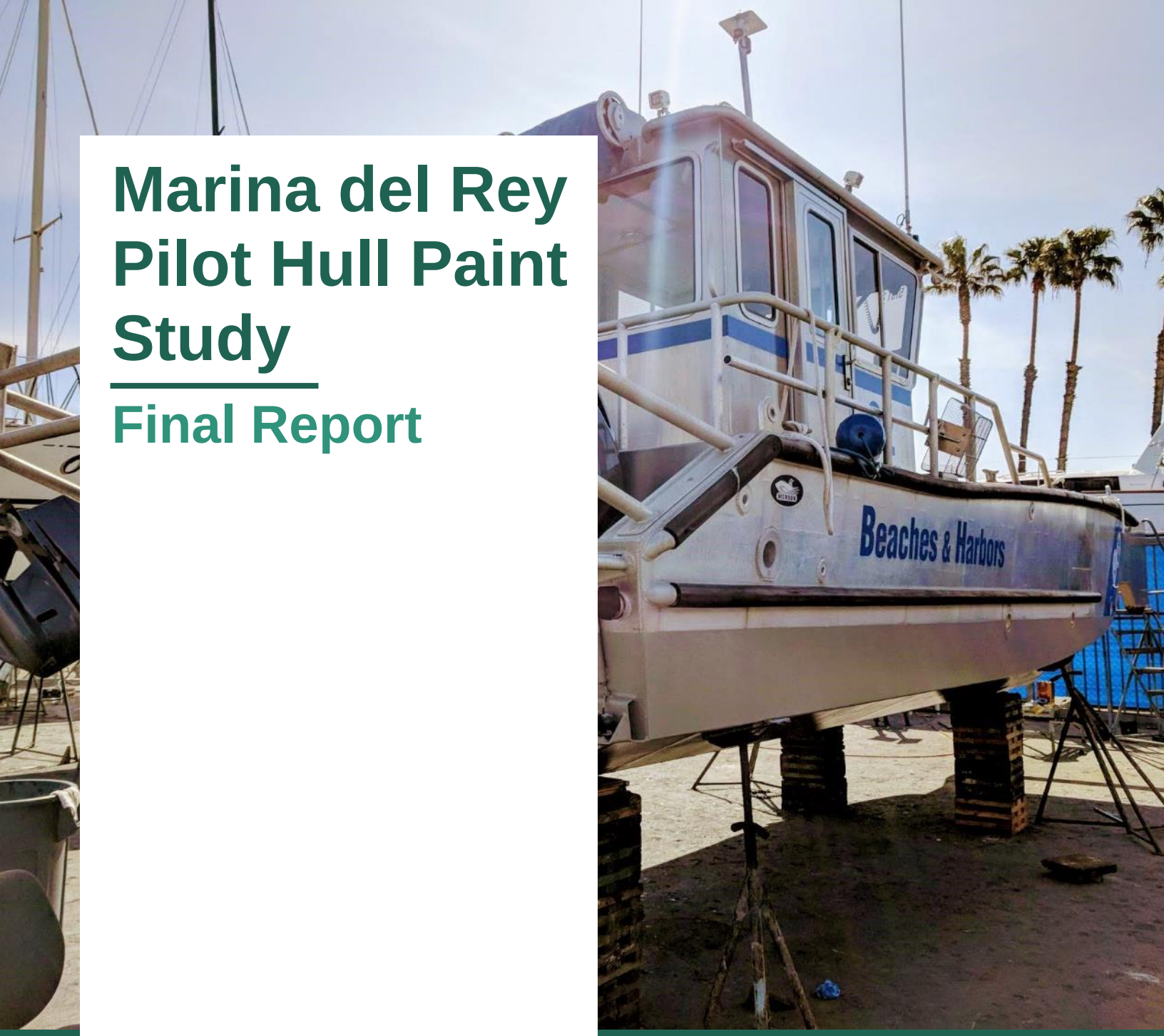

Marina del Rey Pilot Hull Paint Study

Final Report

MAY 9, 2019

County of Los Angeles
Department of Beaches and Harbors

Marina del Rey Pilot Hull Paint Study Report

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1 Introduction

Los Angeles County (County) continues to be an active participant in water quality improvement programs in Marina del Rey (MdR) Harbor. 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. The strategy includes technical studies, pilot projects, and developing a site-specific objective for copper. Also important is building public awareness around the impacts of copper to marine life and gaining public support for use of alternative paints and hull cleaning best management practices (BMPs). The County has ongoing and planned voluntary programs to meet its water quality goals. One such program has been the implementation of the MdR Harbor Pilot Hull Paint Study (Pilot Paint Study) to evaluate the effectiveness and economic feasibility of non-biocide hull paints. This report summarizes the findings of the first phase of the Pilot Paint Study.

1.1 Background

The MdR Harbor is listed as impaired on the State's 303(d) list of impaired water bodies due to several pollutants, including dissolved copper. Dissolved copper concentrations in the MdR Harbor exceed water quality limits specified by the California Toxics Rule by almost four times the chronic limit of 3.1 µg/L. The MdR Harbor's Toxic Pollutants TMDL was revised in 2014 to address dissolved copper exceedances in the water column. The revised TMDL became effective in 2015 and includes dissolved copper load allocations for the County, anchorages, and boat owners in the MdR Harbor. The revised Toxics TMDL requires a dissolved copper reduction of 85% from baseline by March 22, 2024. The TMDL also estimates that approximately 94% of the dissolved copper is coming from passive leaching of antifouling paints, with the other 6% coming from boat hull cleaning.

Compliance with the Toxics TMDL requires one of the following to be met:

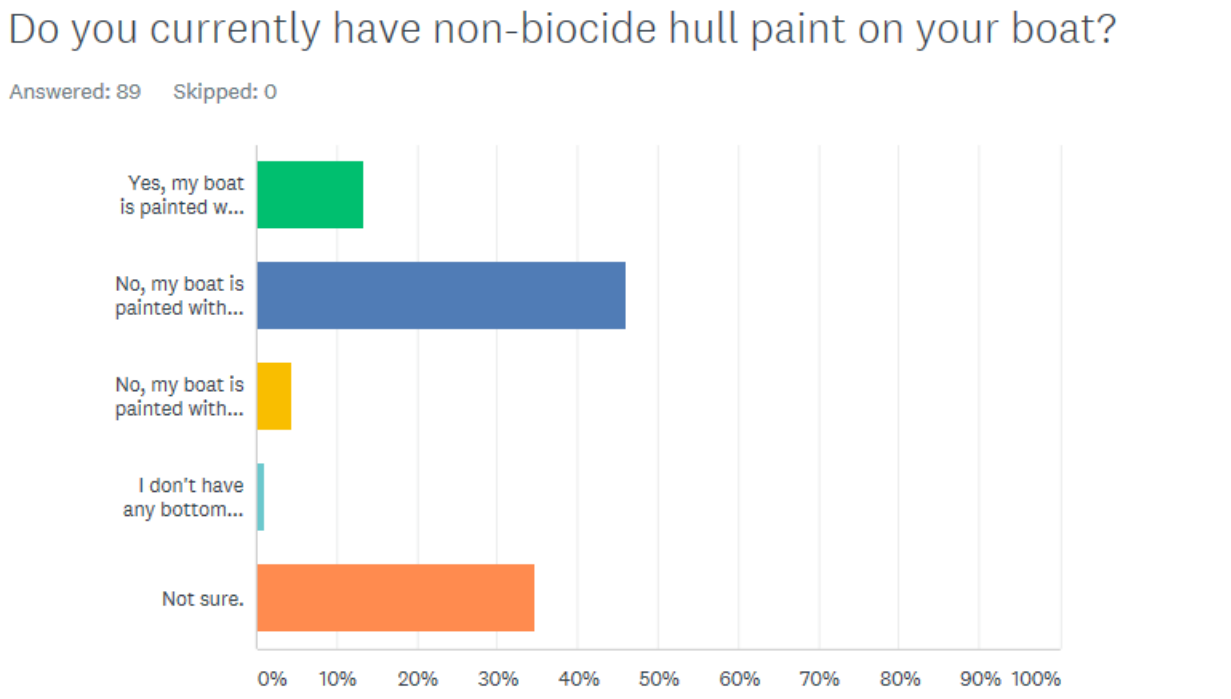
- Meeting numeric targets in the water column, or
- Demonstrating that 85% of boats in the harbor are using copper-free hull paints, or
- Another acceptable means of demonstrating compliance as approved by the Executive Officer of the Regional Board that would result in attainment of copper numeric targets 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).

Because the primary source of dissolved copper loading is antifouling hull paints, controlling the source through conversion to non-copper hull paints has been identified as a key strategy to meet the requirements of the Toxics TMDL.

1.2 Problem Statement

The majority of the boats in the MdR Harbor have hulls painted with copper leaching antifouling paints. Of the 89 MdR boaters that responded to the boater survey developed for this Pilot Paint Study in 2018 (see Section 2.1), 46% reported using copper biocide hull paints and another 35% reported not knowing the type of hull paint on their boat, which generally implies copper. Figure 1 summarizes the responses to the survey question. Copper leaching hull paint is the most commonly known and used type of hull paint in recreational marinas due to its effectiveness for protecting boat hulls from the damages of fouling growth and its relatively low cost as compared to other types of hull paint. While some boaters have tried alternatives to the common copper paints in the past, there has been significant uncertainty about the effectiveness, longevity and cost of such alternative paints, and none have been widely accepted by the boating community. Such alternatives include zinc biocides, organic biocides, and non-biocide hull paints.

