REVISED

STATE IMPLEMENTATION POLICY JUSTIFICATION REPORT

SITE-SPECIFIC OBJECTIVE FOR DISSOLVED COPPER TO SUPPORT IMPLEMENTATION OF THE MARINA DEL REY TOXICS TOTAL MAXIMUM DAILY LOAD

Prepared for

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LIST OF ACRONYMS AND ABBREVIATIONS

µg	microgram
AB	Assembly Bill
AFP	antifouling paint
BLM	Biotic Ligand Model
BMP	best management practice
CalEPA	California Environmental Protection Agency
CCC	criterion continuous concentration
CFR	Code of Federal Regulations
cm	centimeter
CMP	Coordinated Monitoring Plan
CMC	criterion maximum concentration
County	Los Angeles County
CPDA	California Professional Divers Association
CTR	California Toxics Rule
DPR	California Department of Pesticide Regulation
Ecology	Washington State Department of Ecology
kg	kilogram
L	liter
LA	load allocation
m	meter
MdR	Marina del Rey
NPDES	National Pollutant Discharge Elimination System
PCB	polychlorinated biphenyl
Regional Water Board	Los Angeles Regional Water Quality Control Board
SED	Substitute Environmental Documents
SIP	Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California
State Water Board	State Water Resources Control Board
TMDL	total maximum daily load

USEPA	U.S. Environmental Protection Agency
WER	Water-Effect Ratio

1 INTRODUCTION

1.1 Toxics Total Maximum Daily Load in Marina del Rey Harbor

The Marina del Rey (MdR) Harbor Toxics total maximum daily load (TMDL) was promulgated in 2005 by the Los Angeles Regional Water Quality Control Board (Regional Water Board) to address the following impairments (Los Angeles RWQCB 2005):

- Sediment: copper, lead, zinc, chlordane, polychlorinated biphenyl (PCBs), and toxicity
- Fish tissue: PCBs

The TMDL became effective in 2006 upon approval by the State Water Resources Control Board (State Water Board) and the U.S. Environmental Protection Agency (USEPA).

Monitoring and special studies conducted in support of the Toxics TMDL have since provided additional information regarding the spatial extent and magnitude of the impairments; the special studies include partitioning coefficient, a low detection level, storm-borne sediment pilot, sediment characterization, and best management practice (BMP) effectiveness studies. In addition, results have shown that dissolved copper concentrations frequently have exceeded the chronic (4-day average) criterion (also referred to as criterion continuous concentration [CCC]) of 3.1 micrograms per liter (µg/L), as specified in the California Toxics Rule (CTR).

The revised Toxics TMDL was adopted in February 2014 by the Regional Water Board and became effective on October 16, 2015. Toxics TMDL revisions were designed to take into consideration new data on the spatial extent and magnitude of sediment contamination as well as address the dissolved copper CTR exceedances in the water column. As such, the revised Toxics TMDL includes load allocations (LAs) for dissolved copper to meet the CCC criterion in the CTR. The TMDL requires a dissolved copper load reduction of 85% from the current baseline.

To demonstrate compliance with the LAs for copper, the Basin Plan Amendment requires one of the following: meeting the numeric target, demonstrating 85% of boats in the harbor are using copper-free hull paints, or using another acceptable means of demonstrating

compliance, as approved by the Executive Officer of the Regional Water Board, that would result in attainment of copper numeric targets in the water column (e.g., demonstrating that 100% of boats in the harbor are using hull paint that discharges 85% less copper than the baseline load).

The revised Toxic TMDL necessitates a regulatory mechanism for implementation of LAs for discharges of dissolved copper from boats to be developed by October 16, 2017 (2 years after effective date of the TMDL) and the LAs for discharges of dissolved copper from boats to be attained by March 22, 2024.

1.2 Site-specific Objective for Copper in Marina del Rey Harbor

The reduction of copper loading in MdR Harbor by 85% presents a unique challenge. Regulators (e.g., USEPA, California Environmental Protection Agency [CalEPA], California Department of Pesticide Regulation [DPR], and Washington Department of Ecology [Ecology]) have engaged in significant studies to evaluate copper- and non-copper-based boat hull paints. The overall findings suggest that some alternative paints are available while new paints continue to be developed that may replace current copper-based antifouling paints (AFPs); sufficient time to test and evaluate the use of these alternative AFPs has not occurred to gain wide acceptance by the boating community.

Los Angeles County (County) has and continues to be an active participant in water quality programs. The County is working with the public to address alternative paint information gaps through notifications, workshops, and educational flyers. It is hoped that through regular communication with the community, non-toxic AFPs can be identified as effective in MdR Harbor and thereby more supported by the boating community. To better understand the boating community behaviors, the County is developing a pilot study to evaluate the most effective approaches to gain public support for the use of non-biocidal paints and other copper-reducing BMPs. As part of the pilot study design, the County will:

1. Develop a focused survey to understand the boating community's experience with non-biocidal paints, including which paints have been applied to boats in the MdR Harbor, how often they required hull cleaning, and how long they remain effective before requiring repainting to better understand boater satisfaction with these paints.

2. The County will track the effectiveness of the non-copper paints on the County Sheriff's Department, Los Angeles Department of Beaches and Harbors, and LA Waterkeeper boats. The County is also exploring opportunities for additional boat conversions to be included in the trial. The goal is to convert 100 boats to non-biocidal paints.
3. The County will conduct a detailed analysis of the costs and logistical constraints associated with converting vessels to alternative paints, both using MdR Harbor boatyards and boat shops outside the MdR Harbor. This analysis will consider time restraints and facilities requirements to apply these paints at the boatyards within the region.

The implementation strategy to address dissolved copper in MdR Harbor requires a multi-pronged approach to restore and maintain water quality for the designated beneficial uses. From identifying grants to fund boat paint conversion to hosting educational workshops to building incentive-based lease agreements, the County is committed to be an active participant in supporting programs that will improve water quality in MdR Harbor. Part of the strategy in continued studies, the pilot projects, and developing a site-specific objective for copper is to build public awareness around the impacts of copper and gain public support for use of alternative paints and BMPs.

The State Water Board (Resolution 2014-0049) provides an opportunity for the stakeholders to develop alternative numeric targets if they can be shown to be protective of beneficial uses in MdR Harbor. The Resolution recognizes that the USEPA-approved Water-Effect Ratio (WER) method may be used to derive site-specific water quality objectives that will supersede the current CTR CCC as the water quality standard for dissolved copper in MdR Harbor if adopted by the Regional Water Board and approved by the State Water Board, Office of Administrative Law, and USEPA. Further, the Resolution offers consideration of the Biotic Ligand Model (BLM) derived site-specific water quality objective if the model is first approved by USEPA for use in marine waters.

From State Water Board's Resolution 2014-0049, page 3:

> *"13. There are a number of U.S. EPA approved tools that can be utilized to derive site-specific water quality objectives such as the water effects ratio method and Biotic Ligand Model (BLM). The Los Angeles Water Board will consider revisions to the existing dissolved copper water quality objective and corresponding TMDL numeric target that are developed using the BLM if it is approved by the U.S. EPA for use in marine waters..... Following the County of Los Angeles' submittal of the dissolved copper site-specific objective study for the marina, the Los Angeles Water Board will consider site-specific objectives for Marina del Rey Harbor that, if adopted by the Los Angeles Water Board, and approved by the State Water Board, Office of Administrative Law and U.S. EPA, will supersede the applicable dissolved copper criterion in 40 C.F.R. section 131.38 ('California Toxics Rule') as the enforceable water quality standard."*

Data collected from the site-specific objective study will provide valuable information specific to MdR Harbor. The site-specific information will help the County to develop and identify more effective implementation options to reduce dissolved copper discharge from boats in MdR Harbor. According to the site-specific objective work plan (Los Angeles County Department of Public Works 2015) submitted to the Regional Water Board in April 2015, it will take 2 years to complete the study.

A site-specific objective for dissolved copper in MdR Harbor will be calculated using USEPA-approved WER methods shown to be effective in predicting protective objectives in similar California WER studies. Study design and method selection will be based on three previous studies: 1) WER calculation for the Los Angeles River and tributaries TMDL; 2) San Francisco Bay copper and nickel site-specific objective derivation; and 3) studies of copper bioavailability and toxicity in San Diego Bay. The studies in the Los Angeles River and tributaries and San Francisco Bay resulted in site-specific objectives for copper that were successfully adopted by regulatory authorities for use in TMDLs.

1.3 SIP Requirements for a Site-specific Objective Study

The Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (SIP) was approved in 2000 and amended in 2005 by the State Water Board. The SIP authorizes the Regional Water Board to adopt a site-specific objective in lieu of CTR criteria whenever the Regional Water Board determines, in the exercise of its professional judgment, that it is appropriate to do so. The SIP establishes that the Regional Water Board shall consider initiating the development of a site-specific objective under the following conditions specified in Section 5.2(1) through (3):

> *"The RWQCB (Regional Water Board) shall, at a public meeting, consider initiating the development of a site-specific objective under the following conditions:*
>
> *(1) A written request for a site-specific study, accompanied by a preliminary commitment to fund the study, subject to development of a workplan, is filed with the RWQCB; and*
>
> *(2) Either:*
>
> *(a) a priority pollutant criterion or objective is not achieved in the receiving water; or*
>
> *(b) a holder of an NPDES permit demonstrates that they do not, or may not in the future, meet an existing or potential effluent limitation based on the priority pollutant criterion or objective; and*
>
> *(3) A demonstration that the discharger cannot be assured of achieving the criterion or objective and/or effluent limitation through reasonable treatment, source control, and pollution prevention measures. This demonstration may include, but is not limited to, as determined by the RWQCB:*
>
> *(a) an analysis of compliance and consistency with all relevant federal and state plans, policies, laws, and regulations;*
>
> *(b) a thorough review of historical limits and compliance with those limits;*
>
> *(c) a thorough review of current technology and technology-based limits; and*

(d) an economic analysis of compliance with the priority pollutant criterion or objective of concern."

This report includes a written request, in the form of a cover letter, and analyses to initiate a site-specific objective as described in Sections 5.2 (1), (2), and (3)(a) through (d). The remainder of this report includes analyses that are required in SIP Sections 5.2(2) and 5.2(3)(a) through (d).

