

ATTACHMENT A TO RESOLUTION NO. R8-2018-0071

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)

Formatted: Underline

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
in Chapter 6. Total Maximum Daily Loads (TMDLs),
6.1 Newport Bay Watershed TMDLs

6.1 Copper: Copper (Cu) TMDLs for Newport Bay
6.1 Metals: Zinc (Zn), Mercury (Hg), Arsenic (As), Chromium (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 Copper TMDLs-1: Total Maximum Daily Loads (TMDLs) for Copper (Cu) for Upper and Lower Newport Bay. The Non-TMDL Action Plans for Zn, Hg, As and Cr are presented in Table 6.1 Zn, Hg, As, Cr Action Plans-1: Non-TMDL Action Plans (Action Plans) for Zinc (Zn), Mercury (Hg), Arsenic (As), Chromium (Cr) for Newport Bay. The documentation prepared to support the adoption of these TMDLs and Non-TMDL Action Plans, which includes the Staff Report, the Supplemental Staff Report, the Basin Plan Amendment and the Substitute Environmental Document, can be found at the Regional Board's website:http://www.waterboards.ca.gov/santaana/water_issues/programs/tmdl/tmdl_metals.shtml.

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

Problem Statement for Copper (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.*)). USEPA found that Cu and Zn exceeded California Toxics Rule (CTR) criteria and sediment metal concentrations exceeded Effects Range Low

Formatted: Underline

ATTACHMENT A TO RESOLUTION NO. R8-2018-0071

(ERL) sediment guidelines. Sediment toxicity was also found in sediment samples across the Upper and Lower Bay (Bight '98, '03). Cu and Zn concentrations above tissue guidelines 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. The concentrations of heavy metals in aquatic plants in Newport Bay have not been documented, although Allen et al (2008) tested metal concentrations in algae.

In 2006, the State Board assessed individual metals in Newport Bay and listed the Upper and Lower Bay for Cu on the 303(d) list of Impaired Waters. No other individual metals were listed based on the State Board assessment, although USEPA's 2002 TMDLs remain in place. The State Board assessment also demonstrated no metals impairment in San Diego Creek.

The Impairment Assessment conducted by Regional Board staff, based on data collected after 2002, showed that Upper and Lower Newport Bay are still impaired for dissolved Cu in water based on exceedances of the CTR criterion (3.1µg/L); and sediment Cu, Zn and Hg exceeded the ERM (Effects Range Median) guidelines of 270µg/g, 410µg/g and 220ng/g, respectively for Cu, Zn and Hg, in the Lower Bay (Staff Report, August 2016). In addition, sediment toxicity was present in areas where the ERMs were exceeded.

The Cu TMDLs address the Cu impairment in water and exceedances in sediments, and revise and replace the Cu TMDLs promulgated by USEPA (2002). Exceedances of sediment and tissue guidelines 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 replaces the Zn TMDLs promulgated by USEPA.

Impairment Assessment Results (Staff Report, August 2016)

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); therefore, Cu TMDLs continue to be required.

Sediments. Sediment Cu exceeded the Cu ERM (Effects Range Median) sediment guideline in surface sediments in the Lower Bay, particularly in marinas and the Turning Basin/South Lido Channel areas. Sediment toxicity was also found in the Upper and Lower Bay in multiple studies but was not paired with Cu chemistry data. Further monitoring of sediments is warranted due to exceedances of the sediment Cu ERM and the presence of toxicity in the same areas (Cu-Metals Marina Study, Coastkeeper and Candelaria 2007) since both ERM exceedances and toxicity in paired samples are required to determine impairment under the State Board's 303(d) Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List (SLP)). (Note that most sampling sites (except the County's LNBHIR) were in marinas and areas of the Lower Bay that were not dredged in 2012.) A post-dredge study in the Lower Bay showed that sediment Cu exceeded the ERL guideline at ALL sites and for ALL sampling periods (October, March, August) in both post-dredge sites and marina/Turning Basin sites (Metals Sediment Study in Lower Newport Bay, Coastkeeper and Candelaria 2014). In addition, only a subset of marinas was sampled in the Cu-Metals Marina Study, and a more extensive marina survey is needed to fully assess sediment quality and sediment Cu concentrations in marina and boatyard areas in Newport Bay.

Fish and/or mussel tissue. Cu did not exceed fish or mussel tissue guidelines for either human health or wildlife.

ATTACHMENT A TO RESOLUTION NO. R8-2018-0071

Numeric Targets for Copper (Cu)

Numeric targets have been identified below for Cu in water and sediment. The numeric targets include 1) the California Toxics rule (CTR) saltwater criteria for dissolved copper (Cu) in water, and 2) sediment targets based on the narrative sediment quality objectives (SQOs) specified in the State's Water Quality Control Plan for Enclosed Bays and Estuaries – Part 1 Sediment Quality (EBE Plan-Part 1). Sediment chemistry, toxicity and benthic monitoring and evaluation are required to determine compliance with the sediment quality objectives (SQOs).

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

Metal	Water		Sediment
	CTR saltwater criteria ¹ (µg/L)		
	acute	chronic	
Cu	4.8	3.1	SQOs

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

²Sediment quality objectives are specified in the State's Water Quality Control Plan for Enclosed Bays and Estuaries – Part 1 Sediment Quality, SWRCB 2009 (EBE Plan-Part1)

In addition, sediment Cu must be evaluated against the ERM/ERL guidelines for trend and antidegradation analyses.

Sediment Guidelines for Copper (Cu)

Metal	Sediment guidelines (ERMs, ERLs)*	
	ERM (µg/g)	ERL ((µg/g)
Cu	270	34

*ERM = Effects Range Median, ERLs =Effects Range Low (NOAA SQiRTS 1999)

Source Analysis for Copper (Cu)

Known sources of Cu include: 1) Cu antifouling paints (AFPs) on boat hulls and boatyard operations, 2) urban runoff from major tributaries, and 3) urban runoff from storm drains that empty directly into Newport Bay. Potential sources include Bay sediments, and air deposition. Cu antifouling paints (AFPs) are the largest sources of Cu to the Bay, and are six (6) times higher than the second largest source which is runoff from the major tributaries. Cu loads in storm drain runoff are 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.

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

ATTACHMENT A TO RESOLUTION NO. R8-2018-0071

<u>Summary of Copper (Cu) Loads to Newport Bay*</u>			
	<u>Dissolved Cu (lbs/yr) Proposed Cu TMDLs</u>	<u>Percent (%) of Total Proposed Cu TMDLs</u>	<u>Cu (lbs/yr) (USEPA's Toxics TMDLs)</u>
Boats ¹	<i>18,000^{1a}</i>	81.1	50,114
Tributary runoff ²	<i>3005 (548)</i>	13.5	7020
Storm drain runoff ³	303	1.4	ND
Air deposition ⁴	101	0.46	101
Ambient seawater ⁵	777	3.5	777
Bay Sediments ⁶	Unknown	-	Unknown
Total	22,186	100%	58,002⁷

* This table includes data from Table E-11 in the Toxics TMDLs, Part E (USEPA 2002). Numbers in italics are different from those estimated by USEPA (Toxics TMDLs, 2002). ND = no data

¹Estimates of dissolved Cu load from boats from passive leaching and hull cleaning (Supplemental Staff Report, May 2018 (revised Cu TMDLs) & USEPA Toxics TMDLs 2002).

^{1a}Cu load estimate for boats is based on 5,000 boats/slips.

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

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

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

⁵Estimate of dissolved Cu loads from ocean based on local data (R. Gossett) x approximate ocean volume into Newport Bay (USEPA 2002).

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

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

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

Loading Capacity and Linkage Analysis for Copper (Cu)

Formatted: Underline

In the 2002 Newport Bay Toxics TMDLs, USEPA set forth both concentration and mass loading approaches to define the metal loading capacity and the total maximum daily loads (TMDLs) for Cu, Zn, Pb and Cd. 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.