Figure 1: Hull Paint Type Distribution According to Survey



ANSWER CHOICES	RESPONSES	
Yes, my boat is painted with a non-biocide hull paint (e.g. ceramic, silicone, etc.).	13.48%	12
No, my boat is painted with a copper biocide hull paint.	46.07%	41
No, my boat is painted with a non-copper biocide hull paint (e.g. Zinc, Econea, etc.).	4.49%	4
I don't have any bottom paint on my boat.	1.12%	1
Not sure.	34.83%	31
TOTAL		89

The effectiveness of non-copper and non-biocide hull paints has been studied previously to identify less toxic alternatives to copper hull paints. The Port of San Diego in particular has studied paint alternatives as part of grant funded projects including the EPA funded *Safer Alternatives to Copper Antifouling Paints for Marine Vessels* (2011) and the *Shelter Island Yacht Basin Copper Hull Paint Conversion Project* (2015). Hull paint formulas continue to be modified, replaced, or discontinued in hope of developing an effective alternative to copper leaching antifouling paints.

Los Angeles County Department of Beaches and Harbors (DBH) identified the need to implement a local study to examine the performance and cost of currently available non-biocide hull paints in the MdR Harbor. This study was developed as a precursor for providing educational outreach and recommendations to the local boating community on what non-biocide hull paints could be effective in the MdR Harbor.

1.3 Project Overview

DBH developed the Pilot Paint Study to assess the effectiveness of non-biocide hull paints and evaluate potential cost implications related to the conversion in order to better inform the boating community of their options to reduce copper loading in the MdR Harbor. The Pilot Paint Study was designed in two preliminary phases. Phase One involved converting County-owned vessels to non-biocide hull paints, and Phase Two will involve efforts targeting the conversion of 100 boats in MdR harbor to non-biocide hull paints. The preliminary results from Phase One are described in this report.

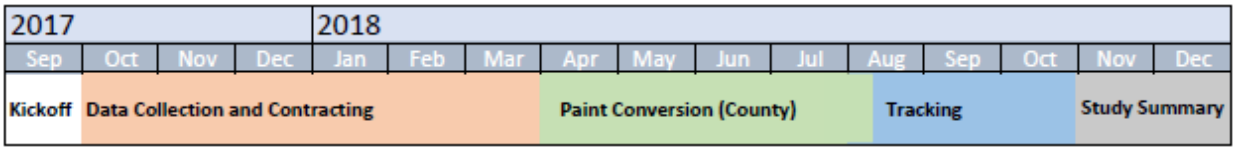
1.3.1 Project Tasks and Schedule

Phase One of the Pilot Paint Study involved three main tasks:

1) Data Collection and Contracting
2) Paint Conversion (County boats)
3) Tracking and Assessment

The project was initiated following conditional approval of the State Implementation Policy (SIP) Justification Report in September 2017. The first stage of the study involved identifying non-biocide hull paints available for use by boaters in the MdR Harbor, followed by information gathering for each paint directly from paint manufacturers, boat yards, and hull cleaners. In addition to data collection, a lengthy administrative process was required to set up the funding and contracting mechanism to implement conversion of County-owned boats to non-biocide hull paints. Once the non-biocide hull paints were selected and the local boat yards were under contract, County-owned boats were converted to non-biocide hull paints between the months of April and August 2018. Tracking and assessment of paint performance continued after paint conversion for a period of approximately three months. Figure 2 summarizes the overall project schedule for Phase One of the Pilot Paint Study. The components of the Study are described in more detail in Sections 2, 3, and 4 of this report.

Figure 2: Phase One Schedule



1.3.2 Participating Entities

To better monitor the impacts of the paint conversion, County-owned vessels were used for Phase One of the Pilot Paint Study. Participation from County Departments as well as two local boat yards and two local dive organizations were key components of the program. The Los Angeles Regional Water Quality Control Board was also kept informed of the Pilot Paint Study's progress on a monthly basis. The participating organizations are summarized in Table 1.

Table 1: Participating Organizations

Agencies	
Los Angeles County Department of Beaches & Harbors	Los Angeles County Sheriff
Los Angeles County Fire Department	Los Angeles Regional Water Quality Control Board
Boat yards	
The Boat Yard	Windward Yacht Center
Divers/Hull Cleaners	
Pro-Tech	S & K Dive Service

1.3.3 Project Goals and Desired Outcomes

The goal of the study was to investigate the effectiveness and cost of available non-biocide hull paints by painting boats in the MdR Harbor and tracking the progression of fouling and paint condition.

2 Data Collection

The initial portion of Phase One of the study involved researching non-biocide paint options to determine which ones were available and applicable to conditions in the MdR Harbor. Information was collected from MdR boaters, paint companies, boat yards, and local hull cleaners.

2.1 MdR Boaters

An electronic survey was distributed to boat owners in the MdR Harbor via email and the DBH website to gather information on current hull paint usage, willingness to convert to alternative hull paints, and hull cleaning frequency and costs. Results from the survey will help with future efforts to convert non-County boats to non-biocide paints. The survey is included as Appendix A.

2.2 Paint Companies

Non-biocide hull paint brands were identified through references in other paint studies, online searches, and verbal reference from members of the boating community. Many paint brands mentioned in previous studies had since been taken off the market or were no longer recommended by the paint companies themselves. Those brands with potential were investigated further through coordination with the paint companies. The companies contacted during the data collection period and the reasoning for including or excluding them from the Pilot Paint Study are summarized in Table 2. Those companies or brands not included in the study are shaded in grey.

Table 2: Paint Companies with Non-Biocide Hull Paints

Manufacturer	Paint(s)	Paint Information and Other Notes	Selected/Not Selected (Y/N)
HullSpeed	**3000-Series** **F-Series** **Smart Armor** **SuperGlide**	**3000-Series**: Designed for commercial, gov't vessels **F-Series**: Designed for racing, high performance vessels **Smart Armor**: Designed for sport fishing, recreational boats **SuperGlide**: Designed for racing, seasonal, vessels as a clear coat polish After coordination between the boat yards and the paint representative, the boat yards identified the 3000-Series and the F-Series brands as appropriate for the boat types used in the Pilot Paint Study.	Y – 3000-Series Y – F-Series N – Smart Armor N – Super Glide
CeRam-Kote	**CeRam-Kote 54 SST**	The paint manufacturer recommended CeRam-Kote 54 SST as an appropriate paint for use in the study.	Y – CeRam-Kote 54 SST
International Paint	**Intersleek 1001** **Intersleek 1100SR**	Initially the paint manufacturer indicated they did not wish to promote these products for the study; this line of paint is intended for commercial vessels that travel continuously for thousands of miles. After additional coordination in June 2018, the paint representative supported use of Intersleek 1100SR for the study.	N – Intersleek 1001 Y – Intersleek 1100SR
Subsea Industries	**EcoSpeed**	Paint primarily used for large vessel in shipping and requires buffing with special equipment, which hull cleaners and boat yards in the MdR Harbor did not have access to at the time of the study. Issues with importing the paint in time for use during the study were also anticipated.	N - EcoSpeed
Ceramic Pro	**Ceramic Pro Marine**	Information received from the paint manufacturer indicated this is a coating not a paint. The coating was dismissed from the study.	N – Ceramic Pro Marine
Hempel	**Hempasil X3+ 87500**	No response from manufacturer after multiple attempts. Additionally, other studies indicated the paint was cost prohibitive.	N – Hempasil X3+ 87500
Pettit	**None**	Paint representative noted that the company does not offer a non-biocide paint.	Not Applicable
Oceanmax	**Propspeed**	No response from manufacturer after multiple attempts. According to the website, this product is only meant for propeller and running gear, not for boat hulls.	N - Propspeed
Interlux	**VC Performance Epoxy**	The paint was supported for use in other studies but is not legal in Los Angeles County due to high volatile organic compound (VOC) levels.	N – VC Performance Epoxy

The manufactures of the paints included in the study were informed about the nature of the Pilot Paint Study, and invited to participate by completing a questionnaire with details on paint composition, application requirements, cleaning recommendations, and purchase costs for the non-biocide paints. The data requested and collected is presented in Appendix B. Basic information about the four non-biocide paints included in the study are summarized in Table 3 below.

Table 3: Non-Biocide Paints Used in the Study

Paint	Type	Application Method	Cleaning recommendations (winter)	Cleaning recommendations (summer)
Hullspeed 3000	Hard, epoxy/silicone copolymer	Roll or spray	Every 2-3 weeks	Every 1-2 weeks
Hullspeed F-Series	Hard, epoxy/silicone copolymer	Roll or spray	Every 2-3 weeks	Every 1-2 weeks
CeRamKote 54 SST	Hard, ceramic polymer coating	Spray only	Every 4 weeks	Every 3 weeks
Intersleek 1100SR	Soft, fluoropolymer	Roll or spray	Every 2 weeks	Every week

2.3 Boat Yards

There are two boat yards local to the MdR Harbor: the Windward Yacht Center and The Boat Yard. Both boat yards were contacted as part of the data collection process and asked for input on the non-biocide paints, including potential issues and conversion costs. The boat yards were also asked if their staff had the equipment and training required for applying the specific non-biocide paints. Responses from the boat yards are summarized in Appendix C. Once the boats that would participate in the study were identified, the boat yards and paint representatives were consulted to identify the most appropriate paint for each boat based on its type and usage.