2 SIP SECTION 5.2(2) ANALYSIS

Section 5.2(2) includes a demonstration that:

> *"either (a) a priority pollutant criterion or objective is not achieved in the receiving water; or (b) a holder of an NPDES permit demonstrates that they do not, or may not in the future, meet an existing or potential effluent limitation based on the priority pollutant criterion or objective."*

Numeric targets for dissolved copper in the water column are set to be equivalent to the following CTR saltwater criteria for the protection of aquatic life:

- Acute target: criterion maximum concentration (CMC)is 4.8 µg/L
- Chronic target: CCC is 3.1 µg/L

Dissolved copper concentrations in the water column have been monitored as part of the revised Toxics TMDL Coordinated Monitoring Plan (CMP) in Basins A through H and the main channel since 2010. Monitoring data show that numeric criteria for dissolved copper were not consistently met in the water column of MdR Harbor. Figure 1 depicts CMP monitoring stations including the nine dissolved copper monitoring stations in MdR Harbor; all related data are presented in Table 1 and Figure 2.

The CMP data from 2010 to 2013 indicate that exceedances of CTR criteria for dissolved copper were observed in all basins in MdR Harbor. Sufficient numbers of samples exceeded the CTR CCC of 3.1 µg/L. Therefore, it is necessary to begin management and implementation strategies to address dissolved copper.

Figure 1

Marina del Rey Harbor Toxics Total Maximum Daily Load Coordinated Monitoring Plan Stations

Table 1

Dissolved Copper Concentrations in the Water Column of Marina del Rey Harbor

Date	Monitoring Station[1]								
	MdRHB-1	MdRHB-2	MdRHB-3	MdRHB-4	MdRHF-1	MdRHF-2	MdRHF-3	MdRHF-4	MdRHF-5
8/20/2010	7.71	5.04	5.26	5.87	6.74	6.6	8.12	5.58	3.61
9/20/2010	6.88	5.26	5.26	5.88	6.74	4.47	6.15	5.02	4.96
10/22/2010	10.4	8.67	8.09	7.5	8.94	9.82	10.9	6.88	6.63
11/16/2010	6.4	3.8	3.6	6.5	4.5	5	7.1	3	3.6
12/9/2010	8.6	7.3	5.4	6.1	6.6	8.2	10	2.4	2.4
1/25/2011	7.7	5.1	4.6	4.6	5.3	6.1	7.7	3.2	4.4
2/24/2011	4.1	2.1	2.6	4.5	4.6	5.8	6.9	2.8	3.2
3/23/2011	2.4	2.7	2.1	1.5	0.81	1.6	2.1	0.83	0.77
4/21/2011	3.1	4.6	3.2	3.4	4.3	4.3	4.5	2.9	2.8
5/19/2011	4	5	3.6	3.5	3.7	4.3	4.6	2.6	2.5
6/23/2011	7.4	7.2	5.5	6.4	6.5	6.5	7.9	3.9	3.4
7/21/2011	3.6	5.8	4.5	4	3.2	4.6	3.7	1.9	2.9
8/25/2011	5.3	6	4.4	5	4.1	3.9	5.1	3.6	3.7
9/22/2011	6.1	5.3	4.5	4.9	6.3	6.2	6.2	2.6	3.8
10/27/2011	3.4	3.3	2.6	2.5	2.7	1.8	2.2	1.7	2.2
11/17/2011	6.1	5.8	4.3	4.7	4.3	4.5	5.5	3.8	3.1
12/14/2011	4.7	5.5	5.4	4.1	3.9	3.5	4.8	4.3	3.2
1/11/2012	5.6	13	5.9	4.8	3.8	3.9	5.6	3.4	3
2/8/2012	4.7	4.7	2.9	2.3	3.5	3.7	4.3	2.3	2.1
3/7/2012	4.4	4.9	3	3.8	3.2	3.4	4	2.9	2.4
4/12/2012	2.8	2.8	2.6	2.3	3.7	3.8	4.9	2.7	2.7
5/10/2012	3.8	4.3	2.5	3.2	3.5	3.4	3.7	2.2	1.8
6/7/2012	2.7	3	2.2	2.8	2.8	3.3	3.7	1.9	1.6

Date	Monitoring Station[1]								
	MdRHB-1	MdRHB-2	MdRHB-3	MdRHB-4	MdRHF-1	MdRHF-2	MdRHF-3	MdRHF-4	MdRHF-5
7/3/2012	7.07	8.55	5.96	4.93	7.69	7.29	7.5	6.33	5.17
8/29/2012	1.6	4.54	1.27	2.01	1.63	1.96	6.9	4.09	3.84
9/26/2012	9.12	7.15	6.03	8.61	6.43	9.01	9.62	4.24	4.93
10/17/2012	6.11	3.79	4.92	5.4	5.18	8.49	7.88	3.06	3.78
11/15/2012	7.54	9.98	6.67	6.63	6.37	7.91	9.77	5.97	6.83
12/19/2012	7.96	5.68	4.7	6.35	6.26	6.39	7.91	5.06	4.04
1/9/2013	14.9	1.84	4.52	6.34	5.28	13.1	10.5	3.97	2.77
2/14/2013	7.86	7.77	5.66	4.48	6.65	6.25	7.35	4.82	6.08
3/6/2013	9.55	8.44	7.61	8.24	7.12	8.59	11	5.93	5.37
4/4/2013	7.03	5.07	3.66	5.04	4.72	5.87	6.91	4.6	2.31
5/14/2013	8.46	8.63	7.04	6.49	6.48	7.28	9.49	5.13	4.23
6/5/2013	8.16	7.71	7.57	6.73	6.9	7.6	8.3	4.74	4.6
7/1/2013	5.99	6.04	4.79	5.59	4.96	5.35	6.92	3.41	3.21

Notes:
Measurements are in micrograms per liter.
Data from draft Marina del Rey Watershed Coordinated Integrated Monitoring Program, Appendix I. Available from:
http://www.swrcb.ca.gov/rwqcb4/water_issues/programs/stormwater/municipal/watershed_management/marina_delrey/MarinaDelRey_CIMP.pdf.
1 See Figure 1 for station locations.

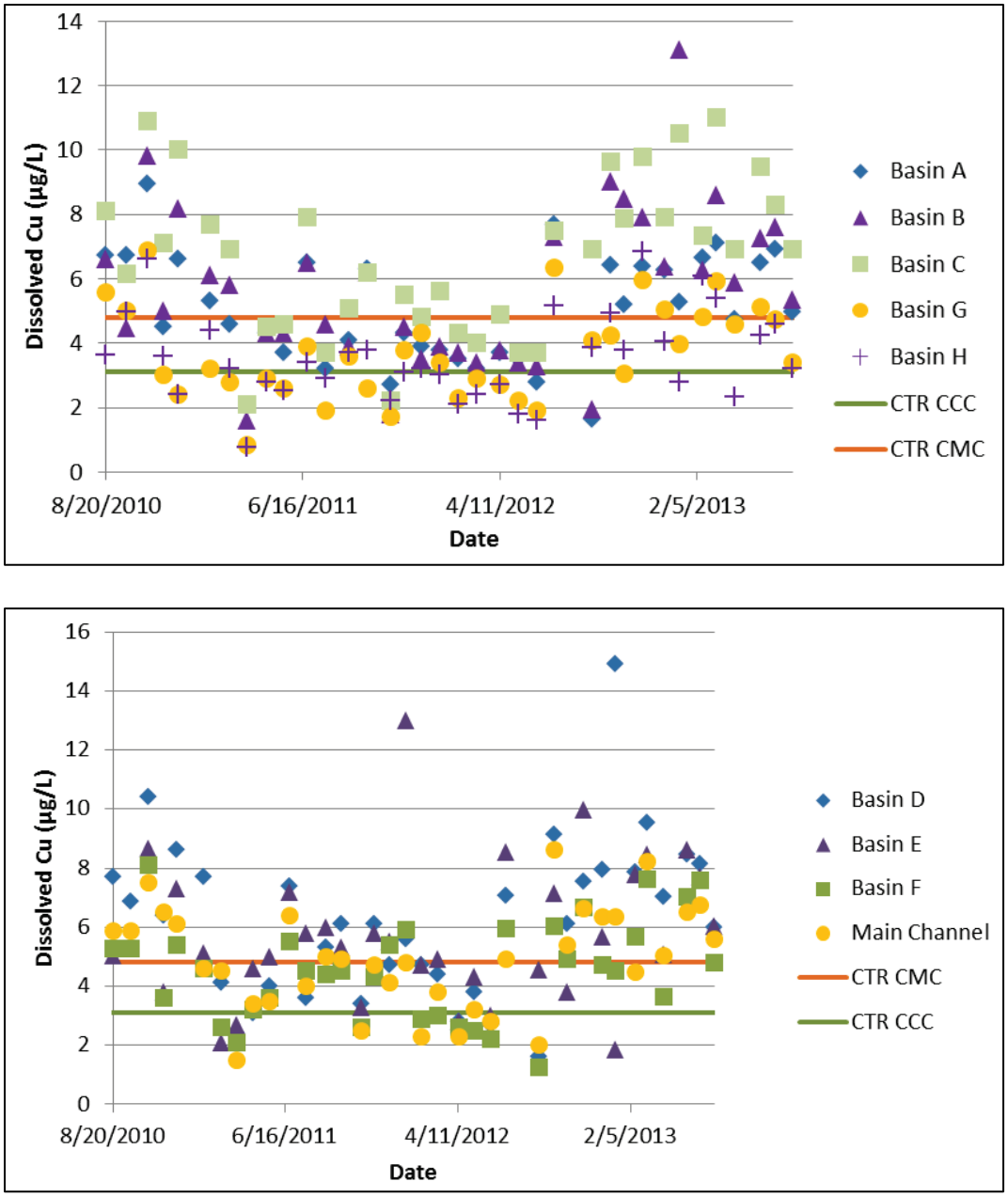

Figure 2

Dissolved Copper Concentrations in the Water Column of Marina del Rey Harbor

Notes:
The upper panel represents data for the front basins, and the lower panel represents data for the back basins. The red line indicates the California Toxics Rule (CTR) criterion maximum concentration (CMC) of 4.8 micrograms per liter (µg/L), and the green line indicates the CTR criterion continuous concentration (CCC) of 3.1 µg/L. See Figure 1 for station locations.

3 SIP SECTION 5.2(3) ANALYSIS

Section 5.2(3)(a) through (d) involve a demonstration that the discharger cannot be assured of achieving the criterion through reasonable treatment, source control, and pollution prevention measures, and it involves the demonstration via the following methods:

(a) "An analysis of compliance and consistency with all relevant federal and state plans, policies, laws, and regulations;

(b) A thorough review of historical limits and compliance with those limits;

(c) A thorough review of current technology and technology-based limits;

(d) An economic analysis of compliance with the priority pollutant criterion or objective of concern."