Formatted: Underline

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

The total allowable dissolved Cu by mass was calculated by multiplying the saltwater numeric

ATTACHMENT A TO RESOLUTION NO. R8-2018-0071

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

$$\begin{aligned} \text{Total allowable Dissolved Cu by mass} &= \text{Bay volume} \times \text{Criteria } (C_c) \\ &= 19,000,000 \text{ m}^3 (1000 \text{ L/m}^3) \times 3.1 \mu\text{g/L } (g/1000 \mu\text{g}) \\ &= 58,900,000 \text{ g} \times \text{lb}/453.6\text{g} \\ &= 129,850.09 \text{ lbs} \end{aligned}$$

$$\begin{aligned} \text{Dissolved Cu Mass Loading Capacity} &= \text{Mass}_{\text{out}} - \text{Mass}_{\text{in}} \\ &= (\text{Criteria} \times \text{Volume}_{\text{out}}) - \text{Mass}_{\text{in}} \\ L_f + L_b &= C_c \times (Q_b + 1.25 A v_s F_p) - Q_o C_o \\ &= (3.1 \mu\text{g/L} \times (g/1000 \mu\text{g})) \times (4,980,399.79 \text{ m}^3/\text{d} \times (1,000 \text{ L/m}^3)) \\ &\quad - (4,830,917.9 \text{ m}^3/\text{d} \times (1,000 \text{ L/m}^3) \times 0.0002 \text{ mg/L} \times (1,000 \text{ mg/g})) \\ &= 14,473.056 \text{ g/d} \times (\text{lb}/453.6\text{g}) \times (365 \text{ d/yr}) \\ &= 11,646.09 \text{ lbs/yr} \end{aligned}$$

Where :

- L_f = Dissolved Cu in Freshwater Inflow (lbs/yr)
- L_b = Dissolved Cu Load from Boats (lbs/yr)
- C_c = Chronic CTR Saltwater Criteria for Dissolved Cu = 3.1 $\mu\text{g/L}$
- Q_b = Volume Mixed Water Leaving the Bay = 4870039.8 m^3/day
- A = Newport Bay Surface Area = 5518000 m^2
- v_s = Net Settling [as a velocity] = 0.08000 m/day = 0.00093 mm/s
- F_p = Particulate Fraction - Estimated = 0.20000 (20% of total metal)
- Q_o = Volume Ocean Water Entering the Bay = 4,830,917.9 m^3/day
- C_o = Dissolved Cu in the Ocean = 0.00020 mg/L

Mass based loading capacity for Dissolved Copper (Cu) in Newport Bay

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

Formatted: Underline

Formatted: Underline

Formatted: Underline

Concentration based loading capacity* for Dissolved Copper (Cu) in Newport Bay

Metal	Saltwater acute loading capacity ($\mu\text{g/L}$)	Saltwater chronic loading capacity ($\mu\text{g/L}$)
Cu	4.8	3.1

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

*These numbers are equivalent to the saltwater CTR criteria for dissolved Cu and were used in USEPA's Toxics TMDLs (2002).

TMDLs, Waste Load and Load Allocations, and Margin of Safety for Copper (Cu)

Formatted: Underline

In USEPA's Toxics TMDLs, mass based loads for dissolved metals were based on data prior to

Formatted: Underline

ATTACHMENT A TO RESOLUTION NO. R8-2018-0071

2002. The total loading capacities were calculated by the bathtub model. A margin of safety (MOS) 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 these Cu TMDLs, Cu load estimates for Newport Bay are based on data obtained since 2002. The total loading capacity for dissolved Cu was calculated by the bathtub model as 11,646 pounds per year, which is the same total loading capacity used by USEPA in the Toxics TMDLs (see Loading Capacity Section above). The margin of safety of 10 percent (%) (revised from USEPA's 20%) 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 USEPA's Toxics TMDLs were used (Tables E-10 and E-11 Toxics TMDLs, USEPA 2002).

For freshwater discharges into the Bay, the mean Cu discharge from both San Diego Creek and the Santa Ana Delhi Channel was calculated to be approximately 3005 pounds of dissolved Cu per year for wet years (2009-10, 2010-11 County of Orange monitoring data). (Cu loads from tributaries during wet years were used in this TMDL to be conservative, 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 discharges in 2007, 2008; Storm Drain Metals Study, Coastkeeper & Candelaria 2010).

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.

The dissolved Cu allocations were calculated as follows:

$$\begin{array}{r} \text{Dissolved Cu Mass Loading Capacity - MOS} = \\ \text{[Tributary+Storm drain allocations (WLAs+LAs) + (boats/other(LAs)) (lbs Cu/yr)} \\ \hline 11,646 - 1,165 = 3,176 + 7,305 \text{ (lbs Cu/year)} \end{array}$$

The Dissolved Cu Mass Loading Capacity minus the MOS 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.

The mass and concentration-based allocations specified in the tables below apply to the receiving waters of Newport Bay at all times of the year, regardless of the volume of freshwater flow from all tributaries, including San Diego Creek, Santa Ana Delhi, Costa Mesa Channel and other tributaries to Newport Bay.

ATTACHMENT A TO RESOLUTION NO. R8-2018-0071

<u>Mass based Allocations for Copper (Cu) in Newport Bay</u>		
<u>Category</u>	<u>Type</u>	<u>Dissolved Copper</u>
<u>Tributary and Storm drain WLAs</u>	MS4 permittees	2,501
	CalTrans	348
	Other NPDES Permittees (IGP, Construction)	156
<u>Tributary and Storm drain LAs</u>	Agricultural runoff	171 [#]
	Open space runoff	(part of MS4 WLA)
	<u>Sub-total</u>	<u>3,176* lbs/yr</u>
<u>Boatyards WLAs</u>	Boatyards	^
<u>Boats and other LAs</u>	Boats w/Cu paints*	7224
	Air deposition	81 [#]
	<u>Sub-total</u>	<u>7,305 lbs/yr</u>
<u>Margin of Safety (MOS) 10%</u>		<u>1,165 lbs/yr</u>
<u>Total TMDL</u>		<u>11,646 lbs/yr</u>

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

*Cu load from tributary (3,005 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.

[#]Boatyards were previously covered under a separate NPDES permit in Newport Bay; they are now covered under the Industrial General Permit (IGP) for stormwater and included in the allocation for this permit. The mass-based allocation for the "Other NPDES" category did not change since no volume data are available for stormwater runoff for boatyard facilities; therefore, a mass load for Cu from boatyards cannot be determined. (Note that the IGP requires monitoring of pollutant concentrations in stormwater runoff, but not monitoring of flow; therefore, Cu loads from boatyards cannot be determined and will be covered under the IGP.)

[#]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).

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

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

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

ATTACHMENT A TO RESOLUTION NO. R8-2018-0071

Implementation Plan for Copper (Cu)
<u>Compliance with the Copper (Cu) TMDLs shall be determined through water, sediment and fish tissue monitoring.</u>
<u>1) Copper (Cu) in Bay waters - Cu discharges from boats, tributary and stormwater runoff</u> <u>Compliance with the numeric target for dissolved Cu will be considered to be achieved if the dissolved Cu CTR criterion of 3.1 µg/L is consistently achieved, pursuant to the assessment methodology specified in the State Board's 303(d) Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List (SLP), and no further reduction in Cu discharges will be required even if the Cu allocation for boats, required in the Cu TMDLs, is not achieved. If, however, the Cu allocation for boats is met, but the CTR criterion is not consistently met, further reduction in Cu discharges will be required.</u>
<u>The highest priority for these Cu TMDLs is to reduce Cu discharges from Cu antifouling paints (AFPs) on boats since Cu AFPs on boats are the largest source of Cu to Newport Bay. These Cu TMDLs cannot be met unless Cu discharges from boats are reduced or eliminated.</u>
<u>2) Copper (Cu) in sediments</u> <u>The sediment task in this Implementation Plan requires the monitoring and evaluation of Lower Bay sediments including marinas and the Turning Basin/South Lido Channel areas, and areas with no or limited SQO or sediment Cu data.</u>
<u>The second priority of these Cu TMDLs is to monitor and evaluate sediments for compliance with the sediment targets – sediment quality objectives (SQOs) consistent with the EBE Plan-Part 1 (through the sediment triad/multiple lines of evidence approach), in areas of the Lower Bay that previously exceeded the Cu ERM sediment guideline, and in areas with no or limited SQO or sediment Cu data (in particular marinas). Evaluations of compliance with the numeric targets shall be conducted and reported along with the data. Investigation is required where these numeric targets are not being achieved. Corrective action may be required.</u>
<u>In addition, sediment Cu data must be evaluated against the ERM and ERL guidelines for trend analysis and antidegradation purposes.</u>
<u>3) Copper (Cu) discharges from tributary and storm drain runoff</u> <u>The third priority is to meet the Cu allocations for tributary and storm drain runoff.</u> <u>This task includes the continued monitoring and evaluation of Cu (and other metals) in tributary and storm drain runoff.</u>
<u>4) Effects of copper (Cu) discharges from large storm drains</u> <u>The fourth priority is to evaluate the local impacts of storm drain runoff from larger storm drains. This task includes the monitoring and evaluation of Cu in larger storm drain discharges (Task 3), and in Bay receiving waters and Bay sediments below storm drain outlets.</u>
<u>These Cu TMDLs include compliance schedules that allow time to implement and adaptively manage the tasks to ensure effectiveness, efficiency and fairness. It is proposed that final</u>

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

ATTACHMENT A TO RESOLUTION NO. R8-2018-0071

compliance with the TMDLs be achieved as soon as possible but no later than 12 years from the date of approval of the TMDLs by USEPA.