2.4 Hull Cleaners

A questionnaire was also sent to hull cleaners in the MdR Harbor. Two companies responded to the information request: BTW Dive Service and Del Rey Divers. Both companies reported that they were not familiar with the non-biocide paints and would need to clean them on a regular basis to determine the best cleaning methods and frequency. Responses to the questionnaire are summarized in Appendix D. Two additional hull cleaning companies were contracted with as part of the Pilot Paint Study to clean and monitor the boat hulls painted through the project. Feedback from these divers is described in Section 4.

3 Paint Conversion

Table 4 summarizes the boat information and the non-biocide paints used on each boat.

Table 4: Boat Summary Table

#	ID	Boat Type	Water Parcel	Slip #	Boat Length	Paint Type	Cleaning Frequency	Boat Use / Activity
1	32	Munson Landing Craft	52	DBH Dock	30	Hullspeed 3000	Every 2 weeks	Marina Maintenance and Debris / 3 days per week
2	27	I/O V hull	52	DBH Dock	27	Hullspeed 3000	Every 2 weeks	Marina Maintenance and Debris / 2 days per week
3	10	Debris Boat	52	DBH Dock	24	CeRam-Kote 54 SST	Every 2 weeks	Marina Maintenance and Debris / 5 days per week
4	55	Debris Boat	52	DBH Dock	22	Hullspeed 3000	Every 2 weeks	Marina Maintenance and Debris / 2 days per week
5	CF 3309 XC	MacGregor Sailboat	EE	Boathouse	25	Intersleek 1100SR	Every 2 weeks	W.A.T.E.R. Youth Sailing Program
6	CF 4540 HF	MacGregor Sailboat	EE	Boathouse	25	Intersleek 1100SR	Every 2 weeks	W.A.T.E.R. Youth Sailing Program
7	4314	1988 Seaway	62	Sheriff Dock	29	Hullspeed F-Series	Every 2 weeks	Patrol / 4 days per week
8	4311	1988 Seaway	62	Sheriff Dock	29	Intersleek 1100SR	Every 2 weeks	Patrol / 4 days per week
9	4315	1988 Seaway	62	Sheriff Dock	29	Hullspeed 3000	Every 2 weeks	Patrol / 4 days per week
10	1386	1969 Drake	62	Sheriff Dock	30	Hullspeed F-Series	Every 2 weeks	Patrol / 2 days per week
11	SX1541	2003 Safe Boat	53	Work Dock	25	CeRam-Kote 54 SST	Every 2 weeks	Patrol / 3 days per week

#	ID	Boat Type	Water Parcel	Slip #	Boat Length	Paint Type	Cleaning Frequency	Boat Use / Activity
12	SZ0717	2001 Catalina Sailboat	62	Sheriff Dock	22	Hullspeed F-Series	Every 2 weeks	Patrol / 1 days per week
13	SD4820	2005 Moose (twin hull)	62	Sheriff Dock	33.5	Hullspeed 3000 on hull / CeRam-Kote on Jet Drives	Every 2 weeks	Patrol / 4 days per week
14	SD5996	2007 Moose (twin hull)	62	Sheriff Dock	35.5	Hullspeed 3000 on hull / CeRam-Kote on Jet Drives	Every 2 weeks	Patrol / 4 days per week
15	SX1015	1972 Monarch	62	Sheriff Dock	42	Intersleek 1100SR	Every 2 weeks	Patrol / 5 days per week
16	BW 14	Rescue Boat	129	Fire Dock	32	Hullspeed 3000	Every 2 weeks	Patrol / 1 days per week
17	FB 310	Fire Boat	129	Fire Dock	41	Hullspeed 3000	Every 2 weeks	Patrol / 2 days per week

DBH identified all County-owned boats that could be used for the Pilot Paint Study. A total of seventeen (17) boats were identified, six (6) belonging to DBH, nine (9) to the County Sheriff, and two (2) belonging to the County Fire Department. Details were collected about each boat including size, hull type, prior paint, frequency of boat use, and average speed. This information was used by the boat yards and paint representatives to determine which paint to use on each boat. In general, paints were chosen for boats based on their potential for providing useful comparison data during the monitoring phase. For instance, three 1998 29' Seaways each received a different paint (Hullspeed F-Series, Intersleek 1100SR, and Hullspeed 3000) allowing for better comparison of paints on comparable boats with the same or similar usage by the same department.

All boats required haul out, stripping, priming, painting and launch. All paints were rolled on except for CeRam-Kote, which required spray application. The boat yards were able to paint approximately two (2) boats every two (2) weeks when boats were available[1]. Some delays resulted from adding Intersleek 1100SR to the paint list halfway through the conversion process. All 17 boats were stripped, primed, and repainted at the two boat yards over the course of a four-month period from April 9, 2018 to August 9, 2018.

3.1 Hull Cleaning

All County boats in the MdR Harbor are cleaned under a standing contract with Pro-Tech and cleaned once every two weeks in the summer and once every four weeks in the winter. The same hull cleaner continued to clean the County vessels converted as part of the Pilot Paint Study. Cleaning occurred once every two weeks for all boats through the end of the tracking period in October 2018. It should be noted, that the Hullspeed and Intersleek paints have manufacturer-recommended cleaning frequencies of once every 1-2 weeks. While the County was unable to increase the cleaning frequency due to contract restrictions, cleaning the hull once every two weeks was within the range of recommended frequencies provided by the company representatives during the data collection period, with the exception of Intersleek[2]. Despite not being able to adjust the cleaning frequency, maintaining the pre-existing cleaning schedule and hull cleaning company provided consistency for comparing fouling rates and cleaning effort changes with previous paints.

3.2 Performance Tracking and Assessment

Following paint conversion, paint performance was monitored to assess fouling rates and paint condition. Tracking included diver inspections to assess hull cleaning effort, as well as fouling and paint condition. Additionally, department boat users were interviewed to understand performance changes from the previous paints.

3.2.1 Diver Inspections

Hull Cleaning Effort Assessment: Pro-Tech, the company hired to clean the hulls, was asked to notify DBH of any changes in fouling or paint condition following paint conversion. The company was also asked to document which day the boats were cleaned to compare with the timing of the diver inspections.

[1] In general, one boat requires approximately 8-10 working days though boat size and stripping and drying times play a factor. Completion times can be accelerated when multiple boats are being worked on concurrently and multiple employees are dedicated to the project.

[2] The Intersleek representative recommended weekly cleanings to be conservative because the paint was designed for use on boats that move frequently, which is not the condition for recreational boats in the MdR Harbor. Despite the recommendation, biweekly cleaning was found frequent enough for this paint during the Pilot Paint Study.

Fouling and Paint Condition Assessment: A second hull cleaning company (S&K Dive) was contracted specifically to monitor paint condition and fouling on each boat for a period of three months. Monitoring included underwater observations and photos of the newly painted County boats and an assessment of fouling and paint condition using a numeric rating scale. Paint inspections began Tuesday, August 14, 2018, and occurred every Tuesday through October 2nd. The final inspection occurred on October 30, 2018. Inspection reports were submitted to DBH the Monday following the inspection. Because inspections occurred once a week for eight consecutive weeks and the hulls were cleaned every two weeks, each inspection occurred within one or two weeks of a boat's last hull cleaning event.

Inspection reports included at least one photo of each of the following:

- Each side of the boat: bow, mid-port, mid-starboard, and stern
- Close-up of the fouling
- The waterline
- The boat ID #
- Any paint damage

Ratings for fouling level and hull paint condition were based on those described in US EPA's *Safer Alternative to Copper Antifouling Paints for Marine Vessels – Final Report* (2011) as summarized below:

Fouling Level	Hull Paint Condition
Light → Normal → Excessive	Excellent → Normal → Fair
1 → 2 → 3 → 4 → 5	1 → 2 → 3 → 4 → 5

Descriptions for the rating scales are included in Appendix E.

3.2.2 Department Close-out Interviews

Performance Assessment: Following completion of the hull inspections, interviews were conducted with the lead vessel manager for each of the three County departments. Interviews included a series of questions to understand the staff's experience with the paints and any possible impact on boat performance. Discussion included frequency of boat use, paint performance, changes in speed or maintenance, and any other remarks the staff wished to make. Interviews were conducted in person at each boat's docking location. Photos were taken from the docks to document paint condition, though visibility was limited.

4 Results

Hull Cleaning Effort: The hull cleaner contracted by the County consistently reported that it is easier to clean boats painted with the soft non-biocide Intersleek, compared to the hard non-biocide paints Hullspeed and CeRam-Kote. The hull cleaner cleaned each hull every two weeks using a soft white pad on Intersleek and a scraper for Hullspeed and CeRam-Kote. He reported needing to spend extra time on the boats painted with the hard non-biocides and attempted wet sanding on those coatings to assist.

Because hard non-biocides require frequent cleaning, the paints may have performed better if cleaned every week rather than every 2 weeks. The level of fouling after 2 weeks was high enough to require more intense cleaning methods that may have resulted in deterioration of paint condition. More frequent cleanings were not possible due to restrictions in the County's preexisting hull cleaning contract, so they could not be explored through this Pilot Paint Study. Additionally, some hard non-biocides like CeRam-Kote require use of power tools (e.g. rotary air powered brushes) to clean the hull properly, but such tools are prohibited

by the MdR Local Coastal Program. Due to these constraints, the Hullspeed and CeRam-Kote paints were determined not to be viable options for use on County vessels at this time. Boats with these paints will require repainting with an alternative paint to remain operational.