After communications with Regional Water Board staff, the following analyses were conducted regarding Section 5.2(3)(a) through (d).

3.1 SIP Section 5.2(3)(a): Analysis of Compliance and Consistency with All Relevant Federal and State Plans, Policies, Laws, and Regulations

3.1.1 Clean Water Act

Section 304(a)(1) of the Clean Water Act requires water quality criteria to be developed to accurately reflect the latest scientific knowledge.[1] Section 303(a)(2) of the Clean Water Act allows modification of the water quality standards as appropriate, such as reflecting scientific knowledge.[2] The intent of the site-specific objective study is to determine if it may be appropriate to modify the standard (i.e., CTR criteria for dissolved copper) using new

[1] SEC. 304. (a)(1): "The Administrator, after consultation with appropriate Federal and State agencies and other interested persons, shall develop and publish, within one year after the date of enactment of this title (and from time to time thereafter revise) criteria for water quality accurately reflecting the latest scientific knowledge …"

[2] (c)(1): "The Governor of a State or the State water pollution control agency of such State shall from time to time (but at least once each three year period beginning with the date of enactment of the Federal Water Pollution Control Act Amendments of 1972) hold public hearings for the purpose of reviewing applicable water quality standards and, as appropriate, modifying and adopting standards. Results of such review shall be made available to the Administrator."

site-specific information collected in MdR Harbor. This approach is consistent with the standard modification allowed in the Clean Water Act.

3.1.2 Toxics Total Maximum Daily Load in Marina del Rey Harbor

The MdR Harbor Toxics TMDL was promulgated in 2005 by the Regional Water Board (Los Angeles RWQCB 2005). The TMDL became effective in 2006 upon approval by the State Water Board and the USEPA. The Toxics TMDL was revised and adopted by the Regional Water Board in February 2014 and was subsequently approved by the State Water Board in September 2014. Toxics TMDL revisions were designed to take into consideration new data on the spatial extent and magnitude of sediment contamination, as well as address the dissolved copper CTR exceedances in the water column. As such, the revised Toxics TMDL includes LAs for dissolved copper to meet the CCC criterion in the CTR. The TMDL requires a dissolved copper load reduction of 85% from the current baseline. The revised Toxics TMDL was adopted on September 9, 2014, by the Regional Water Board and became effective on October 16, 2015. The revised Toxic TMDL necessitates a regulatory mechanism for implementation of LAs for discharges of dissolved copper from boats to be developed by October 16, 2017 (2 years after effective date of the TMDL) and the LAs for discharges of dissolved copper from boats to be attained by March 22, 2024.

3.1.3 Federal Water Quality Standard Regulations on Site-specific Criteria

The federal water quality standards regulation (40 Code of Federal Regulations [CFR] Part 131) at Section 131.11(b)(l)(ii) provides states with the opportunity to adopt water quality criteria that are "modified to reflect site-specific conditions." The site-specific objective study approach is consistent with this regulation.

3.1.4 U.S. Environmental Protection Agency's Guidance on Site-specific Criteria

Guidance for modifying water quality criteria is provided in USEPA's *Water Quality Standards Handbook* (USEPA 1994). Section 3.7 of the handbook states that the national criteria may not apply for all watersheds, and it is sometimes necessary to develop site-specific objectives to address localized conditions:

> *"Site-specific criteria are allowed by regulation and are subject to USEPA review and approval. …Site-specific criteria, as with all water quality criteria, must be based on a sound scientific rationale in order to protect the designated use. Existing guidance and practice are that USEPA will approve site-specific criteria developed using appropriate procedures.*
>
> *A site-specific criterion is intended to come closer than the national criterion to providing the intended level of protection to the aquatic life at the site, usually by taking into account the biological and/or chemical conditions (i.e., the species composition and/or water quality characteristics) at the site."*

The *Water Quality Standards Handbook* (USEPA 1994) provides an explanation of the following three types of procedures available for use in developing a site-specific objective and a description of each procedure:

- The recalculation procedure is intended to take into account relevant differences between the sensitivities of the aquatic organisms in the national dataset and the sensitivities of organisms that occur at a site.
- The WER procedure is intended to take into account relevant differences between the toxicities of the chemical in laboratory dilution water and in site water.
- The resident species procedure is intended to take into account resident species sensitivity differences in biological availability and/or toxicity of a material due to variability in physical and chemical characteristics of site water.

A site-specific objective for dissolved copper in MdR Harbor will be developed using the WER procedure (USEPA 1994).

3.1.5 State Implementation Policy

The SIP provides information on the development of site-specific objectives, including an overview and decision tree of the site-specific objective process and related regulatory mechanisms. In Section 5.2, the SIP provides the use of "scientifically defensible methods appropriate to the situation to derive the objectives," and these methods are defined as "USEPA-approved methods (e.g., Water Effects Ratio [WER] procedure, recalculation procedure, a

combination of recalculation and WER procedures), and/or other methods specified in the work plan." The Work Plan will be developed based on USEPA's approved method, and this report is intended to facilitate approval for MdR site-specific objective development.

3.1.6 California Toxics Rule

The CTR allows a site-specific consideration using a WER procedure to implement metal criteria.

40 CFR Part 131 F(2)(c), emphasis added:

> *"In selecting an approach for implementing the metals criteria, the principal issue is the correlation between metals that are measured and metals that are biologically available and toxic. In order to assure that the metals criteria are appropriate for the chemical conditions under which they are applied, EPA is providing for the adjustment of the criteria through application of the 'water-effect ratio' procedure."*

Because the WER is incorporated in the CTR, the WER approach in the site-specific objective study is consistent with the site-specific consideration allowed in the CTR.

3.1.7 California Water Code

Section 13241 of the state Porter-Cologne Water Quality Control Act requires consideration of the following factors when establishing water quality objectives:

> *"Factors to be considered by a regional board in establishing water quality objectives shall include, but not necessarily be limited to, all of the following:*
>
> *(a) Past, present, and probable future beneficial uses of water.*
>
> *(b) Environmental characteristics of the hydrographic unit under consideration, including the quality of water available thereto.*
>
> *(c) Water quality conditions that could reasonably be achieved through the coordinated control of all factors which affect water quality in the area.*
>
> *(d) Economic considerations.*
>
> *(e) The need for developing housing within the region.*

(f) The need to develop and use recycled water."

Once the site-specific objective study is completed, these factors, if necessary, will be evaluated for adoption and approval via appropriate processes (e.g., a reopener of the MdR Harbor Toxic TMDL or an amendment to the Basin Plan).

3.1.8 Antidegradation Review

Under federal water quality standards regulations, water quality standards consist of designated uses, criteria to protect those uses, and an anti-degradation policy. An anti-degradation policy is "a policy requiring that state standards be sufficient to maintain existing beneficial uses of navigable waters, preventing their further degradation" (Public Utility District No. 1 of Jefferson County v. Washington Dept. of Ecology, 511 U.S. 705).

The State of California also has an antidegradation policy with respect to "maintaining high quality waters in California" (Resolution No. 68 68-16). This policy is incorporated into the state policy for water quality control and incorporated into all regional water quality control plans. Like the federal policy, it is applicable to point and nonpoint activities that could impact water quality.

An antidegradation review will be performed following the completion of the site-specific objective study and prior to the adoption of the site-specific objective.

3.1.9 Anti-backsliding Policy

The Clean Water Act and associated Federal Regulations, specifically 40 CFR 122.44(l)(1), provides that "when a permit is renewed or reissued, interim effluent limitations, standards, or conditions must be at least as stringent as the final effluent limitations, standards, or conditions in the previous permit" with exceptions as follows:

(i) "Exceptions—A permit with respect to which paragraph (l)(2) of this section applies may be renewed, reissued, or modified to contain a less stringent effluent limitation applicable to a pollutant, if—

(A) Material and substantial alterations or additions to the permitted facility occurred after permit issuance which justify the application of a less stringent effluent limitation;

(B) (1) Information is available which was not available at the time of permit issuance (other than revised regulations, guidance, or test methods) and which would have justified the application of a less stringent effluent limitation at the time of permit issuance; or

(2) The Administrator determines that technical mistakes or mistaken interpretations of law were made in issuing the permit under section 402(a)(1)(b);

(C) A less stringent effluent limitation is necessary because of events over which the permittee has no control and for which there is no reasonably available remedy;

(D) The permittee has received a permit modification under section 301(c), 301(g), 301(h), 301(i), 301(k), 301(n), or 316(a); or

(E) The permittee has installed the treatment facilities required to meet the effluent limitations in the previous permit and has properly operated and maintained the facilities but has nevertheless been unable to achieve the previous effluent limitations, in which case the limitations in the reviewed, reissued, or modified permit may reflect the level of pollutant control actually achieved (but shall not be less stringent than required by effluent guidelines in effect at the time of permit renewal, reissuance, or modification).”

This anti-backsliding requirement applies to an effluent limitation modification in permits, and it does not apply to the site-specific objective development for dissolved copper in MdR Harbor, because it is a water quality standard modification via the method already incorporated in the standard itself. Also, there is no prior permit with effluent limitations applicable to dissolved copper discharges from boats. Therefore, no anti-backsliding review is necessary for the development of the site-specific objective.

3.2 SIP Section 5.2(3)(b): Review of Historical Limits and Compliance with Those Limits

As discussed in Section 1.1 of this report, the 2005 Toxics TMDL did not have a limitation for dissolved copper in water column. The revised Toxics TMDL, adopted in 2014, contains the numeric target and an LA for dissolved copper in water column.

The County has been implementing the following actions to comply with the dissolved copper target in the revised Toxics TMDL:

- Partitioning coefficient study: The study documented concentrations of copper and partitioning coefficients in the sediment, water column, and stormwater of MdR Harbor. A final report was submitted to the Regional Water Board in December 2011.
- CMP: The monitoring requirements in the Toxics TMDL include two phases: ambient monitoring and effectiveness monitoring phases. The ambient monitoring was conducted per storm event from August 2010 through July 2014 to establish baselines for stormwater, harbor water and sediment, and fish and mussels qualities. To transition into the effectiveness monitoring, a pilot study was conducted to assess the effectiveness of various storm-borne sediment collection devices. The effectiveness monitoring was initiated in August 2014, and this monitoring phase added storm-borne sediment monitoring and increased the frequency of harbor sediment monitoring. The effectiveness monitoring phase also eliminated the harbor water quality monitoring requirement.
- Site-specific objective study: The County is preparing to initiate the study to develop a site-specific objective for dissolved copper in MdR Harbor.
- Hull paint conversion of County's vessels: In approximately 2013, the County Sheriff's Department converted three of their fiberglass boats and the Los Angeles Department of Beaches and Harbors converted one fiberglass boat that had copper leaching hull paints (Interlux Trilux 33) to non-copper organic biocide-based paints (Interlux Micron CF and most recently to Pettit Hydrocoat ECO).