The compliance schedule approach also recognizes that responsible parties may elect to pursue investigation(s) and adoption of site-specific objectives for Cu in Newport Bay that may supersede the CTR criteria for dissolved Cu, and thereby necessitate reconsideration of the numeric targets identified for these TMDLs.

Implementation tasks and schedules are summarized below, along with the parties responsible for TMDL implementation in Newport Bay (listed by task).

The Regional Board intends to implement these requirements through appropriate orders issued to the dischargers/responsible parties, e.g., waste discharge requirements, conditional waiver(s) of waste discharge requirements, Water Code Section 13267 investigative orders and, where necessary, cleanup and abatement or other enforcement orders. The dischargers/responsible parties are encouraged to coordinate their efforts to implement these TMDLs to optimize efficacy and the use of resources.

Implementation Plan and Schedule for Copper (Cu) TMDLs

<u>Implementation Task</u>	<u>Schedule and Dischargers/Responsible Parties</u>
<p><u>1) Reduce Copper (Cu) loads from Cu antifouling paints (Cu AFPs) on recreational and commercial boats</u></p>	<p><u>As soon as possible but no later than (12 years from date of USEPA approval of the Basin Plan amendment (BPA)), with the following interim schedule:</u></p> <p><u>No later than (4 years from the date of USEPA approval of the BPA): A minimum 20% reduction of Cu discharges from AFPs shall be achieved</u></p> <p><u>No later than (8 years from the date of USEPA approval of the BPA): A minimum 40% reduction of Cu discharges from AFPs shall be achieved</u></p> <p><u>No later than (12 years from the date of USEPA approval of the BPA): A minimum 60% reduction of Cu discharges from AFPs shall be achieved</u></p> <p><u>Consistent compliance with the CTR chronic criterion* for dissolved Cu is the goal of these Cu TMDLs. Compliance with the Cu TMDLs will be considered to be achieved if the dissolved Cu CTR criterion of 3.1 µg/L is consistently achieved, (i.e. no impairment is demonstrated per the assessment methodology in the State Listing Policy (SLP)) and no further reduction in Cu discharges will be required, even if the Cu load allocation for boats is not yet achieved. If, however, the Cu allocation for boats is achieved, but the CTR</u></p>

Formatted: Underline

Formatted: Underline

Formatted: Underline

ATTACHMENT A TO RESOLUTION NO. R8-2018-0071

	<p><u>critterion is not consistently achieved, further reduction in Cu discharges from Cu antifouling paints (AFPs) will be required.</u></p> <p><u>The percent reductions and schedule for those reductions identified above shall become moot upon the demonstration that consistent compliance has been achieved. *(or a chronic CTR criterion adjusted by a Water Effects Ratio)</u></p>
<p><u>1.1 Implementation Plan and Schedule to reduce Cu discharges from Cu AFPs</u></p> <p><u>1.1.1 The dischargers shall submit their own proposed 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.</u></p> <p><u>The proposed implementation plan(s) and schedule(s) shall include monitoring and evaluation of Cu in marinas, channels and open water sites in the Bay ; identify actions to be taken to reduce Cu from boats; and determine the Cu load reduction from boats.</u></p> <p><u>The proposed plan shall include monitoring and evaluation of dissolved and total Cu in water for compliance with the Cu CTR criterion, and water quality parameters (DOC, pH, salinity, temperature, TSS); and the evaluation of sediments for compliance with the SQOs (consistent with the EBE Plan-Part 1) and assessment of sediment Cu data against the Cu ERM and ERL guidelines.</u></p> <p><u>1.1.2 The dischargers shall implement their plan(s) and schedule(s), and submit an annual report that includes the data and assessment of that data with respect to compliance with the Cu CTR criterion (and sediment guidelines); identifies actions taken and the effectiveness of those actions; and evaluates progress towards meeting the CTR criterion, the TMDL allocation- for Cu discharges from boats and the percent reduction requirements identified in 1) above.</u></p>	<p><u>Dischargers/Responsible Parties</u> <u>City of Newport Beach (City)</u> <u>County of Orange (County)</u> <u>Marina owners/operators</u> <u>Individual boat owners</u> <u>Underwater hull cleaners</u> <u>Boatyard owners/operators</u></p> <p><u>1.1.1 As soon as possible but no later than (3 months from date of USEPA approval of the BPA)</u></p> <p><u>1.1.2 Upon Regional Board approval of the dischargers' implementation plan (or upon Executive Officer approval of the plan if no significant public comments are received). The report shall be submitted one year from date of Regional Board or EO approval of the implementation plan, and annually thereafter. The EO is authorized to adjust the annual report submittal schedules based on the demonstration that such adjustment is justified.</u></p>
<p><u>1.2 Recommended Implementation Tasks to reduce Cu discharges from Cu AFPs</u></p> <p><u>The implementation plan(s) and schedule(s) (not to exceed 12 years) proposed by the dischargers shall consider the recommended tasks listed below, and provide justification for tasks that are not included in their plans.</u></p>	

Formatted: Underline

Formatted: Underline

Formatted: Underline

ATTACHMENT A TO RESOLUTION NO. R8-2018-0071

1.2.1 Convert from Cu AFPs to nontoxic AFPs or Cu AFPs with lower leach rates (leach rates at or below DPR's maximum allowable leach rate of 9.5 µg/cm²/d). (The conversion of Cu AFPs to non-Cu AFPs (other biocides) may be considered only if no significant adverse environmental impacts associated with their use is demonstrated).

The implementation plan(s) shall consider strategies to:

1) Convert from Cu AFPs to alternative AFPs/coatings on recreational and commercial boats moored in the Bay permanently or intermittently for more than 30 consecutive days. The order of preference for alternative AFPs/coatings is

1.1) nontoxic AFPs/coatings,

1.2) Cu AFPs with leach rates at or below 9.5 µg/cm²/d,

1.3) Non-Cu AFPs (other biocides) may be considered only if no significant adverse environmental impacts associated with their use is demonstrated.

2) Require new boats to use nontoxic AFPs/coatings or Cu AFPs with leach rates at or below DPR's maximum allowable leach rate of 9.5 µg/cm²/d. (Non-Cu AFPs (other biocides) may be considered only if no significant adverse environmental impacts associated with their use is demonstrated.)

3) Determine the current usage of Cu AFPs and Cu discharges to the Bay from Cu AFPs.

4) The implementation plan(s) shall consider 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 Require all underwater hull cleaners to use BMPs, and develop a diver certification program

The implementation plan(s) shall consider strategies to:

1) Require all underwater hull cleaners to use BMPs, such as soft cloth and/or container/filter methods; and

2) Develop and implement a diver certification, permit or licensing program, including education, training and enforcement.

3) Additional BMPs developed by responsible parties to reduce hull cleaning discharges, including use of a containment/filter method during cleaning and dry dock cleaning and storage.