Fouling and Paint Condition[3]: Reports from diver inspections conducted over the first few months after paint application indicated boats painted with Intersleek had Light to Normal fouling with Excellent paint condition, receiving a ranking of either 1 or 2 in either category. Boats painted with Hullspeed 3000, Hullspeed F-series or CeRam-Kote showed Normal to Excessive fouling and Normal to Fair paint condition, typically being ranked with a 2, 3, or 4 in either category. Photos showed consistent scratches and growth on boats painted with the hard non-biocides, whereas the boats with Intersleek maintained paint coverage during the 3-month tracking period. Inspection photo summaries are provided in Appendix F. A table summarizing the inspection ratings and cleaning schedules is provided in Appendix G. Photos of the three 1988 Seaway Sheriff boats painted with Intersleek, Hullspeed F-series, and Hullspeed 3000 are shown below for comparison (three similar boats each painted with a different paint), as well as representative photos of a boat painted with CeRam-Kote. Photos were taken approximately one week after the boats were cleaned, as noted in the captions.

Performance Assessment: Interviews with the staff using the converted boats indicated that boats painted with Hullspeed or CeRam-Kote had increased fouling compared to the copper and non-copper biocide paints used on the hulls before conversion. Some hulls were thought by staff to not have any paint on them at all based on their bare appearance and high fouling rates. Sheriff staff noted that boats with Intersleek had increased speed and potential fuel savings compared to prior paints, which included copper and non-copper organic biocide paints. Sheriff staff also noted that fouling on the Intersleek hulls could be wiped off with the swipe of a hand, whereas the other non-biocide paints required a scraper. Notes from the interviews are included as Appendix H.

[3] Dates of hull cleaning events reported for the study are based on the dates reported to DBH by the Hull Cleaner. The timing of these cleanings was not verified.

Figure 3: Boat #4311 Painted with Intersleek

Images of the 1988 Seaway Boat #4311 on October 2, 2018 at the waterline and a close-up under the water showing Light fouling (1) and Excellent to Normal paint condition (2) approximately 1 week after hull cleaning.

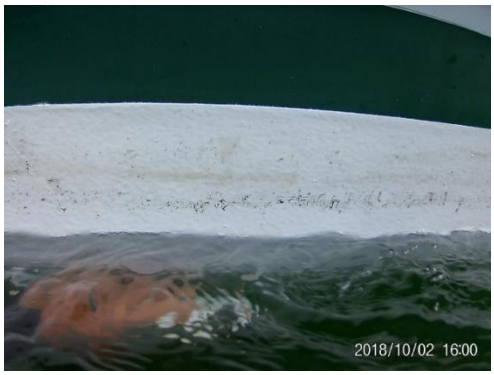


Figure 4: Boat #4314 Painted with Hullspeed F-Series

Images of the 1988 Seaway Boat #4311 on October 2, 2018 at the waterline and a close-up under the water showing Normal fouling (3) and Excellent to Normal paint condition (2) approximately 1 week after hull cleaning.

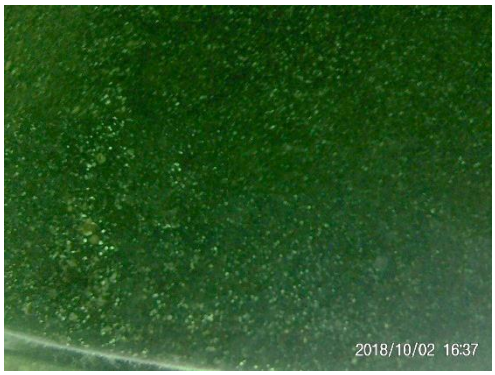


Figure 5: Boat #4315 Painted with Hullspeed 3000

Images of the 1988 Seaway Boat #4311 on October 2, 2018 at the waterline and a close-up under the water showing Normal fouling (3) and Normal paint condition (3) approximately 1 week after hull cleaning.

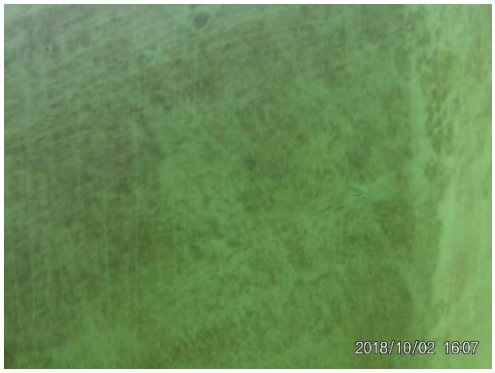
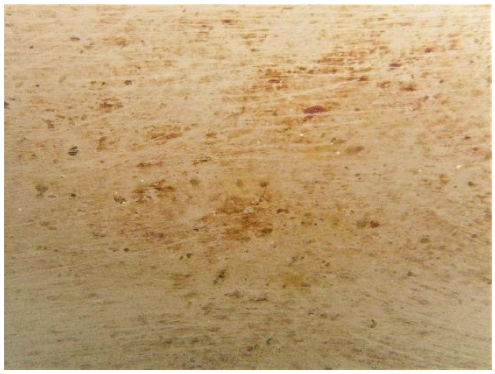


Figure 6: Boat #10 Painted with CeRam-Kote

Images of the Debris Boat #10 on October 2, 2018 at the waterline and a close-up under the water showing Light to Normal fouling (2)[4] and Normal paint condition (3) approximately 1 week after hull cleaning.



[4] October 2 and October 10 inspections for Boat #10 showed better performance than all previous inspections for this boat. Previous inspections rated fouling at Excessive (8/16, 8/21, 8/28, and 9/4) and Normal to Excessive (9/11, 9/18, and 9/25). Changes in the rating system may partially explain the lower ratings for fouling growth later in the study, or, more likely, the better ratings may be due to inspections being performed shortly after cleaning took place.

5 Cost Assessment

A major impediment to convincing the boating community to convert to non-biocide hull paint is the higher up-front cost of non-biocide paints compared to copper antifouling paints. A preliminary cost analysis was conducted as part of the Pilot Paint Study using information provided by boat yards before and after paint conversion. The analysis includes the approximate cost of re-painting a hull with copper paint versus converting to non-biocide hull paint. This cost differential is what boaters will evaluate when asked to consider non-biocide hull paints and is important for assessing how readily boaters will convert to non-biocide hull paints.

The cost to convert to a non-biocide hull paint is approximately 4-6 times higher than the cost to re-paint with copper antifouling paints. Estimates for re-painting with copper paint[5] roughly equate to $60/ft, whereas the average cost of converting to a non-biocide paint[6] are on the range of $240/ft (hard non-biocides) to $355/ft (Intersleek)[7]. Application of Intersleek is substantially more costly than application of the hard non-biocide paints due to the price per gallon of the paint, as well as the time and labor intensive application process. Conversion costs are variable based on the existing hull paint type to be stripped[8], hull condition, hull type, and boat length and width.

The cost per gallon for each paint ranges widely, as summarized in Table 5 below. These per gallon estimates were provided by the paint company representatives during the data collection period. Intersleek, while the favored paint, costs more than twice as much per gallon as Hullspeed and more than six times as much per gallon as CeRam-Kote. CeRam-Kote, while costing less per gallon, had comparable application costs overall due to required spray application, which is higher in cost than roll-on application. For comparison, Table 5 also includes the approximate cost of two biocide-based antifouling paints that were previously used on County boats.

Table 5: Paint Costs

Paint Brand	Cost per Gallon (2017/2018)
CeRam-Kote 54 SST (hard non-biocide)	$125/gal
Hullspeed 3000 (hard non-biocide)	$389/gal
Hullspeed F-Series (hard non-biocide)	$369/gal
Intersleek 1100SR (soft non-biocide)	$850/gal
Pettit Trinidad Pro (copper biocide)	$265/gal
Pettit Hydrocoat Eco (organic biocide)	$240/gal

[5] Includes haul out, hull prep/priming, paint application, and boat launch. Cost of stripping is not included as it is not typically required for reapplication of copper paint. Copper paints only require stripping after a substantial buildup of paint has accumulated from several paint jobs (e.g. 6-8 coats).

[6] Includes haul out, stripping, priming, paint application, and boat launch costs required for the paint application.

[7] The initial cost quoted for the application of Intersleek was similar or equal to the hard non-biocide paints. After the paints were applied, one of the boat yards acknowledged that the amount of labor and time required to apply Intersleek had been underestimated. They provided an updated estimate of roughly $355/ft.

[8] Stripping hard non-biocide paints is substantially more difficult and time intensive than stripping soft biocide paints, resulting in higher than average costs. Recent cost quotes to convert County boats from hard non-biocide paints to Intersleek ranged from $385/ft to $419/ft.

When looking at lifecycle costs, non-biocide hull paints can potentially provide cost savings that are not reflected in the initial cost comparison with copper antifouling paints. Copper paints only require stripping after a substantial buildup of paint has accumulated from several paint jobs, and they do not require cleaning for several months (approximately 90 days) after initial application. This combined with a lower cost per gallon for the paint results in much lower typical application costs. Non-biocide hull paints, while having notably higher initial painting costs, could last as much as 5 times longer than copper paints[9] and may provide other maintenance savings. Intersleek, for example, may require less frequent cleanings and may provide some fuel savings. Additionally, repainting a hull with the same non-biocide paint may be less expensive than the initial conversion, as it would not require as much hull preparation (i.e. stripping), depending on the condition of the sub-coating. These potential ongoing cost savings and longevity claims will need to be studied further before integrating into a long-term cost comparison with copper antifouling paints.