Further, the County has been actively conducting public outreach and has developed a public outreach plan that has included and will continue to include the following:

- Educational materials developed and planned for production:
  - "MdR TMDL Basics for Boaters" fact sheet (2016). This fact sheet was developed to inform the boating community about the details of the TMDL and identify what changes may be necessary in the future. To date, 1,650 have been distributed.
  - "Boater's Guide to Using Hull Paint in California" brochure (2016). This brochure was developed in collaboration with the Port of San Diego, California State Parks, Division of Boating and Waterways, and the California Coastal Commission, to inform the boating community about the different types of paints available (non-biocide, non-copper biocide, lower leach rate copper, and higher leach rate copper) and the paints' potential environmental impacts. To date, 2,250 flyers have been distributed.
  - Boater survey (2016). This survey was developed to collect boater habits information in order to understand how well the boating community is informed with regard to the TMDL and to understand their willingness to participate in boat lift and low-leach rate copper paint programs. To date, 1,950 hard copy surveys have been distributed, and an online "Survey Monkey" version was distributed to boaters electronically through their marina managers. To date, 150 completed surveys have been collected.
  - "MdR Harbor Copper Impairment Facts" flyer (2016). This flyer was developed to inform the boating community of the copper impairment in MdR Harbor. To date, 1,050 have been distributed.
  - In-water hull cleaning fact sheet. This fact sheet will be designed to inform the boating community about in-water boat hull cleaning frequency and methods.
  - Boat lifts fact sheet. This fact sheet will be designed to inform the boating community about the benefits of using a boat lift from both a cost and environmental standpoint.
  - The fact sheets, along with other educational materials, will also be posted to the County web site currently under development.

- Workshop:
  - February 7, 2015. Options for Reducing Copper Levels in Marina del Rey Workshop. The County sponsored a workshop for presentations and discussion of alternatives to copper antifouling hull paints that included operation and maintenance considerations. The workshop included guest speakers and six activity stations.
- Booths:
  - March 21, 2015. Hosted a booth to inform the boating community about MdR Harbor TMDLs at the Windward Yacht Center Maintenance event.
  - April 10, 2015. Hosted a booth to inform the boating community about MdR Harbor TMDLs at the Los Angeles Marina Fest Boat Show.
  - October 11, 2015. Hosted a booth to inform the boating community about MdR Harbor TMDLs at Discover Marina del Rey Day.
  - February 27 to 28, 2016. Hosted a booth to inform the boating community about MdR Harbor TMDLs at the Los Angeles Boat Show. Distributed the Boater Survey, "Boater's Guide to Using Hull Paint in California" brochure, and the "Marina del Rey Copper TMDL Basics for Boaters" brochure at the event.
  - April 9, 2016. Hosted a booth at the Marina del Rey Harbor Farmers Market. Distributed "Boater's Guide to Using Hull Paint in California" brochure and Boater Survey.
  - June 4, 2016. Hosted a booth at MarinaFest. Informed the boating community about Marina del Rey TMDLs and the Clean Marina Program. Distributed the Boater Survey, "Boater's Guide to Using Hull Paint in California" brochure, and the "Marina del Rey Copper TMDL Basics for Boaters" brochure at the event.
  - July 7, 2016. Hosted a booth at the Oxford Basin Grand Opening. Distributed informational materials related to the MdR Harbor Toxics TMDL. Materials distributed include: "Marina del Rey Copper TMDL Basics for Boaters" brochure, "Boater's Guide to Using Hull Paint in California" brochure, and "Marina del Rey Harbor Copper Impairment Fact Sheet."
  - The same booths at all annual events are planned.

- Presentations:
  - May 13, 2015. Presented the status of the County's progress toward TMDL compliance at the Lessees Association meeting at California Yacht Club.
  - May 21, 2015. Presented the status of the County's progress toward TMDL compliance at the Marina Managers meeting at Avalon Marina Bay.
  - June 18, 2015. Presented the status of the County's progress toward TMDL compliance at the Lessees TMDL Sub-Committee meeting at the County.
  - July 13, 2015. Presented the status of the County's progress toward TMDL compliance to Los Angeles Waterkeeper staff.
  - August 12, 2015. Presented an update of TMDL activities at the Small Craft Harbor Commission meeting.
  - October 6, 2015. Presented an overview of the actions taken relative to the copper TMDL at the California Association of Harbor Masters and Port Captains meeting.
  - October 21, 2015. Presented an update to the International Paint and Printing Ink Council's Antifouling Coatings Subcommittee on TMDL efforts in MdR Harbor and the status of the water quality study.
  - January 21, 2016. Presented County TMDL efforts at the California Marina Affairs and Navigation Conference at Marina del Rey Hotel.
  - June 15, 2016. Presented County TMDL efforts at the Harbor Masters and Port Captains meeting at Marina del Rey Beaches and Harbors.
  - Other monthly presentations
- Meetings:
  - April 7, 2015. Meeting with the Unified Port of San Diego to discuss lessons learned from the Port's copper reduction program.
  - June 16, 2015. Meeting with Public Outreach on Copper Issue Group that comprises the Regional Water Board, DPR, and other stakeholders.
  - July 17, 2015. Meeting with Clean Marinas Board and marina managers to discuss the TMDL program and Clean Marinas certification.
  - July 29, 2015. Meeting with Public Outreach on Copper Issue Group.
  - August 25, 2015. Meeting with Public Outreach on Copper Issue Group.
  - September 30, 2015. Meeting with Public Outreach on Copper Issue Group.

  - February 24, 2016. Meeting with marina managers representing Waves MDR, Esprit I, Mariners Bay, and Windward Yacht Center to drop off the Boaters Survey and the "Boater's Guide to Using Hull Paint in California" brochure materials, as well as to discuss other ongoing County efforts for water column copper reduction.
  - February 25, 2016. Meeting with marina managers representing Marina Harbor Anchorage, Marina City Club Marina, and the California Yacht Club to drop off the Boaters Survey and the "Boater's Guide to Using Hull Paint in California" brochure materials, as well as to discuss other ongoing County efforts for water column copper reduction.
  - Other meetings as required.

- Boating community outreach:
  - July 2016. A dock walking program related to the TMDL, boat lift program, and paints was developed and implemented. County staff walked the docks, handed out flyers, fact sheets, and surveys, and engaged with boaters to answer questions related to the TMDL and environmental compliance programs available.

- Boatyards:
  - March 23, 2015. Meeting with the Boat Yard-MdR to discuss hull painting options and constraints relative to the boatyard.
  - Monthly coordination with the boatyards.

- Conferences:
  - October 28, 2015. Attended the Marina Recreation Association Mission Possible conference. The conference included a workshop session on boat hull paints presented and moderated by DPR and paint manufacturer Pettit.
  - Upcoming conferences, as available.

The County has engaged the consulting firm RMC Water and Environment to act as a TMDL manager on their behalf, specifically to address the Toxics TMDL. In addition to the public outreach elements described above, the County has recently applied for grant funding for the following two studies:

- MdR Harbor Boat Lift Program: The County is being awarded funding through the State Water Board 319(h) grant program to provide a financial incentive to enable

MdR Harbor boat owners to use inflatable boat lifts. The program is designed for 5% of the required Toxics TMDL reduction in copper discharge to MdR Harbor water. A component of the program will involve public outreach conducted in coordination with the Bay Foundation.

- Hydrodynamic Fate and Transport Modeling for Dissolved Copper Mitigation Strategies in the MdR Harbor: The County applied for grant funding through DPR's Pest Management Research Grant Program to conduct a hydrodynamic fate and transport study of dissolved copper in MdR Harbor. The project will involve the development of a grid-based two-dimensional hydrodynamic model of MdR Harbor to better understand how copper moves through the water column. Once developed, the project will use the model to assess the effectiveness of potential long-term mitigation strategies.

The County has drafted a hull cleaning ordinance designed to require the use of BMPs for in-water hull cleaning. The draft is currently under review and will be presented for public input in spring of 2017 to various stakeholder groups.

The County is looking into the feasibility of acquiring a Scandinavian-designed drive-in boat wash within MdR Harbor that would reduce copper inputs during hull cleaning.

3.3 SIP Section 5.2(3)(c): Review of Current Technology and Technology-based Limits

Technology-based limits suggested in SIP Section 5.2(3)(c) are technology-based "effluent" limits in National Pollutant Discharge Elimination System (NPDES) permitting. As discussed in Section 3.2 of this report, the Toxics TMDL contains the CTR CCC for dissolved copper in the water column, which is a water quality-based limit, and there is no applicable technology-based limit for dissolved copper in MdR Harbor that is required for review under SIP Section 5.2(3)(c) and the Basin Plan.

As discussed in Sections 1.1 and 1.2 of this report, the revised Toxics TMDL requires a reduction of dissolved copper load by 85% from the current baseline. The TMDL LA is

expected to be achieved through the conversion of 85% of the boats to non-copper-based AFPs or the conversion of 100% of the boats to paint that discharges 85% less copper.

This section provides an evaluation of constraints to the TMDL compliance schedule using currently available mitigation measures. This section first summarizes the determination of copper as a source to the water column from leaching from antifouling boat hull paints. Following that is a summary of the available mitigation measures to address copper leaching from AFP.

3.3.1 Copper-based Antifouling Paints

The Regional Water Board staff report *Reconsideration of the Total Maximum Daily Load for Toxic Pollutants in Marina del Rey Harbor* (Staff Report; Los Angeles RWQCB 2013) identified three sources for copper to the receiving water of MdR Harbor: 1) AFP from boats; 2) stormwater; and 3) atmospheric deposition. In the Staff Report, the amount of copper entering MdR Harbor from copper-based hull paints was estimated using a model previously used in the Shelter Island Yacht Basin TMDL (San Diego RWQCB 2005) and USEPA's Newport Bay Toxics TMDL (USEPA 2002). In the Technical Report to the Shelter Island Yacht Basin TMDL (San Diego RWQCB 2005), 95% of copper loading was estimated from passive leaching from boats, and 5% of the loading was estimated from hull cleaning based on Schiff et al. (2004). The Staff Report to the revised Toxics TMDL (Los Angeles RWQCB 2013) states that 94% of copper loading was estimated from passive leaching, and 6% of the loading was estimated from hull cleaning in MdR Harbor. Regardless of the means (passive or active), copper in AFP is believed to be the predominant source.