ATTACHMENT A TO RESOLUTION NO. R8-2018-0071

<p><u>1.2.3 Continue Education Program(s) for Boaters, Boatyards and Marinas</u></p> <p><i>The implementation plan(s) shall consider strategies to develop and/or continue education programs for boaters, and boatyard and marina owner/operators, that include the following:</i></p> <p><i>1) Cu water quality issues, impairment due to Cu and TMDL requirements;</i></p> <p><i>2) Conversion from Cu to nontoxic AFPs or lower leach rate Cu AFPs including costs, availability and efficacy of nontoxic and alternative AFPs/coatings; costs for conversion from Cu to alternative AFPs; application and maintenance costs; and hull cleaning costs;</i></p> <p><i>3) Conversion to non-Cu AFPs (other biocides) only if no significant adverse environmental impacts associated with their use is demonstrated, and use requirements including recommended BMPs for hull cleaning and frequency of cleaning;</i></p> <p><i>4) BMP requirements for all underwater hull cleaners, including the use of soft cloths or container/filter methods, and BMP requirements for boatyards;</i></p> <p><i>5) Alternative boat storage options, such as dry dock storage and/or slip liners; and</i></p> <p><i>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).</i></p>	
<p><u>2) Continue to monitor and evaluate sediments for compliance with the sediment targets (SQOs) in Lower Newport Bay, including marinas and the Turning Basin/South Lido Channel areas, and areas with no or limited SQO or sediment Cu data (in particular marinas). Evaluate sediment Cu data against the ERM and ERL guidelines for trend and antidegradation analyses. Conduct stressor identification studies in accordance with the EBE Plan-Part 1.</u></p>	
<p><u>2.1 Implementation Plan and Schedule - monitor and evaluate sediments* for compliance with the sediment targets (SQOs – consistent with the EBE Plan-Part 1), and evaluate sediment Cu data against the ERM and ERL guidelines for trend and antidegradation analyses.</u></p>	<p><i>Dischargers/Responsible Parties</i></p> <p><i>City of Newport Beach (City)</i></p> <p><i>County of Orange (County)</i></p> <p><i>Marina owners/operators</i></p> <p><i>Individual boat owners</i></p> <p><i>Underwater hull cleaners</i></p> <p><i>Boatyard owners/operators</i></p>

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

ATTACHMENT A TO RESOLUTION NO. R8-2018-0071

<p><u>*Sediments must be evaluated in Lower Newport Bay and lower Upper Newport Bay in areas that previously exceeded the Cu ERM sediment guideline, and in areas with no or limited SQO or sediment Cu data (in particular marinas).</u></p> <p><u>2.1.1 The dischargers shall submit proposed implementation plan(s) and schedule(s) to monitor and evaluate sediments for compliance with the sediment targets (SQOs - consistent with the EBE Plan-Part 1), in areas that previously exceeded the Cu ERM sediment guideline, including marina sites and the Turning Basin/ South Lido Channel areas, and in areas with no or limited SQO or sediment Cu data (in particular marinas). Evaluate sediment Cu data against the ERM and ERL guidelines for trend and antidegradation analyses.</u></p> <p><u>2.1.2 The dischargers shall implement their plan(s) and schedule(s), and submit an annual report that includes the data and assessment of that data with respect to compliance with the sediment targets. This annual report may be combined with the report required in 1.1.2. above.</u></p> <p><u>2.1.3 If sediments are found to be impacted (based on the SQO assessment), the dischargers shall develop and submit a plan(s) and schedule(s) to conduct stressor identification studies in accordance with the EBE Plan-Part 1. The proposed plan(s) and schedule(s) shall include a recommended reporting program and schedule.</u></p> <p><u>2.1.4 The dischargers shall implement their plan(s) and schedule(s), and submit a report that includes the data and assessment of that data with respect to compliance with the sediment targets</u></p>	<p><u>2.1.1 As soon as possible but no later than (3 months from date of USEPA approval of the BPA)</u></p> <p><u>2.1.2 Upon Regional Board approval of the dischargers' implementation plan (or upon Executive Officer approval of the plan if no significant public comments are received). The report shall be submitted one year from date of Regional Board or EO approval of the implementation plan, and annually thereafter. The EO is authorized to adjust annual report submittal schedules based on the demonstration that such adjustment is justified.</u></p> <p><u>2.1.3 As soon as possible but no later than 3 months from the finding that sediments are impacted, as determined by the Executive Officer</u></p> <p><u>2.1.4 Upon Executive Officer approval of the plan(s) and schedule(s)</u></p>
<p><u>3) Meet Copper (Cu) allocations for tributary and storm drain runoff - continue to monitor and evaluate Cu concentrations in runoff</u></p>	
<p><u>3.1 The Regional Board will revise existing WDRs and NPDES permits</u></p> <p><u>Existing permits, including the MS4 storm water permit, will be revised as necessary to implement the Cu TMDL requirements.</u></p> <p><u>New permits will implement applicable Cu TMDL requirements.</u></p>	<p><u>Existing permits : Upon permit renewal (or earlier, if dictated by circumstances that require revisions to an existing permit) after (date of USEPA approval of the BPA)</u></p> <p><u>New permits: as new permits are established</u></p>
<p><u>3.2 Monitoring by dischargers</u></p> <p><u>3.2.1 The dischargers shall submit proposed implementation plan(s) and schedule(s) to monitor Cu and determine the Cu loads from tributary and</u></p>	<p><u>Dischargers/Responsible Parties</u> <u>County of Orange (County)</u> <u>City of Newport Beach (City)</u> <u>Other MS4 permittees</u> <u>CalTrans</u></p>

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

ATTACHMENT A TO RESOLUTION NO. R8-2018-0071

<p><u>storm drain runoff to ensure that the Cu wasteload and load allocations (WLAs, LAs) continue to be achieved.</u></p> <p><u>The proposed plan shall include monitoring and evaluation of dissolved and total Cu in water (compliance with the Cu CTR criterion), and water quality parameters (DOC, pH, salinity, temperature, TSS). This plan shall also include the determination of the Cu loads in tributary and storm drain runoff. (Existing monitoring for MS4 systems may be utilized for this task.)</u></p>	<p><u>Agricultural dischargers</u> <u>Other NPDES permittees</u></p> <p><u>3.2.1 As soon as possible but no later than (3 months from date of USEPA approval of the BPA)</u></p> <p><u>3.2.2 Upon Regional Board approval of the dischargers' implementation plan (or upon Executive Officer approval of the plan if no significant public comments are received). The report shall be submitted one year from date of Regional Board or EO approval of the implementation plan, and annually thereafter.</u></p>
<p><u>3.2.2 The dischargers shall implement their plan(s) and schedule(s), and submit an annual report that includes the data and an assessment of that data, with respect to achieving the TMDL allocations. (Existing monitoring and reporting for MS4 systems may be utilized for this task.)</u></p>	<p><u>The EO is authorized to adjust annual report submittal schedules based on the demonstration that such adjustment is justified.</u></p>
<p><u>3.2.3 If the Cu loads exceed the TMDL allocations for urban and/or agricultural runoff, the dischargers shall develop and submit proposed plan(s) and schedule(s) to achieve the TMDL allocation for Cu discharges from tributary runoff. The proposed plan(s) and schedule(s) shall include a recommended reporting program.</u></p> <p><u>3.2.4 The dischargers shall implement their plan(s) and schedule(s), and submit a report that identifies the actions taken and the effectiveness of those actions, and evaluate progress towards meeting the TMDL allocation for Cu discharges from tributary runoff.</u></p>	<p><u>3.2.3 As soon as possible but no later than 3 months from the finding that the that WLAs or LAs have not been achieved, as determined by the Executive Officer</u></p> <p><u>3.2.4 Upon Executive Officer approval of the remediation plan</u></p>
<p><u>4) Evaluate local impacts of Copper (Cu) discharges from larger storm drains</u></p>	
<p><u>4.1 The dischargers shall submit proposed implementation plan(s) and schedule(s) to evaluate the local impacts of Cu discharges from the larger storm drains (48 to 78 inches in diameter) in the Upper and Lower Bay.</u></p> <p><u>The proposed plan shall include monitoring and evaluation of dissolved and total Cu in larger storm drain discharges (Task 3), and in-Bay receiving waters near storm drains, and include water quality parameters (DOC, pH, salinity, temperature, TSS). The proposed plan shall include monitoring and evaluation of in-Bay sediments near storm drain outlets for compliance with the sediment targets (SQOs - consistent with the EBE Plan-Part 1), and assessment of sediment Cu data against the ERM and ERL guidelines for trend analysis and</u></p>	<p><u>Dischargers/Responsible Parties</u> <u>County of Orange (County)</u> <u>City of Newport Beach (City)</u> <u>Other MS4 permittees</u> <u>CalTrans</u> <u>Agricultural dischargers</u> <u>Other NPDES permittees</u></p> <p><u>4.1 As soon as possible but no later than (3 months from date of USEPA approval of the BPA)</u></p> <p><u>4.2 Upon Regional Board approval of the dischargers' implementation plan (or upon Executive Officer approval of the plan if no significant public comments are received).</u></p>