6 Conclusions

6.1 Non-Biocide Paints as an Alternative

Of the four paints investigated in the Pilot Paint Study, Intersleek was the only paint that showed potential as an effective alternative to copper antifouling paints. Intersleek 1100SR has a slime release technology that deters initial growth from attaching to the hull, aiding the removal of fouling organisms when the boat is in motion. According to the manufacturer, Intersleek 1100SR was designed for use on commercial vessels which travel thousands of miles. These vessels do not require manual hull cleaning; the paint provides a surface slick enough to self-clean when the vessel is in motion. Recreational boats, on the other hand, spend more time sitting in-slip and would require manual hull cleaning to remove fouling organisms. As a soft non-biocide, since the paint is not designed for any manual cleaning, it is prone to damage if cleaned too frequently or aggressively. The manufacturer also noted the paint can cost $800-850/gallon and has a short shelf life which can be a deterrent for boat yards that typically apply paint to recreational boats. Despite the initial reservations with the Intersleek paint, the soft non-biocide performed well in the Study. The slippery surface of the paint made it difficult for marine growth to attach to the hull and provided easy cleaning for the hull cleaners.

In order for a hull paint alternative to be supported by the boating community, the cost and effort to maintain the hull will need to make financial sense to the boat owner.[10] The hard non-biocides tested in this study require frequent and aggressive cleaning and/or use of power equipment, which are not currently accessible options for recreational boat owners in MdR Harbor. While the hard non-biocide paints may perform better when cleaned weekly, the cost of weekly cleanings would be a deterrent for MdR boat owners unless offset by substantial cost savings elsewhere. Additionally, since use of power tools for hull cleaning is not allowed in MdR, local hull cleaners do not have such tools at their disposal even for testing on hard non-biocides to determine if this would improve performance. The boats painted with Intersleek did not seem to require frequent cleaning nor did they show high levels of growth that would require aggressive cleaning or tools to remove. It is possible that this paint could be cleaned even less frequently than copper antifouling paints. These results align with findings in the Port of San Diego USEPA study (2011), which found that soft non-biocides can be cleaned at a frequency similar to copper hull paints, thereby reducing maintenance costs.

[9] Based on manufacturer claims. See Appendix B.

[10] Based on feedback from The Boat Yard, Marina boaters are very cost conscious. Although they might spend 5-10% more money for a more environmentally friendly paint, they would not pay 6 times the cost of the paint, as well as increased cleaning costs and reduced warranties.

The Intersleek paint also remained in good condition throughout the study, showing the potential to last longer than copper paints before requiring repainting. Despite the better performance of Intersleek 1100SR, the high application costs are likely to be a deterrent for boat owners. Long-term monitoring of boats painted with Intersleek will be required to assess longevity claims of the paint.

6.2 Potential Issues with Foul-Release Non-Biocides

Soft non-biocide paints may contain foul-release compounds that require additional investigation as to the potential long-term impacts on marine life. These paints are not regulated by the Department of Pesticide Regulation, and the environmental risks associated with intentional or unintentional foul-release compounds are not well studied. Researchers recommend further research on the compounds before these products can be fully supported (State of Washington, 2017).

6.3 Long-term Cost Analysis and Durability Study

The boats painted with Intersleek as part of this Pilot Paint Study will continue to be monitored to assess the longevity and durability of the paint, maintenance needs, and optimal frequency of hull cleaning. Additional information will be collected related to ongoing fuel savings. Once enough data has been collected, a lifecycle cost comparison between copper antifouling paints and the non-biocide paint can be assessed.

Further study is also needed to determine how Intersleek 1100SR would perform on more stationary boats. The boats used in this study are all operated regularly (between one to five times per week), whereas most boaters in MdR Harbor take their boats out of slip less frequently. According to the boater survey, more than 18% of boaters take their boat out of slip rarely or less than 10 times per year, and another 43% take their boats out between one to three times per month. Since Intersleek 1100SR is formulated for use on commercial vessels that are continually in motion, and the present study tested the paint on frequently used boats, it is yet unclear whether the paint would be a viable option for boats that spend the majority of their time in slip.

7 References

Department of Ecology, State of Washington, 2017. Report to the Legislature on Non-copper Antifouling Paints for Recreational Vessels in Washington. Publication 17-04-039. December 2017.

San Diego Unified Port District, 2015. Shelter Island Yacht Basin Copper Hull Paint Conversion Project Grant Project 10-437-559 – Final Report. May 29, 2015.

USEPA, 2011. Safer Alternatives to Copper Antifouling Paints for Marine Vessels – Final Report. Project NP00946501-4. January 2011.

Appendix A

Boater Paint Survey

Marina del Rey Harbor Boater Hull Paint Survey

Copper TMDL Implementation Program

The County of Los Angeles Department of Beaches and Harbors is working on several efforts to help reduce copper pollution from antifouling paints in the Marina del Rey Harbor. The newest program provides an opportunity for interested boaters to receive a rebate for a portion of the cost to convert their boats to a non-biocide hull paint. The purpose of this survey is to learn more about the non-biocide hull paints currently in use in the Marina del Rey Harbor and to invite interested boaters to learn more about the Marina del Rey Harbor Pilot Hull Paint Conversion Program as well as other efforts being implemented in the Harbor.

1. Do you currently have non-biocide hull paint on your boat?

- ◯ Yes, my boat is painted with a non-biocide hull paint (e.g. ceramic, silicone, etc.).
- ◯ No, my boat is painted with a copper biocide hull paint.
- ◯ No, my boat is painted with a non-copper biocide hull paint (e.g. Zinc, Econea, etc.).
- ◯ I don't have any bottom paint on my boat.
- ◯ Not sure.

Please specify the name/brand of the paint.

2. If you currently have a biocide hull paint (e.g. copper, zinc, econea, etc.), would you be interested in converting your boat to a non-biocide hull paint (e.g. ceramic, silicone, etc.) through a rebate/discount program being offered through the Department of Beaches and Harbors?

- ◯ Yes
- ◯ No
- ◯ Maybe

If interested, please provide contact information including name, phone number, email address, and slip number.

3. If you responded no, why are you not interested in converting your boat to non-biocide hull paint?

4. What type of boat do you own?

5. What is the size/length of your boat?

6. At which anchorage in Marina del Rey Harbor do you rent a slip / dock for your boat?

- Del Rey Landing (Fuel Dock)
- Waves (Tahiti) Marina
- The Harbor at Marina Bay
- Neptune Marina
- Esprit I
- Villa del Mar Marina
- Esprit II
- Dolphin Marina
- Panay Way Marina
- Holiday Harbor Marina
- Mariners Bay
- Del Rey Yacht Club
- Marina del Rey Marina
- Pier 44
- Anchorage 47
- The Boat Yard
- Windward Yacht Center
- Fisherman's Village
- Marina Harbor Anchorage
- Marina City Club
- California Yacht Club

7. What activities do you use your boat for?

- [ ] Racing
- [ ] Fishing
- [ ] Leisure Cruising
- [ ] Liveaboard
- [ ] Skiing or Wakeboarding
- [ ] Boat Camping
- [ ] In-slip usage
- [ ] Other (please specify)

8. How often do you take your boat out of the slip?

9. How long ago was your current hull paint applied?

10. Where did you get your boat hull painted?

11. About how long until your current hull paint will need repainting?

12. How often do you clean your hull in the summer?

13. How often do you clean your hull in the winter?

14. Approximately how much does it cost to have your hull cleaned (single cleaning)?

15. Have you experienced any issues with your current hull paint?

- ◯ Yes
- ◯ No

Please explain

16. Would you like to be added to the **Marina del Rey Harbor Boating Stakeholder Group** email list? This group will meet every few months to discuss experiences with non-copper and non-biocide hull paints, as well as other topics and programs related to the Marina del Rey Harbor water quality program and TMDL implementation. If interested, please provide contact information.

- ◯ Yes
- ◯ No
- ◯ Maybe

If interested, please provide your contact information including name, phone number, email address, and slip number.

The Marina del Rey Harbor is designated as impaired water body on the State's 303(d) list due to high levels of copper in the water column. The leading contributor to copper in the water column is from boats with copper leaching antifouling hull paints. To address copper pollution, the Regional Water Quality Control Board (Regional Board) developed a Total Maximum Daily Load (TMDL) for dissolved copper in the Marina del Rey Harbor. A TMDL sets limits on how much pollutant can enter a water body. To enforce the copper TMDL, the Regional Board assigned load allocations for discharges of dissolved copper to the County, individual anchorages, and persons owning boats moored in the Marina. The State has the authority to implement these regulations through waste discharge requirements and other regulatory mechanisms if the copper loading in not reduced.

Two solutions the Regional Board has identified to reduce copper in the water column is to convert 85% of boats to non-copper based paints or to reduce the leaching of copper levels by 85% for 100% of the boats in the Marina del Rey Harbor. As part of its efforts to help the Marina del Rey Harbor comply with the water quality regulations, the County has developed a number of programs to help reduce copper loading from boats. These copper reduction programs are designed to provide opportunities for anchorages and boat owners to reduce their copper before the State requires enforcement of the regulations. One of the programs being offered in the Harbor is the Pilot Hull Paint Conversion Program that will provide a rebate to boaters who convert to a non-biocide paint.