The Staff Report (Los Angeles RWQCB 2013) stated that copper is the primary constituent used in most biocidal AFPs by citing a USEPA report (USEPA 2011a). While boat hulls in MdR Harbor have not been tested to confirm the presence of copper in the AFPs, copper is currently used in 90% of marine AFPs in California and worldwide (Singhasemanon et al. 2009; Blossom 2015). Therefore, it is appropriate to assume the majority of boats in MdR Harbor also use copper-based AFPs.

3.3.2 Mitigation Measures to Address Copper Leaching from Antifouling Paint

This section reviews currently available mitigation measures to reduce copper leaching from AFP. The review includes the following:

- Maximum allowable copper leach rate for AFPs set by DPR
- Non-copper-based paints
- Available BMPs to reduce discharges of copper from boat hulls

3.3.2.1 Maximum Allowable Copper Leach Rate for Antifouling Paints

Required by Assembly Bill (AB) 425, DPR established a leach rate for copper-based AFP used on recreational vessels and made recommendations for appropriate mitigation measures that may be implemented to protect aquatic environments from the effects of exposure to copper from registered AFP.

DPR 2014, pages 3 to 4:

1) *"Require copper antifouling paint registrants reformulate existing products that have leach rates above the leaching threshold set by DPR per AB 425*
2) *Require in-water hull cleaners to implement best management practices for in-water hull cleaning*
3) *Reduce in-water hull cleaning frequency to no more than once per month*
4) *Include painted-hull maintenance information as part of product labels*
5) *Develop for distribution hull maintenance brochures to be provided to boaters via boat yards at the time of painting*
6) *Increase boater awareness and acceptance of copper AFP (antifouling paint) alternatives*
7) *Foster new incentive programs and continue support for existing programs to convert copper-painted boat hulls to those painted with alternatives"*

DPR set a maximum allowable copper leach rate for AFPs at 9.5 μg/square centimeter (cm^2)/day for paints that require hull cleaning. The proportion of paints that are greater than 9.5 $\mu g/cm^2$/day is estimated to be approximately 42% (80 of 190) of copper-based AFPs that were active in DPR AFP registration as of December 10, 2014 (DPR 2015). The proportion of

boats in MdR Harbor with elevated leachate rates is unknown, but it can be estimated to be similar to or higher than the proportion in the state because higher copper concentration paints are often preferred in warmer waters, like that of Southern California. Therefore, the eventual conversion of boats with higher copper paints to lower copper paints will be realized as the higher copper paints are removed from the common market. As stated in the State Water Board's Resolution 2014-0049 (see Section 1.2 of this report for the excerpts), DPR's maximum allowable leach rate is not designed to achieve the dissolved copper TMDL allocations necessary to meet water quality objectives in the largest marinas in California, including MdR Harbor. DPR acknowledged that the implementation of the AFP reformulation and other mitigation approaches recommended by DPR may not achieve the current CTR CCC for copper of 3.1 µg/L at all times in MdR Harbor and recommended considering site-specific objectives for copper in MdR Harbor using USEPA's WER method or BLM.

DPR also set a recommendation for in-water hull cleaners to follow the California Professional Divers Association's (CPDA) BMP method (2008) of using soft-pile carpet and not cleaning more frequently than once per month. Although DPR recommended hull cleaning less than once per month, an optimum hull cleaning frequency will depend on various factors such as types of paints, locations of marinas, water temperature, seasons, and types of hull cleaning methods. For instance, boats in marinas in a warmer climate may need more frequent cleaning due to higher growth rates of fouling organisms than other marinas in a cooler climate. In addition, the use of soft pads for hull cleaning actually requires more frequent cleaning to prevent buildup of fouling organism. At a workshop provided by the University of California and the County on February 7, 2015, a CPDA representative recommended hull cleaning using soft pads or used carpets once every 2 weeks for boats in MdR Harbor.

Appendix 2 to DPR 2014, page 3, emphasis added:

> *"Recommendation #8: Dischargers consider site-specific objectives for copper for marinas or harbors that have extremely high boat density and very poor flushing.*
>
> *Primary Parties Involved: Dischargers, TMDL responsible parties, and Water Boards Rationale: Modeling by DPR suggests that some marina locations (e.g., Marina del Rey) may not achieve the current California Toxics Rule chronic water quality criterion for*

copper of 3.1 µg/L at all times even with the implementation of copper AFP [antifouling paint] reformulation and other mitigation approaches outlined in this document. Therefore, dischargers or TMDL responsible parties may consider pursuing site specific objectives (SSOs), which are allowed under the Water Boards' Basin Plans. Moreover, these parties could potentially rely on the Water Effects Ratio approach or on the marine Biotic Ligand Model (if and when it is accepted by USEPA) as the basis for the SSOs. DPR's analysis using the draft marine Biotic Ligand Model for many California coastal marinas suggests that this approach could raise the compliance threshold to a level higher than the current 3.1 ppb criterion."

3.3.2.2 Review of Non-copper-based Alternative Boat Hull Paints

For many years, copper-based AFPs have been used to protect hulls of marine vessels from excessive fouling. The paints are designed to leach copper gradually over time into water, and the released copper acts as a biocide to prevent marine organisms from attaching to boat hulls. The average life of copper-based paint is 2 to 3 years before repainting, according to CalEPA (2011), and 3 to 4 years before repainting, according to a boat yard located in MdR Harbor.

Due to environmental concerns regarding the effect of copper on aquatic life, non-copper-based boat hull paints were developed. These non-copper-based paints can be classified in the following categories (CalEPA 2011):

- Zinc biocide paint: generally contains zinc pyrithione as a zinc biocide and also often contains zinc oxide that functions as an adjuvant or a material that aids in the effect of another component.
- Zinc-oxide-only paint: contains no biocides and zinc acts as a catalyst in the formation of hydrogen peroxide which appears to repel fouling.
- Organic biocide paint: often contains Econea, a new organic biocide that has emerged in the last several years and also generally contains zinc oxide.
- Zinc/organic biocide combination paint: contains both zinc and organic biocides.
- Soft non-biocidal paint: contains no biocides or zinc oxide and is based on silicone compounds and/or fluoropolymers. These types of paint do not function by releasing chemicals to prevent organisms from attaching to the boat hull but rather as a

non-stick surface which makes it more difficult for fouling organisms to attach and easier to remove fouling organisms that have attached on the surface.

- Hard non-biocidal paint: contains no biocides but instead contains epoxy and sometimes ceramic to prevent organisms from fouling the hull.

Evaluation of these non-copper-based antifouling or foul-controlling paints as alternatives to copper-based paint was conducted in three studies commissioned by USEPA, CalEPA's Department of Toxic Substances Control, and Ecology. In the USEPA study (2011b), 46 paints, which included biocidal paints based on copper and zinc and non-biocidal paints, were evaluated. In the CalEPA study (2011), only non-biocidal paints were evaluated. Based on the USEPA and CalEPA studies, Ecology commissioned a study (Ecology 2014) to further evaluate six potential paints to compare to copper AFP.

Findings from the three studies are summarized below:

- In the USEPA (2011b) study, two paints were found to be effective in replacing copper-based paints: Intersleek 900 and Hempasil X3. Intersleek 900 is currently available and has undergone reformulation since 2011.
- In the CalEPA (2011) study, the researchers found that XP-A101, Hempasil XA 278, BottomSpeed, and Sher-Release performed the best. XP-A101 and Hempasil XA278 have since been removed from the market; BottomSpeed and Sher-Release are currently available.
- In the Ecology (2014) study, three non-biocidal paints, Intersleek 900, BottomSpeed TC Base Coat/Top Coat Clear, and Surface Coat Part A – Black, showed positive results.

3.3.2.3. Evaluation of Boat-hull Conversion to Non-biocidal Paint in Southern California

This section summarizes findings from the conversion of boats to non-copper-based paint conducted in Shelter Island Yacht Basin, San Diego, and MdR Harbor. Conversion to non-copper paints has been shown to be technically feasible in both locations, but data on performance and durability are too limited to draw general conclusions. In the MdR Harbor, some boats have converted to non-copper antifouling paints. In 2013, the County Sheriff's Department converted three of their fiberglass boats and the Los Angeles Department of

Beaches and Harbors converted one fiberglass boat that had copper leaching hull paints (Interlux Trilux 33) to non-copper organic biocide-based paints (Interlux Micron CF and most recently to Pettit Hydrocoat ECO). This paint so far needs to be repainted every 9 months and cleaned once per month in the winter and twice per month in the summer. The Sheriff's department reported that the cleaning frequency for copper and non-copper paints is about the same (as often as twice per month). LA Waterkeeper switched their boat to Pettit Vivid Free 4 years ago. This paint needed repainting every 2 years but did need not require cleaning with frequent use. Two years ago, LA Waterkeeper repainted the boat with HullSpeed 3000-series, which is working well so far. The hull needs to be cleaned once per month despite frequent use, but the paint is supposed to last 7 years before repainting is needed. The County will continue to track the effectiveness of non-copper paints on these boats as part of the planned pilot study.

The Port of San Diego's Hull Paint Conversion project, funded through the 319(h) Nonpoint Source Pollution Prevention Grant Program, helped the conversion of 41 vessels in Shelter Island Yacht Basin using non-biocidal hull paints from 2012 to 2015 (San Diego Unified Port District 2015). A majority of conversions (27 of 41 vessels) were carried out in 2013. Non-biocidal paints used in the conversion are shown in Table 2.

Table 2
319(h) Hull Paint Conversion in Shelter Island Yacht Basin

Year	Number of Boats	Non-biocidal Hull Paint Applied
2012	3	2 – Intersleek 900 1 – VC Performance Epoxy
2013	26	1 – CeramKote 2 – Pettit White Epoxy 23 – Intersleek 900
2014	5	1 – Intersleek 900 2 – CeramKote 1 – Micanti Thorn-D 1 – VC performance Epoxy
2015	7	4 – CeramKote 1 – Proline/Y3066/Primer/White 2 – Intersleek 900

Source: San Diego Unified Port District 2015

Hulls of the converted vessels with non-biocidal paints were cleaned every 2 to 3 weeks on average (Holeman 2015). The project had an original total budget of $833,800; $600,000 in State grant funds accounted for 72% of the overall budget, and the Port's matching funds accounted for the remaining 28% ($233,800).