Formatted: Font: Arial, Not Bold, Underline

Formatted: Underline

Formatted: Font: (Default) Arial, Underline

Formatted: Font: Not Bold, Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

ATTACHMENT A TO RESOLUTION NO. R8-2018-0071

<p><u>antidegradation purposes.</u></p> <p><u>(The six larger storm drains in the Bay include El Paseo, Carnation, Polaris, PCH West, Arches West and Arches East)</u></p> <p><u>The plan shall include a recommended reporting program.</u></p> <p><u>4.2 The dischargers shall implement their plan(s) and schedule(s) to determine the significance of localized Cu discharges from larger storm drain discharges, and submit a report that evaluates progress towards meeting the TMDL allocation for Cu discharges from tributary runoff.</u></p> <p><u>4.3 If impairment is found in the water column (based on exceedances of the CTR criterion consistent with the assessment methodology in the State Listing Policy), the dischargers shall develop and submit a plan(s) and schedule(s) to reduce Cu discharges from storm drains to impacted areas, and correct the impairment. The proposed plan(s) and schedule(s) shall include a recommended reporting program.</u></p> <p><u>If sediments are found to be impacted (based on the SQO assessment), then the dischargers shall implement a plan(s) and schedule(s) to conduct stressor identification studies in accordance with the EBE Plan-Part 1. The proposed plan(s) and schedule(s) shall include a recommended reporting program.</u></p> <p><u>4.4 The dischargers shall implement their plan(s) and schedule(s) to correct impairment in the water column resulting from Cu discharges from storm drains in the Upper and Lower Bay. The reports submitted shall identify actions taken and the effectiveness of those actions, and evaluate progress towards meeting the Cu CTR criterion and the concentration-based TMDL allocation for Cu discharges from storm drain runoff, and/or numeric targets for sediments.</u></p>	<p><u>4.3 As soon as possible but no later than 3 months from the finding of impairment in the water column, or the finding that sediments are impacted, as determined by the Executive Officer</u></p> <p><u>4.4 Upon Executive Officer approval of the plan(s) and schedule(s)</u></p>
<p><u>5) Conduct Special Studies</u> <u>If the implementation of the strategies above does not achieve consistent compliance with the Cu CTR criterion, additional special studies may be required to identify and/or quantify additional Cu sources. These studies may include the following or additional studies that the dischargers develop and implement.</u></p>	<p><u>Special studies shall be implemented by the dischargers in accordance with direction from the Regional Board Executive Officer per Water Code Section 13267.</u></p> <p><u>Dischargers/Responsible Parties</u> <u>County of Orange and other MS4 permittees</u> <u>City of Newport Beach</u></p>

- Formatted: Underline
- Formatted: Underline
- Formatted: Underline

ATTACHMENT A TO RESOLUTION NO. R8-2018-0071

<p><u>5.1 Determine the Cu load from In-Bay Sediments</u></p> <p><u>5.2 Determine the Cu load from Algae & Other Vegetation</u></p> <p><u>5.3 Additional studies proposed by the dischargers</u></p>	<p><u>CalTrans</u> <u>Agricultural dischargers</u> <u>Other NPDES permittees</u></p>
<p><u>6) Submit Updated TMDL Report, and Reevaluate and Revise the TMDL</u></p>	<p><u>Within six months of the completion of implementation Tasks 1 through 5 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.</u></p> <p><u>The Regional Board will reevaluate these TMDLs 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 TMDLs report.</u></p>

Formatted: Underline
Formatted: Underline

Formatted: Underline

Formatted: Underline

References for Copper (Cu) TMDLs

Allen, M. J. A. Z. Mason, R. Gossett, D. W. Diehl, V. Raco-Rands and D. Schlenk. 2008. "Assessment of the Food Web Transfer of Organochlorine Compounds and Trace Metals in Fishes in Newport Bay, California.", Southern California Coastal Water Research Project, 3535 Harbor Blvd., Ste. 110, Costa Mesa, CA 92626.

County of Orange monitoring data for San Diego Creek and Santa Ana Delhi (2009-10 and 2010-11, OCPFRD).

NOAA SQuiRTS 1999

Orange County Coastkeeper and L.M. Candelaria. March 2014. Metals Sediment Study in Lower Newport Bay (Post-dredging) Final Report. Report for Santa Ana Regional Water Board.

Orange County Coastkeeper and L.M. Candelaria. January 2010. Newport Bay Stormdrain Metals study. Report for Santa Ana Regional Water Board.

Orange County Coastkeeper and L.M.Candelaria. July 2007. Lower Newport Bay Copper-Metals Marina Study. Report for Santa Ana Regional Water Board.

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.

Supplemental 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, 2018.

Formatted: Underline
Formatted: Underline

ATTACHMENT A TO RESOLUTION NO. R8-2018-0071

State Water Resources Control Board (SWRCB). 2009. Water Quality Control Plan for Enclosed Bays and Estuaries – Part 1 Sediment Quality (EBE Plan-Part 1).

Southern California Coastal Water Research Project (SCCWRP). 1998. Southern California Bight 1998 Regional Monitoring Program.

Southern California Coastal Water Research Project (SCCWRP). 2003. Southern California Bight 2003 Regional Monitoring Program.

USEPA 2002. Total Maximum Daily Loads for Toxic Pollutants, San Diego Creek and Newport Bay, California. U.S. Environmental Protection Agency, Region 9.

USEPA 2000 *California Toxics Rule* [CTR], Water Quality Standards: Establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California; Federal Register Rule—40CFR Part 131. U.S. Environmental Protection Agency, Washington, D.C.

DRAFT

ATTACHMENT A TO RESOLUTION NO. R8-2018-0071

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

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

Formatted: Underline

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. The concentrations of heavy metals in aquatic plants in Newport Bay have not been documented, although Allen et al (2008) tested metal concentrations in algae.

In 2006, the State Board assessed individual metals in Newport Bay and listed the Upper and Lower Bay for dissolved Cu. No other individual metals were listed based on the State Board assessment, although USEPA's 2002 TMDLs remain in place. The State Board also demonstrated no metals impairment in San Diego Creek.

Board staff's Impairment Assessment, based on data collected after 2002, showed exceedances of the ERM sediment guidelines for zinc (Zn) and mercury (Hg) and the presence of toxicity, and exceedances of fish tissue guidelines for arsenic (As) and chromium (Cr) and Zn in Newport Bay (Staff Report, August 2016). In addition, a post-dredge study showed that the ERL guidelines were exceeded at 13/15, 14/15 and 3/15 sites for Zn & Hg, As and Cr, respectively, in one or more sampling periods (October, March, August) (Metals Sediment Study in Lower Newport Bay, Coastkeeper and Candelaria 2014). Non-TMDL Action Plans (Action Plans) for these metals, rather than TMDLs, are identified below. The rationale for this alternative remediation approach is described below. The Action Plans include a Problem Statement, Source Analysis (if available) and Recommended Tasks to Address Impairment/Potential Impairment. No allocations or linkage analyses are included. The Action Plan for Zn replaces the Zn TMDL that was promulgated by USEPA (2002). The Action Plan approach may be modified via future Basin Plan Amendment(s) if additional data and information warrant a TMDL or other alternative approach.