For more information about the Rebate Program or the Copper TMDL, please visit the Department of Beaches and Harbors website at http://beaches.lacounty.gov/toxics-tmdl/ or contact:

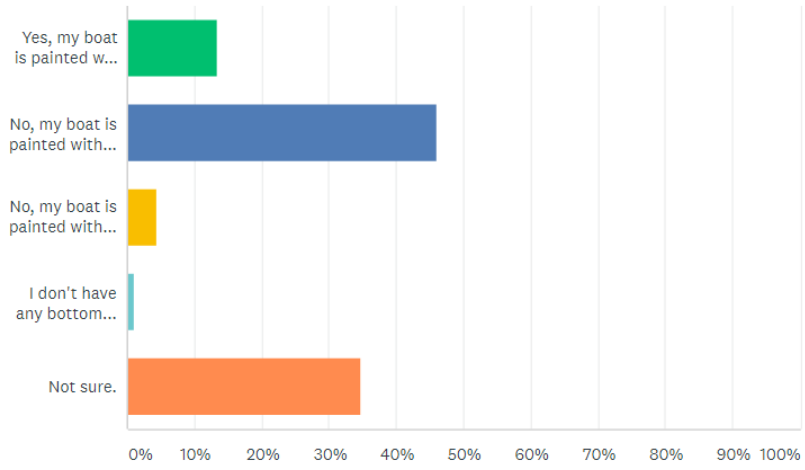
Maral Tashjian
County of Los Angeles
Department of Beaches and Harbors
13837 Fiji Way
Marina del Rey, CA 90292
Office: (424) 526-7750
MTashjian@bh.lacounty.gov

Q1

Customize Save As

Do you currently have non-biocide hull paint on your boat?

Answered: 89 Skipped: 0



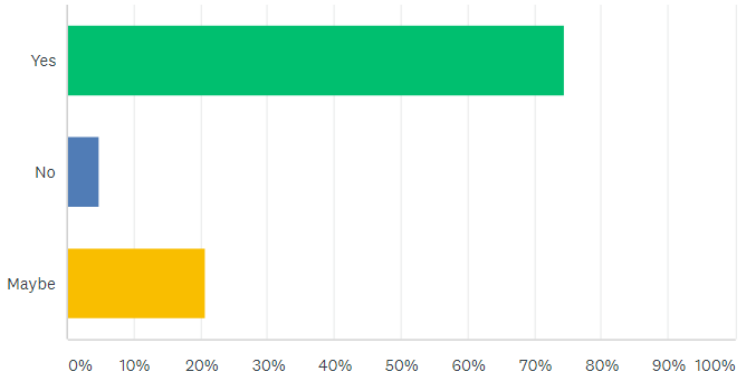
ANSWER CHOICES	RESPONSES	
Yes, my boat is painted with a non-biocide hull paint (e.g. ceramic, silicone, etc.).	13.48%	12
No, my boat is painted with a copper biocide hull paint.	46.07%	41
No, my boat is painted with a non-copper biocide hull paint (e.g. Zinc, Econea, etc.).	4.49%	4
I don't have any bottom paint on my boat.	1.12%	1
Not sure.	34.83%	31
TOTAL		**89**

Q2

Customize Save As

If you currently have a biocide hull paint (e.g. copper, zinc, econea, etc.), would you be interested in converting your boat to a non-biocide hull paint (e.g. ceramic, silicone, etc.) through a rebate/discount program being offered through the Department of Beaches and Harbors?

Answered: 82 Skipped: 7



ANSWER CHOICES	RESPONSES	
Yes	74.39%	61
No	4.88%	4
Maybe	20.73%	17
TOTAL		82

Q3

Save As

If you responded no, why are you not interested in converting your boat to non-biocide hull paint?

Answered: 6 Skipped: 83

RESPONSES (6) WORD CLOUD TAGS (0)

Apply to Selected Filter by tag Search responses

Showing **6** responses

I had the bottom painted less than a year ago and I don't want to go through the expense, stress, and hassle again just now.

8/9/2018 12:13 AM View respondent's answers Add tags

Copper free bottom paints perform poorly and must be replaced each year

4/11/2018 12:36 PM View respondent's answers Add tags

Help the water quality of the marina and get help with the cost of converting to a better bottom paint for the environment.

3/19/2018 11:47 AM View respondent's answers Add tags

Not applicable -- I already have it.

3/2/2018 9:37 AM View respondent's answers Add tags

not sure about the effectiveness and longevity of the newer non-copper products.

2/23/2018 2:32 PM View respondent's answers Add tags

Does not work to keep growth of boat.

2/22/2018 2:41 PM View respondent's answers Add tags

Q4

Save As

What type of boat do you own?

Answered: 89 Skipped: 0

RESPONSES (89) WORD CLOUD TAGS (0)

Cloud View | List View

Search responses

Sailboat	23.60%	21
Sail	16.85%	15
power	7.87%	7
Hunter	6.74%	6
cruiser	6.74%	6
Catalina	5.62%	5
boat	4.49%	4
Beneteau	4.49%	4
power boat	4.49%	4
Sea Ray	4.49%	4
catamaran	3.37%	3
Jeanneau	3.37%	3

Q5

What is the size/length of your boat?

Answered: 88 Skipped: 1

RESPONSES (88) WORD CLOUD TAGS (8)

+ New Tag

You've added **8** tags

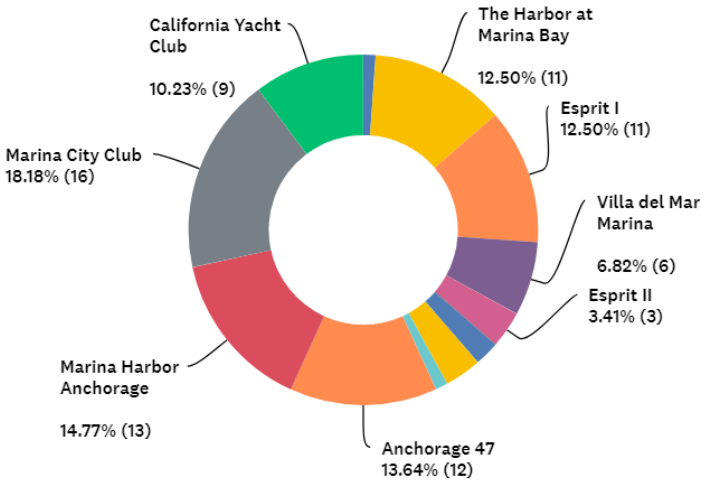
15-25'		13.64%	12
26-35'		29.55%	26
36-40'		14.77%	13
41-45'		27.27%	24
46-55'		11.36%	10
55-75'		0%	0
75-100'		2.27%	2
>100'		1.14%	1

Q6

Customize | Save As

At which anchorage in Marina del Rey Harbor do you rent a slip / dock for your boat?

Answered: 88 Skipped: 1

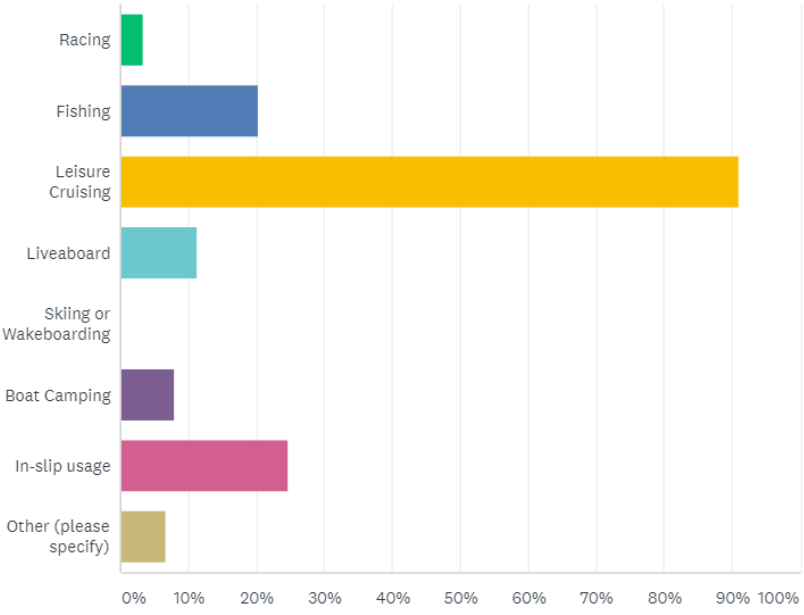


Q7

Customize

What activities do you use your boat for?

Answered: 89 Skipped: 0



Q8

How often do you take your boat out of the slip?

Answered: 86 Skipped: 3

RESPONSES (86) WORD CLOUD TAGS (5)

+ New Tag

You've added **5** tags

1 to 3 times per month	43.02%	37
5 to 10 times a year	2.33%	2
less than 5 times a year	10.47%	9
Once a week or more	38.37%	33
rarely	5.81%	5

Q9

How long ago was your current hull paint applied?

Answered: 87 Skipped: 2

RESPONSES (87) WORD CLOUD TAGS (5)

+ New Tag

You've added **5** tags

0-2 years ago	18.39%	16
3-5 years ago	18.39%	16
6-10 years ago	4.60%	4
more than 10 years ago	2.30%	2
Not Sure	10.34%	9

Q10

Where did you get your boat hull painted?

Answered: 82 Skipped: 7

RESPONSES (82) WORD CLOUD TAGS (9)

+ New Tag

You've added **9** tags

Elsewhere in CA	23.17%	19
Long Beach	4.88%	4
Marina del Rey	6.10%	5
Mexico	1.22%	1
Not sure	23.17%	19
Out of state	4.88%	4
Owner painted	1.22%	1
The Boat Yard	21.95%	18
Windward Yacht Center	13.41%	11

Q11

About how long until your current hull paint will need repainting?