3.3.2.3 Available Best Management Practices to Reduce Discharges of Copper from Boat Hulls

3.3.2.3.1 Underwater Hull Cleaning Best Management Practices

In addition to passive leaching of copper from the paints, hull cleaning of the vessels by divers using abrasive tools can also contribute to copper (mostly as particulate copper) in MdR Harbor. The CPDA developed a handbook of BMPs for boat hull cleaning in response to water quality concerns (CPDA 2008). The *CPDA Hull Cleaning Best Management Practices Certification Manual* describes certain cleaning tools and specifies hull cleaning industry standards. Research by the University of California Cooperative Extension concluded that the BMPs used by the CPDA, a schedule of frequent cleanings with the softest tool possible, is effective at cleaning boat hulls in water and minimizing the release of copper to the environment. Therefore, implementation of underwater hull cleaning BMPs can further reduce copper discharges to the marina. BMPs and hand cleaning tools are specified in various materials readily available to the public, such as the *CPDA Hull Cleaning Best Management Practices Certification Manual* (CPDA 2008), the California Division of Boating and Waterways' Boating Clean and Green Program website (2016), the California Coastal Commission BMPs for in-water hull cleaning (2012), and the California Coastal Commission Water Quality Factsheet (2011). Key BMPs for underwater hull cleaning are summarized as follows:

- Wait 90 days (a minimum of 60 days) after applying new paint before cleaning. New paints release more toxicants.
- Soft sloughing or ablative paints release toxicants and paint to water when cleaned. On these boats, clean only running gear and zinc anodes.
- Use only a piece of carpet, sponge, or other soft materials to clean the hull.
- Use soft nylon or similar material on rotary brush machines.
- Use stainless steel brushes and pads on non-painted metal areas only.
- Use more rigorous cleaning pads only as needed to remove hard marine growth.
- Do not sand or strip hull paint underwater.

- Bring zinc anodes back to shore; recycle or dispose of properly.
- Clean gently to avoid creating a plume or cloud of paint in the water.

3.3.2.3.2 In-slip Boat Lifts

An in-slip boat lift is designed to keep a boat out of water when not in use, so the boat hull does not contact the water and therefore no leaching occurs. Because the boat is not in contact with the water, fouling on the hull is prevented when on the lift, which reduces hull cleaning requirements. Vessel size, capital costs, marina lease restrictions, permit requirements, reduced accessibility to a boat, and maintenance costs are all factors that need to be evaluated to determine the feasibility of installing in-slip boat lift systems. A few examples of currently available in-slip boat lift systems include polyethylene air lift systems, locking block floating docks, and inflatable PVC systems. Prices typically range from $2,500 to $25,000, depending on the type of lift required to match vessel size and location. While AFP can be applied to some boat lifts, it is not required, and, according to boat lift owners and vendors, lifts can function properly with only occasional cleaning as recommended by the manufacturer.

Inflatable pillow-type boat lifts are a type of in-slip lift being investigated by the County as a feasible strategy for MdR boaters to reduce copper discharge. These types of lifts are less expensive than other alternatives, have low maintenance requirements, have minimal visual impact, and have received positive feedback from lift owners in the MdR Harbor that have had first-hand experience with the lifts. The County is applying for grant funding to help offset the cost to purchase these types of inflatable boat lifts for use by slip tenants. Contracts will be developed with anchorages that will include language requiring that no copper AFP be applied to the lift.

3.3.3 Feasibility to Achieve TMDL Compliance

3.3.3.1 Evaluation of Feasibility of Implementation Options

The County evaluated categories of implementation options as presented in the TMDL Substitute Environmental Documents (SED), which are provided as A through G shown below.

A. Implement financial incentives to encourage the use of alternative antifouling strategies

Alternative antifouling strategies available at this time include the use of boat lifts and the conversion from copper-based AFP to non-copper AFP or non-toxic boat hull paints. The County is currently being awarded grant funding to help reduce copper loading to MdR Harbor from copper-based AFP by providing a financial incentive to anchorage owners to purchase and use "pillow" type inflatable boat lifts. The County will continue to pursue available grants to offer financial incentives for promoting the use of non-copper and lower-leach rate copper AFPs. In the meantime, the County will continue its public outreach efforts to inform boaters of the environmental concerns in MdR Harbor and the available paints that may be able to mitigate future impacts, and begin the pilot program with a goal of converting 100 boats to non-biocidal paints.

B. Reduce effects of copper-based paints through management practices

The County drafted an ordinance that will require in-water hull cleaners to be trained and certified in the practice of using BMPs during in-water hull cleaning activities. The draft is currently under review and will be presented for public input in winter/spring of 2017 to various stakeholder groups.

C. Conduct boater education program

To date, the County has conducted one workshop, sponsored seven booths, presented at nine meetings, attended eight committee meetings, attended one conference, and is planning to continue similar efforts as well as to continue to develop and distribute at least six flyers and fact sheets and post web pages all related to the TMDL, as described in detail in Section 3.2. In addition, the County developed a program similar to the Dock Walker program, where the County sent qualified staff out to walk the docks around MdR Harbor to engage with the boating community in person and to explain and provide educational materials.

D. Commercial demonstrations and scientific studies

The County has in the past, is currently, and is planning on conducting a series of demonstrations and special studies. To date, the County has completed the directly related Partitioning Coefficient Study and CMP and is planning on conducting the Hydrodynamic Fate and Transport of Dissolved Copper in MdR Harbor study as described in Section 3.2, and

it also intends to test new paints as they come out for effectiveness and financial viability. The testing will be completed using a test boat that the County has already identified and dedicated to the project and will be documented through a series of memorandums.

E. Impose controls on MdR boat owners and marina owners and operators:
There are no current mechanisms for the County to impose controls directly on the boat owners to prohibit the use of copper-based paints beyond the state law. However, the County is leading public outreach and education programs within MdR Harbor and is developing incentive-based programs to motivate boaters, marina owners, and marina operators to use non-biocidal ATPs and copper-reducing BMPs. In addition, the County is currently developing an ordinance to require certification of boat hull cleaners.

In summary, the County has or is planning on implementing many of the options identified in the SED, including the following options:

- Securing grant funding for incentive programs
- Reducing copper discharges though management controls in the form of ordinances
- Conducting boater educations programs that include presentations, distribution of fact sheets and flyers, web pages, and in-person communication with the boating community at conferences, meetings, and docks.
- Conducting special studies to better understand the current state of MdR Harbor environmental impacts, future mitigation strategies, and the effectives of different options.

3.3.3.2 Anticipated Reduction in Copper Load from Implementation Actions

As described in the Staff Report (Los Angeles RWQCB 2013), there is a significant amount of dissolved copper loading to the water column attributed to leaching from boat hull paints (84% of total dissolved copper loading) and in-water boat hull cleaning (6% of total dissolved copper loading). The Staff Report presents mass-balance modeling of the MdR Harbor that suggests that the LA of copper to the water column is 547 kilograms (kg)/year to achieve the required CTR concentration of 3.1 µg/L. The report also presents calculations indicating that the existing condition of dissolved copper mass loading to the water column from boat hull paints is 3,390 kg/year and from in-water boat hull cleaning is 219 kg/year for a total mass loading of

3,609 kg/year. The difference between existing conditions mass loading and the LA indicates that there needs to be an 85% reduction in copper loading to the water column to achieve the CTR concentration.

To work toward the TMDL objective, the County is first planning the following four activities:

1. A boat lift program, where the County will subsidize the purchase of boat lifts for use by boaters through grant funding or other sources
2. Conversion to non-copper paints through the County's pilot program that has a goal of converting 100 boats to non-biocidal paints and the continuation of the public education and outreach.
3. Conversion to lower-leach rate copper paints because of the copper paint restrictions imposed by DPR (2014, 2015).
4. An in-water hull cleaning ordinance that requires the use of in-water hull cleaning BMPs

The implementation of these four preliminary mitigation measures are described as follows:

1. Boat lift program: Twenty-five percent[3] of the boats in MdR Harbor are of a size that is eligible for a boat lift. This will lower the loading sources from the estimated 4,754 boat hulls, as documented in the Staff Report, to 3,566. The County is currently being awarded grant funds through the State Water Board's Clean Water Act 319(h) Nonpoint Source Grant Program to subsidize boat lifts. The 3-year program is anticipated to begin in late April or early May 2017, following the execution of the grant agreement. The grant provides funds for approximately 200 boats. The estimated load reduction from the grant funded program is 142 kg/year and is provided in Table 3.
2. Conversion to non-copper paints: The primary method to reduce copper loading will be through the conversion of copper paints to non-biocidal paints. The County is developing a pilot program with the goal to convert 100 boats in the next 2 years,

[3] The County conducted a preliminary analysis of all the slips in the MdR Harbor using the County database to estimate how many boats would be eligible for the program. In order to work for this type of boat lift, the boat cannot have a non-retractable keel and needs to be less than approximately 50 feet in length. For estimating purposes, the County assumed that the subsidy would be primarily for boats approximately 35 feet and under. These boat lifts are designed to meet a number of dimensional requirements, including length, width, and weight, and a general assumption of 35 feet is best suited for the program, though longer boats can be eligible. The assumed number of vessels is based on County database files and estimated to be approximately 25% of the total number of slips.

when approved by County Supervisors. The estimated load reduction from the grant funded program is 71 kg/year and is provided in Table 3.

3. Conversion to low-leach rate copper paints: Approximately 4,754 boats will convert to low-leach rate copper paints with the phasing in the DPR policy. The Regional Water Board used a leach rate of 6.5 μg/cm^2/day in the original calculations of boat hull leaching loading based on the TMDL Staff Report, which is well below the 9.5 μg/cm^2/day recommended as the maximum leach rate by DPR (2014). The leach rate assumed for the loading calculation from the remaining boats (not part of the grant and pilot program) is 5.25 μg/cm^2/day, which is the average of the lowest leach rate, 1 μg/cm^2/day, and 9.5 μg/cm^2/day as reported in DPR (2014). It is anticipated that the new paints will be on the market in late 2017 and the old paints will begin to phase out. It is anticipated that all vessels will have compliant paints within 5 years. The estimated load reduction is 763 kg/year (3,390 - 2,627 kg/year) and summarized in Table 3.