Zinc (Zn) and Mercury (Hg). Action Plans are recommended for Zn and Hg in Lower Newport Bay. Zn and Hg exceeded ERM sediment guidelines, but not CTR saltwater criteria for dissolved metals, and sediment toxicity was not paired with ERM exceedances. While findings of impairment in sediment are thus inappropriate, Zn and Hg are metals of concern that warrant attention; therefore, the Action Plans require the monitoring and evaluation of Lower Bay sediments, including marinas and the Turning Basin/South Lido Channel areas. The priority for the Zn and Hg Action Plans is to monitor and evaluate sediments for compliance with the sediment targets (SQOs specified in the EBE Plan-Part 1) in areas of the Lower Bay that previously exceeded the Zn and Hg ERM sediment guidelines, and in areas with no or limited SQO or sediment Zn and Hg data (in particular marinas). Evaluations of compliance with the sediment targets (SQOs) shall be conducted and reported along with the data. In addition, sediment Zn and Hg data must be evaluated against the ERM and ERL guidelines for trend and antidegradation analyses. These data can be reported from the SQO monitoring required in the Cu TMDLs.

ATTACHMENT A TO RESOLUTION NO. R8-2018-0071

Continued monitoring of Zn in fish/mussel tissue is also required.

Note that the monitoring of sediment Zn and Hg can be added to the sediment monitoring required by the Cu TMDLs, since Zn and Hg exceeded sediment guidelines in generally the same areas as sediment Cu, and the methods used to assess the SQOs includes the analysis of Zn and Hg.

Arsenic (As) and Chromium (Cr). Action Plans are recommended for As and Cr in Upper and Lower Newport Bay since (As) and Cr exceeded fish and/or mussel tissue guidelines, but did not exceed the CTR saltwater criteria or ERM sediment guidelines. The 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; however, sediment As and Cr did exceed the ERL guidelines in a number of sites in at least one study (Metals Sediment Study in Lower Newport Bay, Coastkeeper and Candelaria 2014). Sediment As and Cr must therefore be monitored and evaluated. In addition, sediment As and Cr data must be evaluated against the ERM and ERL guidelines for trend and antidegradation analyses. These data can be reported from the SQO monitoring required in the Cu TMDLs.

Continued monitoring of As and Cr in fish/mussel tissue is also required

Note that for the Lower Bay, the monitoring of sediment As and Cr can be added to the sediment monitoring required by the Cu TMDLs, since the methods used to assess the SQOs includes the analysis of As and Cr. Monitoring of sediment As and Cr in the Upper Bay must also be included.

Impairment Assessment Results (Staff Report, August 2016)

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

Sediments. Metals that previously exceeded the ERM sediment guidelines, include Zn and Hg (and Cu) in parts of Lower Newport Bay, particularly marinas and in the Turning Basin/South Lido Channel areas. Sediment toxicity is present in areas where Zn and Hg (and Cu) exceeded the ERM guidelines, however, the toxicity data were not paired with ERM exceedances. In addition, Zn, Hg, As and Cr exceeded ERL guidelines in at least one study evaluated.

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

Human health. (As) exceeded the lower human health guideline (0.026 µg/g ww) in all fish filets (8) and mussels (2/2 samples) in the Upper Bay, and in 2/2 mussels in the Lower Bay (Cr) exceeded the lower human health guideline (0.026 µg/g ww) in all fish filets (7) in the Upper Bay.

Wildlife. Wildlife guidelines were exceeded for Cr (2.5 µg/g ww) in most fish (26/31, 18/32) in the Upper and Lower Bay, in Allen's study (2008) but not in the Department of Fish and Game's study (2006), respectively; and for Zn in 10/36 fish and 1/2 mussel samples in the Lower Bay (Allen 2008, Freuh and Ichikawa (DFG) 2006).

ATTACHMENT A TO RESOLUTION NO. R8-2018-0071

(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).

Action Plans are recommended for Zn, Hg, As and Cr; and, As and Cr in fish tissue are recommended for 303(d) listing. Action Plans address metals that exceed sediment and/or fish/mussel tissue guidelines by implementing monitoring and evaluation requirements, including stressor identification studies (per the EBE Plan – Part 1), where warranted. Action Plans do not include waste load or load allocations.

Numeric Targets for Zinc (Zn), Mercury (Hg), Arsenic (As) and Chromium (Cr)

The numeric targets for Zn, Hg, As and Cr include: 1) the saltwater CTR criteria for dissolved Zn, Hg, As and Cr in water; 2) sediment targets based on the narrative sediment quality objectives (SQOs) of the State's Water Quality Control Plan for Enclosed Bays and Estuaries – Part 1 Sediment Quality (EBE Plan-Part1)); and 3) fish/mussel tissue guidelines for human health and wildlife.

Targets in sediments and fish/mussel tissue are based on total metal concentrations. Sediment chemistry, toxicity and benthic monitoring are required to determine compliance with the sediment quality objectives (SQOs).

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.

<u>Numeric Targets for Zn, Hg, As, Cr</u>			
<u>Metal</u>	<u>Water</u>		<u>Sediment</u>
	<u>CTR saltwater criteria¹ (µg/L)¹</u>		<u>sediment quality objectives (SQOs)²</u>
	<u>acute</u>	<u>chronic</u>	<u>SQOs</u>
<u>*Zn</u>	90	81	SQOs
<u>Hg</u>	1.8	0.94	SQOs
<u>As</u>	69	36	SQOs
<u>Cr</u>	1100	50	SQOs
	<u>Fish Tissue</u>		<u>Fish Tissue</u>
	<u>Human Health (µg/g ww)</u>		<u>Wildlife (µg/g ww)</u>
<u>Zn</u>	40 ³		45 ⁴
<u>Hg</u>	200 ⁵ ng/g ww		
<u>Methyl Hg</u>	220 ⁶ ng/g		30 ⁷ , 55 ⁷ ng/g ww
<u>As</u>	0.026 ⁸		25 ⁹
<u>Cr</u>	1.0 ¹⁰		2.5 ¹¹

*Zn TMDLs were promulgated by USEPA in 2002

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

²Sediment quality objectives (State's Water Quality Control Plan for Enclosed Bays and Estuaries – Part 1 Sediment Quality, SWRCB 2009 (EBE Plan-Part1-SQ))

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

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

ATTACHMENT A TO RESOLUTION NO. R8-2018-0071

- ⁴Zn wildlife target from Eisler 1993
- ⁵Total Hg human health target from Johnson & Looker 2004, San Francisco Bay Mercury TMDL
- ⁶Methyl Hg human health target from Klasing & Brodberg 2008 (OEHHA)
- ⁷Methyl Hg wildlife guidelines from Russell 2003 (USFWS) (30ng/g value for smaller fish (< 5cm) -protective of the California least tern; 55ng/g value for larger fish –protective of sea otter)
- ⁸Inorganic As human health target (carcinogen target) from USEPA 2000a Fish consumption guidance Volume 1 (Table 5-3)
- ⁹Total As wildlife target from Stanley 1994 (wet wt. conversion from dry wt. screening value-(assumes fish contain 75% moisture)
- ¹⁰Cr human health target from Median International Standards (MIS), Nauen 1983
- ¹¹Cr wildlife target from Eisler 1998

In addition, sediment Zn, Hg, As and Cr must be evaluated against the ERM (Effects Range Median) and ERL (Effects Range Low) sediment guidelines for trend and antidegradation analyses.