Answered: 86 Skipped: 3

RESPONSES (86) WORD CLOUD TAGS (6)

+ New Tag

Search response

You've added **6** tags

3+ years from now	4.65%	4	View all
Due now.	29.07%	25	View all
Unknown	3.49%	3	View all
within 1 year	30.23%	26	View all
within 2 years	17.44%	15	View all
within next 6 months	15.12%	13	View all

Q12

How often do you clean your hull in the summer?

Answered: 86 Skipped: 3

RESPONSES (86) WORD CLOUD TAGS (9)

+ New Tag

You've added **9** tags

1 time per month	46.51%	40
2 times per month	36.05%	31
3 times per month	2.33%	2
Every 2 months	1.16%	1
Every 3 weeks	3.49%	3
Every 6 months	1.16%	1
Every 6 weeks	1.16%	1
Quarterly	2.33%	2
weekly	5.81%	5

Q13

How often do you clean your hull in the winter?

Answered: 86 Skipped: 3

RESPONSES (86) WORD CLOUD TAGS (8)

+ New Tag

You've added **8** tags

1 time per month		72.09%	62
2 times per month		12.79%	11
Every 2 months		4.65%	4
Every 3 weeks		2.33%	2
Every 6 months		1.16%	1
Every 6 weeks		1.16%	1
Quarterly		3.49%	3
Weekly		2.33%	2

Q14

Save As

Approximately how much does it cost to have your hull cleaned (single cleaning)?

Answered: 86 Skipped: 3

RESPONSES (86) WORD CLOUD TAGS (8)

+ New Tag

Search responses

You've added **8** tags

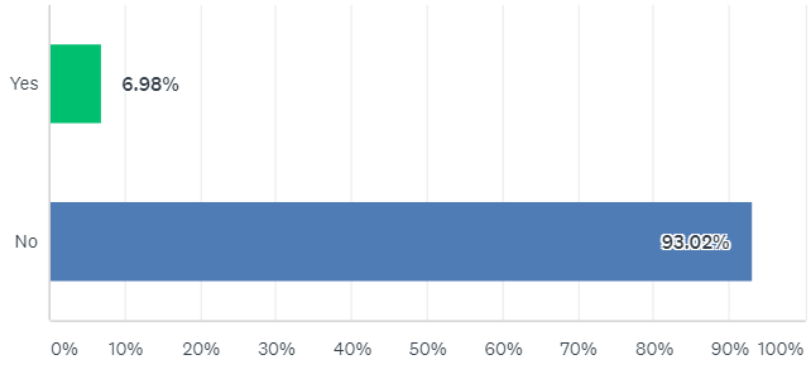
$100-200	4.65%	4	View all Edit	Delete
$20 or less	3.49%	3	View all Edit	Delete
$25-35	20.93%	18	View all Edit	Delete
$250 or more	4.65%	4	View all Edit	Delete
$35-50	29.07%	25	View all Edit	Delete
$50-65	23.26%	20	View all Edit	Delete
$65-85	12.79%	11	View all Edit	Delete
Not sure	1.16%	1	View all Edit	Delete

Q15

Customize

Have you experienced any issues with your current hull paint?

Answered: 86 Skipped: 3

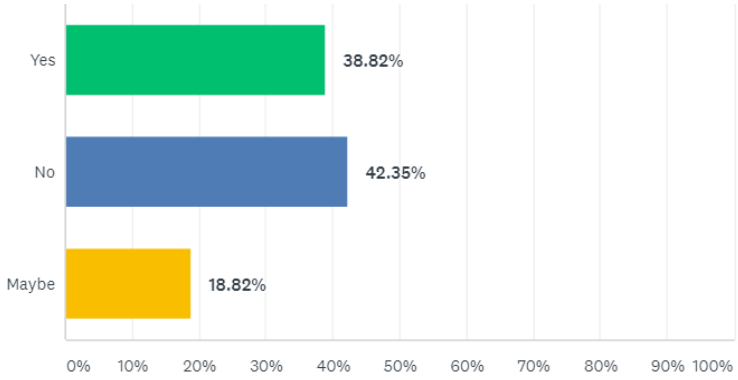


Q16

Customize | Save As

Would you like to be added to the Marina del Rey Harbor Boating Stakeholder Group email list? This group will meet every few months to discuss experiences with non-copper and non-biocide hull paints, as well as other topics and programs related to the Marina del Rey Harbor water quality program and TMDL implementation. If interested, please provide contact information.

Answered: 85 Skipped: 4



Appendix B

Paint Information Sheet

Marina del Rey Harbor Pilot Hull Paint Conversion Program – Non-Biocide Paint Information Sheet

	Subsea Industries Ecospeed	**CeRam-Kote** CeRam-Kote 54 SST	**Ceramic Pro** Ceramic Pro Marine	**HullSpeed™** Smart Armor	**HullSpeed™** 3000-Series	**HullSpeed™** F-Series	**HullSpeed™** SuperGlide	**International Paint** Intersleek 1100SR
What is paint base?	Vinyl ester base reinforced with glass platelets	Thin-film ceramic polymer coating	Ceramic	Waterborne epoxy/silicone copolymer	Waterborne epoxy/silicone copolymer	Waterborne epoxy/silicone copolymer	Waterborne epoxy/silicone copolymer	Fluoropolymer
Hard or soft non-biocide?	Hard non-biocide	Hard non-biocide	Hard non-biocide	Hard/slick, non-biocide/non-heavy metal	Hard/slick, non-biocide/non-heavy metal	Hard/slick, non-biocide/non-heavy metal	Thin film hard/slick polish non-biocide	Soft (non-ablative)
Recommended boat type/ usage for paint?	All boats and ships	Underwater hull all recreational boats, fiberglass and aluminum	All vessels	Sport fishing, recreational boats	Commercial, government vessels	Racing, high performance	Racing/recreational seasonal clear coat polish	Power and sail – works best for moving vessels
Application method?	Spray only	Spray only	Rolled, brushed or sponged	Roll or spray	Roll or spray	Roll or spray	Polish/buff	Roll or spray
Any restrictions on hull composition/ material?	No, but 3 coats instead of 2 for a wood hull	Extremely high adhesion to virtually any substrate (including marginally prepared substrates making this product an excellent surface tolerant coating)	No	Must be applied over an epoxy compatible primer/barrier coat	Must be applied over an epoxy compatible primer/barrier coat	Must be applied over an epoxy compatible primer/barrier coat	Apply over clean/dry surface	None

Marina del Rey Harbor Pilot Hull Paint Conversion Program – Non-Biocide Paint Information Sheet

	Subsea Industries Ecospeed	**CeRam-Kote** CeRam-Kote 54 SST	**Ceramic Pro** Ceramic Pro Marine	**HullSpeed™** Smart Armor	**HullSpeed™** 3000-Series	**HullSpeed™** F-Series	**HullSpeed™** SuperGlide	**International Paint** Intersleek 1100SR
Special application requirements or equipment?	Uses regular spray equipment, but inspectors are required to be present to provide the 10 year guarantee and application teams need to be briefed on application details and overseen during at least initial applications	Standard spray gun driven by air	No	Non-hazardous, traditional app. equip. 25 min between coats	Non-hazardous, traditional app. equip. 25 min between coats	Non-hazardous, traditional app. equip. 25 min between coats	Use lint free rag and/or lint free buff pad	Airless application preferred
Would the local boat yards need paint application training/ certification for this paint?	Guidance and assistance can be very useful. Company insists on an inspector on site during application for warranty purposes and to make sure that the application will be done in accordance to all requirements.	Training is not needed.	Business licenses and insurance	No. Preparation and application are the same as traditional paints. They are also non-hazardous, diluted with water and very easy/cost efficient to work with.	No. Preparation and application are the same as traditional paints. They are also non-hazardous, diluted with water and very easy/cost efficient to work with.	No. Preparation and application are the same as traditional paints. They are also non-hazardous, diluted with water and very easy/cost efficient to work with.	No. Preparation and application are the same as traditional paints. They are also non-hazardous, diluted with water and very easy/cost efficient to work with.	