   Loading from conversion to low leach rate copper paints:
   Annual dissolved copper load (kg/year) = P*N*S, and S = L*B*0.85

   where:

   P = Passive leaching rate = 5.25 μg/cm^2/day
   N = Number of vessels = 4,554
   L = Average length = 34.25 feet = 10.4 meters (m)
   B = Average beam width = 11 feet = 3.4 m
   S = Wetted hull surface area = (10.4 m)*(3.4 m)*(0.85) = 30.1 m^2

   Annual dissolved copper load = (5.25 μg/cm^2/day)*(30.1 m^2)*(4,554 vessels)* (10,000 cm^2/m^2)*(kg/10^9 μg)*(365 days/year) = 2,627 kg/year

4. In-water hull cleaning BMPs: The loading from hull cleaning was calculated using the loading rates for in-water hull cleaning using BMPs as described in the TMDL Staff Report as detailed below. The County is currently developing an ordinance to require certification of boat hull cleaners. It is anticipated that the ordinance will be presented to the County Supervisors for approval in the next 6 months. The reduced copper is assumed to be effective for all boats with copper paints compliant with DPR

leachate rate requirements. The estimated load reduction is 67 kg/year (219 - 152 kg/year) and summarized in Table 3.

Loading from In-water Hull Cleaning Calculation

Average dissolved copper emissions rate from epoxy paints = 8.6 μg/cm^2/event
Average dissolved copper emissions rate from vinyl paints = 3.8 μg/cm^2/event
Total average dissolved emission rate = (8.6 μg/cm^2/event + 3.8 μg/cm^2/event)/2 = 5.9 μg/cm^2/event

Annual dissolved copper load (kg/year) = P*Nv*Nh*S, and S = L*B*0.85

where:

P	=	Underwater hull cleaning rate[4] = 5.9 μg/cm^2/event
Nv	=	Number of vessels = 4,754
Nh	=	Number of cleaning events per year = 18 events/year
L	=	Average length = 34.25 feet = 10.4 m
B	=	Average beam width = 11 feet = 3.4 m
S	=	Wetted hull surface area = (10.4 m)*(3.4 m)*(0.85) = 30.1 m^2

Annual dissolved copper load = (5.9 μg/cm^2/day)*(30.1 m^2)*(4,754 vessels)* (10,000 cm^2/m^2)*(kg Cu/10^9 μg)*(18 events/year) = 152 kg/year

As Table 3 shows, the implementation of the four mitigation measures will result in a total annual copper load from copper-based AFP of 2,566 kg/year (2,414 kg/year from low-leach rate copper-based AFP and 152 kg/year from hull cleaning). This is approximately a 30% reduction in copper; the TMDL estimates an 85% reduction is needed to achieve the CTR requirement.

[4] Recent studies have been published that suggest further loading reductions may be calculated using the revised leachate values for the use of boat hull cleaning BMPs, developed by Early et.al. (2013). The Earley (2013) study suggests boat hull cleaning using BMP methods (soft cloths) results in 25.6% and 31.9% less dissolved copper into the water column for epoxy and ablative-type paints, respectively, than for boat hull cleaning using non-BMP methods. This adjustment could be made to the daily leach rate or to the calculated loading (in pounds)/year for specific types of paint. The County's pilot study will survey the boaters to estimate the type of paint currently used to estimate the effectiveness of this boat hull cleaning BMP as well as the use of additional BMPs recommended by DPR.

Table 3
Water Column Dissolved Copper Loading Summary

Preliminary Mitigation Measures	Schedule	Current Baseline Load	Estimated Load Reduction from Mitigation Strategies	Estimated Loading After Preliminary Mitigation Measures	Load to Comply with TMDL 85% Reduction (TMDL-required Load Allocation)	Difference Between Future Load and TMDL Required Load
Boat Lift Grant Program	Within 3 years, April 2020	3,390	142	2,414	**547** (85% reduction from the current baseline load)	**2,566 – 547 = 2,019**
Pilot conversion program	Within 2 years[1], April 2019		71			
Conversion to low leach rate copper paints (DPR Regs)	Within 5 years, April 2022		763			
Hull cleaning	Within 6 months[1], October 2017	219	67	152		
Total		**3,609**	**1,043 (29% load reduction)**	**2,566**		

Notes:
1 With County Supervisor approval
Measurements are copper kilograms/year

3.3.3.3 Challenges in Timely Compliance with the TMDL Implementation Schedule

As discussed previously, several BMPs are available to limit copper leaching, but none eliminate copper except the conversion to non-copper-based paints. While several types of non-copper paints are currently available and appear to be feasible for some applications (based on short-term data), boatyard capacity in MdR Harbor is one of the most significant challenges. MdR Harbor has two full service boatyards: The Boat Yard-MdR and Windward Yacht Center, which are fully equipped to handle all vessel types moored in MdR Harbor. The two boatyards

combined handle approximately 1,550 boats, with 60% of the boats receiving routine bottom painting that does not require stripping a hull. Both boatyards are currently operating close to their peak capacity; they have stated between 100 and 200 boats can hypothetically be converted annually to an alternative paint. The number of boats in MdR Harbor changes year to year, but the number of slips in the harbor is around 4,700. For these analyses, it is assumed all conversions are conducted within MdR Harbor for vessels that reside in MdR Harbor. A boater behavior survey will be conducted as part of the County's pilot study to gain a clear understanding of the costs and logistical constraints of using boatyards outside of MdR Harbor.

The capacity of local boatyards in MdR Harbor could increase, which may reduce the time needed to comply with the TMDL. At this time, an increase in the capacity of the existing MdR Harbor boatyards is not planned due to space constraints, length of time remaining on existing leases, and County land use and zoning regulations. The existing boatyards are at the capacity for their facility size. Additional land space is not available for expansion. The County will continue exploring options to increase the capacity in the future and working with boaters and boatyards.

3.4 SIP Section 5.2(3)(d): An Economic Analysis of Compliance with the Priority Pollutant Criterion or Objective of Concern

The County has committed funds to meet water quality objectives through various regulatory pathways, from waste discharge requirements permits to municipal separate storm sewer system compliance requirements to toxic TMDL monitoring and special studies. To address dissolved copper water quality within the Toxic TMDL, the County has hired consultants, implemented numerous public outreach, is developing site-specific studies (including the site-specific objectives), and converted the County's vessels to non-copper-based paints (see Section 3.2). This section provides the best estimate of boat conversion and maintenance costs with currently available technologies.

In this section, the estimated cost to convert boats to non-copper-based paints is discussed based on cost estimates and assumptions from USEPA (2011b), CalEPA (2011), and San Diego Unified Port District (2015). All three evaluations shared the same assumptions and information collected from local boatyards in San Diego and paint vendors, as well as

findings from the alternative hull paint studies (USEPA 2011b; CalEPA 2011). The estimated costs for one-time painting, hull cleaning, and stripping of hull paint were summarized for copper-based AFP and non-copper-based paints.

3.4.1 One-time painting Cost

When-copper based AFP is applied at boatyards, a boat is hauled out of water and then it is hydrowashed to remove any excess fouling and loose coating that might be on the hull. The areas where paint is peeling are sanded, and an epoxy primer is applied to the sanded spots. After this preparation, one layer of copper-based top coat is applied to the hull by rolling (USEPA 2011b). The painting cost for copper-based AFP included costs for haul-out, minimal preparation work, and a single coat of copper paint (p. 5-5 in USEPA 2011b; p. 37 in CalEPA 2011). Painting costs were obtained from five different boatyards in San Diego (Table 4).

Table 4
Costs of One-time Painting for Copper-based AFP from Five Boatyards in San Diego

Boatyard	30-Foot Boat		40-Foot Boat	
	Cost/foot	Total Cost	Cost/foot	Total Cost
1	$37	$1,110	$43	$1,720
2	$36	$1,080	$42	$1,680
3	$29	$870	$34	$1,360
4	$36	$1,080	$27	$1,080
5	$35	$1,050	$40	$1,600
Average		**$1,038**		**$1,488**

Source: Table 5-1 in USEPA 2011b
Notes:
Based on haul-out, hydrowash, and one coat of copper paint
AFP = antifouling paint

Painting costs for eight non-copper-paints, including three soft non-biocidal paints and one hard non-biocidal paint, were estimated for 30-foot and 40-foot boats in Table 5. The estimated costs were based on different painting methods assumed for each paint in the studies (rolled or sprayed). The non-biocidal paints require more complex application methods, including stripping a boat hull, using more paint and more paint systems including sealer/primer and top coasting, and using spray application (p. 5-3 in USEPA 2011b). Spraying is typically more

expensive than rolling (e.g., an additional $1,000 for a 30-foot boat [p. 24 in CalEPA 2011]). It should be noted that suppliers of non-copper-based paints recommend that the non-biocidal paints be applied using spray rather than rollers (p. 5-8 in USEPA 2011b). Nonetheless, the USEPA 2011b study assumed that three of four non-biocidal paints could be applied via rolling and Intersleek 900 could be applied using both methods. For each paint and painting method, two cost estimates were provided, identifying two scenarios: 1) stripping of existing hull paint is required prior to new painting (stripped); and 2) stripping is not required (not stripped).

Table 5
Average One-time Painting Cost

Hull Paint		Assumed Painting Method[1]	Average Painting Cost (from five boatyards)[2]			
			30-Foot Boat		40-Foot Boat	
Paint Category	Paint Name		Not Stripped	Stripped	Not Stripped	Stripped
Copper AFP	Copper AFP[3]	Rolled	$1,038	NA	$1,488	NA
Soft non-biocide	Red Hempasil X3	Sprayed	$3,858	$6,358	$4,917	$8,537
	Intersleek 900	Sprayed	$2,922	$5,512	$4,113	$7,733
		Rolled	$2,286	$4,556	$3,413	$6,713
	Klear N' Klean	Rolled	$2,001	$4,268	$3,013	$6,313
Hard non-biocides	VC Performance Epoxy	Rolled	$1,875	$3,915	$2,303	$4,935

Source: USEPA 2011b
Notes:
1 P. 5-8 and Table 5-5
2 Tables 5-6 and 5-7
3 A paint name for copper AFP was not disclosed in USEPA 2011b, CalEPA 2011, and San Diego Unified Port District 2015
AFP = antifouling paint
NA = A cost was not provided in the references

3.4.2 Hull Cleaning Cost and Frequency

For calculating a hull cleaning cost, a total of 15 times annually (every 4 weeks in the winter and every 3 weeks in the summer) was assumed as the baseline cleaning frequency for a boat hull with copper-based AFP (p. 5-1 in USEPA 2011b). Cleaning costs presented in three studies that were obtained from three hull cleaners are summarized in Tables 6 and 7 for 30-foot and 40-foot boats, respectively. According to information from the same three hull cleaners, cleaning frequencies for the types of non-copper-based paints varied and, consequently, cleaning cost varied (Tables 6 and 7; p. 5-3 in USEPA 2011b).