Sediment Guidelines for Zn, Hg, As, Cr		
Metal	Sediment guidelines (ERMs, ERLs)*	
	ERM (µg/g)	ERL (µg/g)
Zn	410	150
Hg	0.71	0.15
As	70	8.2
Cr	370	81

*ERM = Effects Range Median, ERLs =Effects Range Low (NOAA SQiRTS 1999)

Preliminary Source Analysis for Zinc (Zn), Mercury (Hg), Arsenic (As) and Chromium (Cr)

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

Revised Summary of Metal Loads to Newport Bay (lbs/yr)				
	Zn	As	Cr	Hg⁷
Tributary runoff ¹	754	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	^			
Air deposition ⁴	606*			
Ambient seawater ⁵	7464			

- Formatted: Underline
- Formatted: Underline
- Formatted: Underline
- Formatted: Underline
- Formatted: Underline
- Formatted: Underline
- Formatted: Underline
- Formatted: Underline
- Formatted: Underline
- Formatted: Underline
- Formatted: Underline

- Formatted: Underline
- Formatted: Underline
- Formatted: Underline
- Formatted: Underline
- Formatted: Underline
- Formatted: Underline

ATTACHMENT A TO RESOLUTION NO. R8-2018-0071

<u>Bay Sediments⁶</u>	<u>unknown</u>	<u>unknown</u>	<u>unknown</u>	<u>unknown</u>
¹ Dissolved metal loads are the mean annual loads estimated from 2009-13 County of Orange monitoring data (OCPFRD) [*] Value same as USEPA's numbers for Zn, (USEPA's values for tributary runoff =26,596, ambient seawater =9330, total Zn =43,181, USEPA 2002) Dissolved Zn in storm water samples from San Diego Creek and Santa Ana-Delhi were calculated from total Zn shown in Table E-11, Toxics TMDLs (total Zn x 0.80 = dissolved Zn) (USEPA 2002, OCPFRD 2000 data) 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 [^] Boatyards are no longer covered under a separate permit in Newport Bay, they are now covered under the Industrial General Permit (IGP) for stormwater. The allocation for the "Other NPDES" category did not increase since the IGP regulates boatyards based on pollutant concentrations in stormwater runoff, and no volume data is available for stormwater runoff for boatyard facilities. 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, 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				
<u>Loading Capacity and Linkage Analysis for Zinc (Zn), Mercury (Hg), Arsenic (As) and Chromium (Cr)</u>				
[^] There is no linkage analysis for Zn, Hg, As and Cr Action Plans.				
<u>TMDLs, Waste Load and Load Allocations, and Margin of Safety for Zinc (Zn), Mercury (Hg), Arsenic (As) and Chromium (Cr)</u>				
[^] There are no TMDLs or allocations for Zn, Hg, As and Cr Action Plans.				
<u>Implementation Plan for Zinc (Zn), Mercury (Hg), Arsenic (As) and Chromium (Cr)</u>				

Formatted: Underline
Formatted: Underline
Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

ATTACHMENT A TO RESOLUTION NO. R8-2018-0071

The largest Zn loads were found in 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 in runoff from tributaries, but Hg loads from storm drains were not evaluated. Much of the sediment Hg is thought to be from historical sources (such as mining of cinnabar).

The highest priorities for Zn and Hg are the monitoring and evaluation of sediments for compliance with the sediment targets (SQOs (consistent with the EBE Plan-Part 1)) in the Lower Bay in areas that previously exceeded Cu, Zn and Hg ERM sediment guidelines, and in areas with no or limited sediment Cu, Zn and Hg data (in particular marinas and boatyards). Evaluations of compliance with the sediment numeric targets (SQOs and ERM guidelines) shall be conducted and reported along with the data. Sediment Zn and Hg data must also be evaluated against the ERM and ERL guidelines for trend and antidegradation analyses. Continued monitoring of Zn in fish/mussel tissue is also required. In addition, monitoring and evaluation of Zn and Hg in tributary runoff must continue, and Zn and Hg loads estimated.

The highest priorities for As and Cr are continued monitoring in fish/mussel tissue and sediments in the Upper and Lower Bay. (Both As and Cr exceeded the ERL sediment guidelines.) If impairment is shown in fish/mussel tissue, a source analysis study shall be conducted. Sediment As and Cr must be monitored and evaluated in Upper Bay, and in the Lower Bay along with the sediment Zn and Hg monitoring required in the Zn and Hg Action Plans. In addition, monitoring and evaluation of As and Cr in tributary runoff must continue, and As and Cr loads estimated. (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.

Implementation tasks and schedules are summarized below, along with the parties responsible for TMDL implementation in Newport Bay (listed by task).

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

<u>Action Plan Task</u>	<u>Schedule and Dischargers/Responsible Parties</u>
<u>1) Action Plan for Zinc (Zn) and Mercury (Hg)</u>	<u>Dischargers/Responsible Parties</u>
<u>Continue to monitor and evaluate Zn and Hg in sediments for compliance with the sediment targets (SQOs - consistent with the EBE Plan-Part 1), and evaluate Zn in fish/mussel tissue for compliance with the guidelines, in Lower Newport Bay and lower Upper Newport Bay, including marinas and Turning Basin/South Lido Channel areas, and in areas with no or limited SQO or sediment Zn and Hg data (in particular marinas). Evaluate sediment Zn and Hg data against the ERM and ERL guidelines for trend and</u>	<u>City of Newport Beach (City) County of Orange (County) CalTrans Boatyards Other NPDES permittees</u>
	<u>1.1 As soon as possible but no later than</u>

Formatted: Underline

Formatted: Underline

Formatted: Underline

ATTACHMENT A TO RESOLUTION NO. R8-2018-0071

<p><u>antidegradation analyses. In addition, monitoring and evaluation of Zn and Hg in tributary and storm drain runoff must continue, and Zn and Hg loads determined.</u></p> <p><u>Develop and implement a plan to conduct stressor identification studies in accordance with the EBE Plan-Part 1. If Zn impairment is shown in fish/mussel tissue, conduct a source analysis(es), and develop and implement a plan to address those sources.</u></p> <p><u>1.1 The dischargers shall submit proposed action plan(s) and schedule(s) to monitor and evaluate 1) sediments for compliance with the SQOs in the Lower Bay*, and assess sediment Zn and Hg against the ERM/ERL guidelines; 2) Zn in fish/mussel tissue in the Lower Bay; and 3) the determination of Zn and Hg in tributary and storm drain runoff, and load estimations. *Sediment evaluation must be conducted in areas that previously exceeded the Zn and Hg sediment ERM guidelines, including marina sites and the Turning Basin/ South Lido Channel areas, and in areas with no or limited SQO or sediment Zn and Hg data (in particular marinas). The proposed plan(s) shall include a recommended reporting program.</u></p> <p><u>1.2 The dischargers shall implement their plan(s) and schedule(s), and submit an annual report that includes the data and assessment of that data with respect to compliance with the sediment and fish tissue targets, and the determination of Zn and Hg loads from tributary runoff. This annual report may be combined with the report required for the Cu TMDLs.</u></p> <p><u>1.3 If sediments are found to be impacted (consistent with the the SQO assessment), the dischargers shall develop and submit a plan(s) and schedule(s) to conduct stressor identification studies in accordance with the EBE Plan-Part 1. If Zn impairment is shown in fish/mussel tissue, conduct a source analysis study(ies), and develop and implement a plan to address those sources.</u></p> <p><u>The proposed plan(s) shall include a recommended reporting program.</u></p> <p><u>1.4 The dischargers shall implement their plan(s) and schedule(s), and submit a report that identifies the actions taken; evaluate the</u></p>	<p><u>(3 months from date of USEPA approval of BPA)</u></p> <p><u>1.2 Upon Regional Board approval of the dischargers' implementation plan (or upon Executive Officer approval of the plan if no significant public comments are received), The report shall be submitted one year from date of Regional Board or EO approval of the implementation plan, and annually thereafter. The EO is authorized to adjust annual report submittal schedules based on the demonstration that such adjustment is justified.</u></p> <p><u>1.3 As soon as possible but no later than 3 months after a finding that fish/mussel tissue is impaired and/or that sediments are impacted, as determined by the Executive Officer</u></p> <p><u>1.4 Upon Executive Officer approval of the plan(s) and schedule(s).</u></p>
---	---

