
Linda Bendsen	8/12	Suisun City, CA
Chuck Iverson	8/12	Newport Beach, CA
Andy Fuller	8/12	Laguna Hills, CA
J Erickson	8/12	Sausalito, CA
Maggie Sabovich	8/13	Crocket, CA
Jack Vetter	8/13	Sacramento, CA
Daniel Hodge	8/13	Newport Beach, CA
Anne Sacks	8/13	Venice, CA
Helen Zidek	8/13	Castro Valley, CA
Michael Coleman	8/13	Vacaville, CA
Robert Larson	8/13	San Francisco, CA
Russ Robinson	8/13	Cupertino, CA
Michael Fanfa	8/13	San Leandro, CA
Samantha Fordyce	8/13	Vallejo, CA
Bradford Weston	8/13	Vallejo, CA
Michael Williams	8/13	Vallejo, CA
George Louis	8/13	Petaluma, CA
Kate Aguilar	8/13	Concord, CA
Joseph DePietro	8/13	Davis, CA
Mike Dyslin	8/13	San Jose, CA
Ray Kaleda	8/13	Los Gatos, CA
Jerry Puglia	8/13	Vallejo, CA
Howard Redding	8/13	Vallejo, CA
Robbie Gabriel	8/13	Vallejo, CA
steve kraus	8/13	Ojai, CA
MARTHA DUKES	8/13	Hayward, CA
Jean Lund	8/13	Davis, CA
Kenneth Leslie	8/13	Vallejo, CA
Richard Engfer	8/14	San Jose, CA
Ken Dretzka	8/14	Dixon, CA
Jeff Ellis	8/14	Boonville, CA
Leo Feltz	8/14	Walnut Creek, CA
Robert Paulsen	8/14	Alameda, CA
Richard Rescho	8/14	San Carlos, CA
Robbie Gabriel	8/14	Vallejo, CA
Jennifer Hinkel	8/14	Sausalito, CA
Robert Edgley	8/14	Sonoma, CA
Diana Gentry	8/14	Walnut Grove, CA
Clifford Park	8/14	Walnut Grove, CA
JERRY MCDANIEL	8/14	Benicia, CA
Doug Hipsley	8/14	Walnut Creek, CA
GARY PHEATT	8/16	Vallejo, CA
ray mceneaney	8/17	Fairfield, CA
Dick Wrenn	8/18	Piedmont, CA
Roy Yates	8/18	Redwood City, CA
Kent Myers	8/19	San Leandro, CA

Patty Ware	8/19	San Leandro, CA
Denise Abero	8/20	San Leandro, CA
Melvin Abero	8/20	San Leandro, CA
GayleAnn Frank	8/20	Benicia, CA
Brad Gross	8/20	Dana Point, CA
Carolyn Glennon	8/20	San Leandro, CA
Steven Grogan	8/21	Alameda, CA
Lolan Ellis	8/21	Alameda, CA
PAUL ANDERSON	8/21	Los Altos, CA
James Catto	8/21	San Jose, CA
Jeff Olmstead	8/21	Sunnyvale, CA
Donna Beckett	8/22	Alameda, CA
Terri Mullen	8/22	Reno, CA
John Marshall	8/27	Aliso Viejo, CA
Larry Fortmuller	8/30	Newport Coast, CA

Attachment 2 - Letters received in April and May 2016

Robbie Gabriel	Vallejo, CA 94591	4/13 (2), 4/14, 4/15 (5)
Richard Rescho	San Carlos, CA 94070	4/13 (2), 4/14, 4/15 (5)
Melvin Abero	San Leandro, CA 94579	4/13 (2), 4/14, 4/15 (5)
Lisa Carrington	Playa del Rey, CA 90293	4/28
Gerald Rogers	Rocklin, CA 95677	5/03
Vanessa Fernandez	Chula Vista , CA 91915	5/19
Harlan Durgin	Coronado, CA 92118	5/22