Table 6

Hull Cleaning Frequency and Cost for 30-Foot Boats

Type of Paint	Hull Cleaner	Number of Cleanings per Year	Total Annual Cost	
			Sailboats	Powerboats
Copper AFP	1	15	$652.50	$742.50
	2	15	$562.50	$675.00
	3	15	$562.50	$675.00
	Average	–	$592.50	$697.50
Hard non-biocides[1]	1	18	$783.00	$891.00
	2	26	$975.00	$1,170.00
	3	37	$1,387.50	$1,665.00
	Average	–	**$1,048.00**	**$1,242.00**
Soft non-biocide[2]	1	15	$652.50	$742.50
	Average	–	**$652.50**	**$742.50**

Source: Table 5-10 in USEPA 2011b
Notes:
1 Includes VC Performance Epoxy
2 Includes Red Hempasil X3, Intersleek 900, and Klear N' Klean
AFP = antifouling paint

Table 7

Hull Cleaning Frequency and Cost for 40-Foot Boats

Type of Paint	Hull Cleaner	Number of Cleanings per Year	Total Annual Cost	
			Sailboats	Powerboats
Copper AFP	1	15	$870.00	$990.00
	2	15	$750.00	$900.00
	3	15	$750.00	$900.00
	Average	–	$790.00	$930.00
Hard non-biocides[1]	1	18	$1,044.00	$1,188.00
	2	26	$1,300.00	$1,560.00
	3	37	$1,850.00	$2,220.00
	Average	–	**$1,398.00**	**$1,656.00**
Soft non-biocide[2]	1	15	$870.00	$990.00
	Average	–	**$870.00**	**$990.00**

Source: Table 5-11 in USEPA 2011b
Notes:
1 Includes VC Performance Epoxy
2 Includes Red Hempasil X3, Intersleek 900, and Klear N' Klean
AFP = antifouling paint

3.4.3 Stripping Cost and Frequency

Stripping of a boat hull is recommended after multiple paint applications to remove built-up paint. In general, it is recommended to strip a hull after five paint applications for a boat with copper-based AFP, which is roughly 10 to 15 years based on copper-based AFP being repainted every 2 to 3 years (USEPA 2011b). The boatyards in San Diego reported that boat hulls are typically stripped every 15 years (p. 2-10 in USEPA 2011b). As discussed previously, manufacturers of the non-biocidal paints recommend stripping existing paint before painting the non-biocidal paints.

Most of the boatyards strip boat hulls using either chemical stripping or hand sanding (p. 24 in CalEPA 2011). Although CalEPA (2011) investigated abrasive blasting methods and costs, it is not permitted in MdR Harbor under South Coast Air Quality Management District Regulation Rule 1140 – Abrasive blasting.[5] Thus, costs for only the chemical stripping and hand sanding, which are permitted in MdR Harbor, are discussed here. The average costs of either chemical stripping or hand sanding from five boatyards in San Diego are $2,280 for a 30-foot boat ($76 per foot) and $3,400 for a 40-foot boat ($85 per foot; Table 8; p. 24 in CalEPA 2011).

Table 8
Stripping Costs from Boatyards in San Diego

Boatyard	30-Foot Boat	40-Foot Boat
1	$85/foot	$95/foot
2	$65/foot	$65/foot
3	$3,200	$4,600
4	$1,700	$3,500
5	$65/foot	$60/foot
Average	**$76/foot**	**$85/foot**

Source: Table 5-15 in USEPA 2011b

These average costs were used in the estimated costs for painting under the scenario of required stripping presented in Table 5. This is similar to the costs provided by a boatyard in MdR Harbor of $4,000 for stripping of a 40-foot boat.

[5] http://www.arb.ca.gov/DRDB/SC/CURHTML/R1140.HTM

3.4.4 Long-term Cost over 30 Years

In USEPA 2011b, a total cost over 30 years to paint and maintain a boat was estimated as the long-term cost for each of the paints using the estimated annual hull cleaning cost and the estimated one-time painting cost discussed in previous sections. Half of a typical boat life (60 years) was assumed as 30 years to calculate the long-term cost. In all cases, it was assumed that a boat hull would be stripped twice during the timeframe of 30 years and that all other painting did not require stripping a boat hull. The total number of painting applications required for each paint varies, depending on the life of the paint in Table 9 (p. 5-4 in USEPA 2011b). In USEPA 2011b, the lives of copper-based AFP and non-copper-based paints were estimated based on input from paint suppliers and experience during the alternative paint testing during the studies in Shelter Island Yacht Basin (Table 9).

Table 9
Life of Paints Used in Cost Estimates

Paint Category	Paint Name	Life of Paint (years)
Copper AFP	NA	2-3
Soft non-biocide	Red Hempasil X3	7.5-10
	Intersleek 900	5-10
	Klear N' Klean	2-5
Hard non-biocides	VC Performance Epoxy	5-10

Source: Table 5-8 in USEPA 2011b
Notes:
AFP = antifouling paint

To sum the one-time painting cost (Table 5) and the annual cost for hull cleaning (Tables 6 and 7), painting cost was amortized to calculate annualized painting cost. Amortizing involves paying off the cost of an asset gradually by payments of principal and interest. In USEPA 2011b, the painting cost was considered to be paid off over 30 years using a 4% cost of capital.[6] Then the annualized painting cost was added to the annual hull cleaning cost to obtain an annualized total cost over 30 years for a 30-foot boat (Table 10). USEPA 2011b provided only the annualized cost over 30 years and did not provide 30-year total cost. The

[6] "This is the rate of return that could be earned if the capital were otherwise invested. This is higher than the current interest rate and results in a higher or more conservative assumption for the cost." (p. 5-4 in USEPA 2011b)

30-year total cost presented in Table 10 was back calculated using the annualized total cost provided in USEPA 2011b by multiplying an annualized total cost by a number of painting applications required over 30 years. No inflation was assumed over 30 years in the calculation of the 30-year total cost. Regardless, both the annualized total cost and the total 30-year cost can be used to compare the long-term costs of the application of different hull paints. Differences in the estimated long-term costs are primarily due to the assumed life of each of the paints evaluated from USEPA 2011b. No other independent study for the life of various paint is currently available.

Table 10

Estimated Total Cost of 30-Foot Boat Conversion over 30 Years

Hull Paint		Assumed Paint Application Method[1]	Life of Paint (year)[2]	Total Annualized Cost of Using Paints over 30-Year Period[3]		30-Year Total Cost (calculated based on the annualized cost over 30 years)	
Paint Category	Paint Name			Sailboat	Powerboat	Sailboat	Powerboat
Copper AFP	NA	Rolled	2	$1,290	$1,395	$19,350	$20,925
			3	$1,110	$1,215	$11,100	$12,150
Soft non-biocide	Red Hempasil X3	Sprayed	7.5	$1,361	$1,451	$5,444	$5,804
			10	$1,228	$1,318	$3,684	$3,954
	Intersleek 900	Sprayed	5	$1,440	$1,530	$8,640	$9,180
			10	$1,136	$1,226	$3,408	$3,678
		Rolled	5	$1,286	$1,376	$7,716	$8,256
			10	$1,048	$1,138	$3,144	$3,414
	Klear N' Klean	Rolled	2	$1,851	$1,941	$27,765	$29,115
			5	$1,226	$1,316	$7,356	$7,896
Hard non-biocides	VC Performance Epoxy	Rolled	5	$1,579	$1,773	$9,474	$10,638
			10	$1,384	$1,578	$4,152	$4,734

Source: USEPA 2011b

Notes:

1 P. 5-8 and Table 5-5

2 Table 5-8

3 Table 5-14

AFP = antifouling paint

NA = not applicable

3.4.5 MdR Harbor-specific Cost Analysis

As discussed previously, the cost of the conversion to non-copper-based hull paint can vary widely depending on various factors. These factors include hull-stripping frequencies and methods, type and price of paint, painting methods (rolling vs. spraying), longevity (life) of paint, and hull cleaning frequency. Further, the costs for these factors varied largely among different boatyards and vendors (USEPA 2011b; CalEPA 2011). The estimated costs for stripping, hull cleaning, one-time painting, and 30-year cost discussed in the previous sections were based on data specific to Shelter Island Yacht Basin in San Diego (USEPA 2011b; CalEPA 2011).

The Port of San Diego grant program has provided an opportunity to study the paint on 40 boats. The conversion to non-biocidal paint occurred in 2013. Cost assumptions that will benefit from longer trial periods include life of paint and cost and frequency of hull cleaning for each paint. The cost estimate is assumed as the average of those provided by three hull cleaners in San Diego. This estimate will be better supported by information collected from more cleaners and boaters.

The County is committed to conducting a pilot study to further evaluate the costs for boaters, specifically to MdR Harbor boaters. The County has begun collecting information on known boats (see Section 3.3.3.2) and will continue gathering cost information specific to boaters and the boatyards in MdR Harbor. It is hoped this study will provide local boaters the information needed to assist boaters in choosing environmentally friendly hull paint that are also cost-effective.

4 CONCLUSIONS

This report is submitted to the Regional Water Board Executive Officer to meet technical and administrative requirements in the SIP for supporting the need to initiate a site-specific objective study. The site-specific objective is necessary because the water quality objective for dissolved coper is not being attained in MdR Harbor and the County cannot be assured of compliance within the TMDL implementation schedule using all reasonable means. In the SIP Section 5.2, the development of a site-specific objective can be considered under the condition that "a priority pollutant criterion or objective is not achieved in the receiving water" and "(a) demonstration that the discharger cannot be assured of achieving the criterion or objective and/or effluent limitation through reasonable treatment, source control, and pollution prevention measures." The analyses presented in this report demonstrate that the need to initiate a site-specific objective study for dissolved copper in MdR Harbor by conducting analyses specified in the SIP Section 5.2. (1), (2), (3)(a) through (d).

The site-specific objective study is as part of a multi-pronged approach to restore and maintain water quality for the designated beneficial uses. The County is committed to educating the public, applying for funds to assist copper-reducing BMPs, implementing a non-biocidal paint pilot program, and conducting special studies to identify and support the most effective management strategies to meet all water quality beneficial uses. The County will continue working with various stakeholders to protect beneficial uses and to enhance water quality in MdR Harbor.

According to the implementation schedule specified in the revised Toxics TMDL, regulatory mechanisms will be developed to reduce dissolved copper discharges from boats by October 16, 2017. It is critical to initiate the site-specific objective study as soon as possible to provide needed information to support various implementation actions and to evaluate the success of those actions to reduce copper loading from boats.

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