ATTACHMENT A TO RESOLUTION NO. R8-2018-0071

<p><u>effectiveness of those actions; and, evaluate progress toward meeting the fish/mussel tissue targets.</u></p>		
<p><u>2) Action Plan for Arsenic (As) and Chromium (Cr)</u> <u>Continue to monitor and evaluate As and Cr in fish/mussel tissue and sediments for compliance with the sediment targets (SQOs - consistent with the EBE Plan) and fish/mussel tissue guidelines in Upper and Lower Newport Bay.</u> <u>Evaluate sediment As and Cr against the ERM and ERL guidelines for trend and antidegradation analyses.</u> <u>In addition, monitoring and evaluation of As and Cr in tributary and storm drain runoff must continue, and As and Cr loads determined.</u></p> <p><u>If impairment is shown in fish/mussel tissue, conduct a source analysis(es), and develop and implement a plan to address those sources.</u> <u>Develop and implement a plan to conduct stressor identification studies in accordance with the EBE Plan-Part 1.</u></p> <p><u>2.1 The dischargers shall submit proposed action plan(s) and schedule(s) to monitor As and Cr in fish/mussel tissue and sediments in the Upper and Lower Bay.</u></p> <p><u>The proposed plan shall include monitoring and evaluation of: 1) As and Cr in fish/mussel tissue for compliance with the fish/mussel tissue guidelines; 2) sediments for compliance with the SQOs, and assess sediment As and Cr against the ERM/ERL guidelines; and 3) the determination of As and Cr in tributary and storm drain runoff and load estimations.</u> <u>The proposed plan and schedule shall include a recommended reporting program.</u></p> <p><u>2.2 The dischargers shall implement their plan(s) and schedule(s), and submit an annual report that includes the data and assessment of that data with respect to compliance with the sediment and fish tissue targets, and the determination of Zn and Hg loads from tributary runoff. This annual report may be combined with the report required for the Cu TMDLs.</u></p>	<p><u>Dischargers/Responsible Parties</u> <u>City of Newport Beach (City)</u> <u>County of Orange (County)</u> <u>CalTrans</u> <u>Boatyards</u> <u>Other NPDES permittees</u></p> <p><u>2.1 As soon as possible but no later than (3 months from date of USEPA approval of BPA)</u></p> <p><u>2.2 Upon Regional Board approval of the dischargers' implementation plan (or upon Executive Officer approval of the plan if no significant public comments are received). The report shall be submitted one year from date of Regional Board or EO approval of the implementation plan, and annually thereafter. The EO is authorized to adjust annual report submittal schedules based on the demonstration that such adjustment is justified.</u></p> <p><u>2.3 As soon as possible but no later than 3 months after a finding of impairment in fish/mussel tissue and/or that sediments are impacted, as determined by the Executive Officer</u></p> <p><u>2.4 Upon Executive Officer approval of the plan(s) and schedule(s).</u></p>	<p>Formatted: Underline</p> <p>Formatted: Underline</p> <p>Formatted: Underline</p>

ATTACHMENT A TO RESOLUTION NO. R8-2018-0071

<p><u>2.3 If monitoring continues to show impairment in fish/mussel tissue, the dischargers shall submit a plan and schedule to conduct a source analysis study(ies) for As and Cr, and to remediate those sources.</u> <u>If sediments are found to be impacted (based on the SQO assessment), the dischargers shall develop and submit a plan(s) and schedule(s) to conduct stressor identification studies in accordance with the EBE Plan-Part 1.</u> <u>Proposed plans to address fish/mussel tissue and/ or impacted sediment shall include a recommended reporting program.</u> <u>2.4 The dischargers shall implement their plan(s) and schedule(s), and submit a report that include the data and assessment of that data with respect to compliance with the fish/mussel tissueand/or sediment targets; identify actions taken and the effectiveness of those actions; and evaluate progress towards meeting the fish/mussel tissue and/or sediment targets.</u></p>	
<p><u>3) Consider Revisions to the Action Plans for Zn, Hg, As and Cr when Above Tasks are Completed</u></p>	<p><u>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.</u></p>
<p><u>4) The general category of "Metals" should be DELISTED from Upper Newport Bay</u></p>	<p><u>In the next listing cycle.</u></p>
<p><u>References for Zinc (Zn), Mercury (Hg), Arsenic (As) and Chromium (Cr) Action Plans</u></p>	
<p><u>Allen, M. J, A. Z. Mason, R. Gossett, D. W. Diehl, V. Raco-Rands and D. Schlenk. 2008. "Assessment of the Food Web Transfer of Organochlorine Compounds and Trace Metals in Fishes in Newport Bay, California.", Southern California Coastal Water Research Project, 3535 Harbor Blvd., Ste. 110, Costa Mesa, CA 92626.</u></p>	
<p><u>County of Orange monitoring data for San Diego Creek and Santa Ana Delhi (2009-10 and 2010-11, OCPFRD).</u></p>	
<p><u>Eisler, R. 1998. Nickel hazards to fish, wildlife, and invertebrates: A synoptic review. Contaminant Hazards Reviews, Report No. 34. U.S. Fish and Wildlife Service, Laurel, Maryland. 76pp.</u></p>	
<p><u>Eisler, R. 1993. Zinc hazards to fish, wildlife, and invertebrates: A synoptic review. Contaminant Hazards Reviews, Report No. 26. U.S. Fish and Wildlife Service, Laurel, Maryland. 63pp.</u></p>	
<p><u>Frueh, B. and G. Ichikawa. November 2007. Tissue, Sediment and Water quality Monitoring for Bioaccumulative Contaminants and Metals in the San Diego Creek and Newport Bay</u></p>	

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

Formatted: Underline

ATTACHMENT A TO RESOLUTION NO. R8-2018-0071

Watershed. DFG DATA 2005-2006 Project Report for the TMDL Program –SARWQCB – Contract #05-279-250-0.

Johnson, B. and R. Looker, 2004. Mercury in San Francisco Bay: Total Maximum Daily Load (TMDL) Proposed Basin Plan and Amendment and Staff Report. CRWQCB, Oakland, CA. 163pp.

Klasing, S. and R. Brodberg (OEHHA). 2008. Development of Fish Contaminant Goals and Advisory Tissue Levels for Common Contaminants in California Sport Fish: Chlordane, DDTs, Dieldrin, Methylmercury, PCBs, Selenium, and Toxaphene. California Environmental Protection Agency, Office of Environmental Health Hazard Assessment, Sacramento, CA. http://www.waterboards.ca.gov/water_issues/programs/swamp/lakes_study.shtml

NOAA SQUIRTS 1999

Nauen, C.E. 1983. Compilation of legal limits for hazardous substances in fish and fishery products. Food and Agriculture Organization of the United Nations. FAO Fisheries Circular.

Orange County Coastkeeper and L.M. Candelaria. March 2014. Metals Sediment Study in Lower Newport Bay (Post-dredging) Final Report. Report for Santa Ana Regional Water Board.

Orange County Coastkeeper and L.M. Candelaria. January 2010. Newport Bay Stormdrain Metals study. Report for Santa Ana Regional Water Board.

Orange County Coastkeeper and L.M.Candelaria. July 2007. Lower Newport Bay Copper-Metals Marina Study. Report for Santa Ana Regional Water Board.

Russell, D. 2003. Evaluation of the Clean Water Act Section 304(a) Human Health Criterion for Methylmercury: Protectiveness for Threatened and Endangered Wildlife in California. US Department of Interior, Fish and Wildlife Service.

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.

Supplemental 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, 2018.

State Water Resources Control Board (SWRCB). 2009. Water Quality Control Plan for Enclosed Bays and Estuaries – Part 1 Sediment Quality (EBE Plan-Part 1).

Southern California Coastal Water Research Project (SCCWRP). 1998. Southern California Bight 1998 Regional Monitoring Program.

Southern California Coastal Water Research Project (SCCWRP). 2003. Southern California Bight 2003 Regional Monitoring Program.

Stanley, T.R., Jr., J.W. Spann, G.J. Smith and R. Rosscoe. 1994. Main and interactive effects of arsenic and selenium on mallard reproduction and duckling growth and survival. Arch. Environmental Contam. Toxicol. 26:444-451

USEPA 2002. Total Maximum Daily Loads for Toxic Pollutants, San Diego Creek and Newport Bay, California. U.S. Environmental Protection Agency, Region 9.

USEPA 2000 California Toxics Rule [CTR], Water Quality Standards: Establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California; Federal Register Rule—40CFR Part 131, U.S.

Formatted: Underline

Formatted: Underline

ATTACHMENT A TO RESOLUTION NO. R8-2018-0071

Environmental Protection Agency, Washington, D.C.

USEPA 2000a. Guidance for Assessing Chemical Contaminant Data for Use in Fish
Advisories, Vol1:Fish Sampling and Analysis, 3rd ed. EPA-823-B-00-007. U.S. Environment
Protection Agency, Office of Water, Washington DC.

Formatted: Underline

DRAFT