Marina del Rey Harbor Pilot Hull Paint Conversion Program – Non-Biocide Paint Information Sheet

	Subsea Industries Ecospeed	**CeRam-Kote** CeRam-Kote 54 SST	**Ceramic Pro** Ceramic Pro Marine	**HullSpeed™** Smart Armor	**HullSpeed™** 3000-Series	**HullSpeed™** F-Series	**HullSpeed™** SuperGlide	**International Paint** Intersleek 1100SR
Is the company willing to provide paint application training to the local boat yards, if needed, as part of the program?	The company is willing to provide training, but not free of charge.	Not needed – can discuss over the phone	yes	HullSpeed would be willing to send a representative to answer questions and do a hands on training if needed.	HullSpeed would be willing to send a representative to answer questions and do a hands on training if needed.	HullSpeed would be willing to send a representative to answer questions and do a hands on training if needed.	HullSpeed would be willing to send a representative to answer questions and do a hands on training if needed.	
VOC?	20-40 G/L calculated	1.63 lb/gal (196 g/lit)	Compliant; 39.998%	Low VOC's CARB compliant, 1.7lb/gal	Low VOC's CARB compliant, 1.7lb/gal	Low VOC's CARB compliant, 1.7lb/gal	Low VOC's CARB compliant, 1.7lb/gal	264 gr/ltr VOC will not vary for brush, roll or spray
Does boat hull need to be stripped?	Yes	Yes. Remove old bottom paint and sand gelcoat with 60 grit paper	The hull would need to be stripped of copper or other antifouling paint prior to application	Any current anti-fouling paint on the hull must be fully removed prior to application	Any current anti-fouling paint on the hull must be fully removed prior to application	Any current anti-fouling paint on the hull must be fully removed prior to application	Any current anti-fouling paint on the hull must be fully removed prior to application	Yes, unless you are just doing touch up on existing Intersleek
Special primer required?	No	No	Yes – primer with silica dioxide. Sold with the coating.	Epoxy compatible primer/barrier coat	Epoxy compatible primer/barrier coat	Epoxy compatible primer/barrier coat	No primer required	Interprotect 2000 or Interprotect HS or Interprotect VOC
Number of paint coats recommended?	2 coats each 500 microns dry film thickness	2	one	3 consecutive coats (3-5 mil wet film/coat)	3 consecutive coats (3-5 mil wet film/coat)	3 consecutive coats (3-5 mil wet film/coat)	3 consecutive coats (3-5 mil wet film/coat)	1 tie coat, 1 finish coat

Marina del Rey Harbor Pilot Hull Paint Conversion Program – Non-Biocide Paint Information Sheet

	Subsea Industries Ecospeed	**CeRam-Kote** CeRam-Kote 54 SST	**Ceramic Pro** Ceramic Pro Marine	**HullSpeed™** Smart Armor	**HullSpeed™** 3000-Series	**HullSpeed™** F-Series	**HullSpeed™** SuperGlide	**International Paint** Intersleek 1100SR
Provide details on drying times and curing temperatures	The overcoat time between the layers is about 3 hours. You will need 24 hours curing before full immersion in water.	6 mil wet film thickness (~5 mils dry) then another 6 mils. Want total 9.6 mils dry Cure 48 hrs, prefer 3 days before putting in water	24 hour dry time curing about 37 degrees F	30 min between coats, 3 coats. Let cure 48hrs, 72hrs+ before trailering/ submerging. Curing about 60F	30 min between coats, 3 coats. Let cure 48hrs, 72hrs+ before trailering/ submerging. Curing about 60F	30 min between coats, 3 coats. Let cure 48hrs, 72hrs+ before trailering/ submerging. Curing about 60F	30 min between coats, 3 coats. Let cure 48hrs, 72hrs+ before trailering/ submerging. Curing about 60F	
Price per gallon?	$150/gal	$125.00/gal	Sold by the liter @$2000 a liter covers 10 24ft boats	$1,655.00/5 gal RETAIL $ 389.00/1 gal $ 109.00/1 qt	$1,709.00/5 gal RETAIL $ 399.00/1 gal	$1,570.00/5 gal RETAIL $ 369.00/1 gal $ 99.00/1 qt	$469.00/1 gal RETAIL $129.00/1 qt	Approx. $850/mixed gallon
Approx. pricing per foot?	N/A	1 gallon will cover ~100 square feet	Starting price $45 linear ft	~$1.65	$1.75	$1.55		
Frequency of winter hull cleaning in Marina del Rey Harbor (Southern CA) assuming limited use?	2 times in three months	Every 4 weeks	monthly	Every 2-3 weeks depending on bio-fouling	Every 2-3 weeks depending on bio-fouling	Every 2-3 weeks depending on bio-fouling	As needed/depending on vessel	Twice monthly
Frequency of summer hull cleaning in Marina del Rey Harbor (Southern CA) assuming limited use?	1 per month or 2 per month depending on owner preference	Every 3 weeks	Bi weekly	Every 1-2 weeks depending on bio-fouling	Every 1-2 weeks depending on bio-fouling	Every 1-2 weeks depending on bio-fouling	As needed/depending on vessel	Weekly

Marina del Rey Harbor Pilot Hull Paint Conversion Program – Non-Biocide Paint Information Sheet

	Subsea Industries Ecospeed	**CeRam-Kote** CeRam-Kote 54 SST	**Ceramic Pro** Ceramic Pro Marine	**HullSpeed™** Smart Armor	**HullSpeed™** 3000-Series	**HullSpeed™** F-Series	**HullSpeed™** SuperGlide	**International Paint** Intersleek 1100SR
Special cleaning requirements or recommendations	Only specialized equipment. Ecospeed hull needs to be cleaned/ conditioned with brushes that are specially designed for this operation. Recommended to do this with the appropriate hydraulic equipment.	Best if use rotary air powered brushes	Soft bristled brushed	No acid washing. Pressure washing ok. Mild/eco-safe detergent/soap with deck brush or abrasive pad recommended if needed.	No acid washing. Pressure washing ok. Mild/eco-safe detergent/soap with deck brush or abrasive pad recommended if needed.	No acid washing. Pressure washing ok. Mild/eco-safe detergent/soap with deck brush or abrasive pad recommended if needed.	No acid washing. Pressure washing ok. Mild/eco-safe detergent/soap with deck brush or abrasive pad recommended if needed.	Soft brush or cloth
What type of warranty is offered?	10 year warranty – includes new Ecospeed material on defected areas	1 year	None	Product replacement	Product replacement	Product replacement	Product replacement	None
How long before repainting is recommended?	10 years, but expected lifetime of 25 years	5-10 years, depending on how well the boat is maintained	Every 3-5 years	3-5 yrs depending on use	5-7 yrs depending on use	1-3 yrs depending on use	1 yr depending on use	Depends on usage and frequency and aggressiveness of cleaning

Marina del Rey Harbor Pilot Hull Paint Conversion Program – Non-Biocide Paint Information Sheet

	Subsea Industries Ecospeed	**CeRam-Kote** CeRam-Kote 54 SST	**Ceramic Pro** Ceramic Pro Marine	**HullSpeed™** Smart Armor	**HullSpeed™** 3000-Series	**HullSpeed™** F-Series	**HullSpeed™** SuperGlide	**International Paint** Intersleek 1100SR
Repainting application process (compared to initial painting)	Not necessary unless collision damage. Only need to apply 1 coat of Ecospeed when repainting	Solvent clean the hull after removal of marine growth and scuff sand with 60 grit paper	Repainting only requires cleaning and reapplication	Follow application procedure for re-paint/repair.	Follow application procedure for re-paint/repair.	Follow application procedure for re-paint/repair.	Follow application procedure for re-paint/repair.	Hydroblast hull, wipe down entire surface with Toluene, fix repair areas first. Remove to substrate, re-prime, apply tie-coat, then apply final topcoat to entire hull
Can other paint products be applied over it (to replace it) without stripping the paint from the hull?	Because of the adhesive properties and superior protection qualities that Ecospeed in essence is a perfect substrate for other products. Adhesion with other products is not clear.	Yes, just scuff sand the hull to apply the other paint	No, the product must be stripped prior to any other paint being applied	Can be applied over themselves as long as the integrity of the sub-coating is good. The coatings will need to be removed down to primer if applying a different product	Can be applied over themselves as long as the integrity of the sub-coating is good. The coatings will need to be removed down to primer if applying a different product	Can be applied over themselves as long as the integrity of the sub-coating is good. The coatings will need to be removed down to primer if applying a different product	Can be applied over themselves as long as the integrity of the sub-coating is good. The coatings will need to be removed down to primer if applying a different product	

Marina del Rey Harbor Pilot Hull Paint Conversion Program – Non-Biocide Paint Information Sheet

	Subsea Industries Ecospeed	**CeRam-Kote** CeRam-Kote 54 SST	**Ceramic Pro** Ceramic Pro Marine	**HullSpeed™** Smart Armor	**HullSpeed™** 3000-Series	**HullSpeed™** F-Series	**HullSpeed™** SuperGlide	**International Paint** Intersleek 1100SR
Once applied, is it difficult to intentionally remove the paint without damaging the hull?	It is difficult to remove Ecospeed once applied. The adhesion between Ecospeed and the surface is superior. It is a once in a lifetime coating system. Unclear if removal will damage the hull.	Might remove gel coat, but as a barrier paint, shouldn't need to remove it	No	Can be removed from a hull with traditional methods (chemical stripping, sanding, blasting…) which don't damage the hull.	Can be removed from a hull with traditional methods (chemical stripping, sanding, blasting…) which don't damage the hull.	Can be removed from a hull with traditional methods (chemical stripping, sanding, blasting…) which don't damage the hull.	Can be removed from a hull with traditional methods (chemical stripping, sanding, blasting…) which don't damage the hull.	No
References for boatyards that have applied the paint?	N/A	Shelter Island Boatyard, San Diego	Pavati boats, Nor-tech, MTI, Skater Boats, US Coast Guard, Domin8r boats	Gillis Boat Repair (Lake George, NY)	The Boat Yard, (Marina del Rey, CA), Driscoll Boat Works (San Diego, CA), Gillis Boat Repair (Lake George, NY)	Driscoll Boat Works (San Diego, CA), Gillis Boat Repair (Lake George, NY)	Driscoll Boat Works (San Diego, CA), Gillis Boat Repair (Lake George, NY)	Windward, The Boatyard (Marina del Rey) Shelter Island Boatyard in San Diego
What studies involving this paint have been completed?	13 White Papers, 1 book	Port of San Diego	IMO Certificate, Bureau Veritas Marine and offshore division	Marina del Rey test panel growth study, L.A. Water Keeper patrol boat, FL marine growth study, Northeast fresh water growth study, 3rd party ASTM, ISO, Mill-Spec testing	Marina del Rey test panel growth study, L.A. Water Keeper patrol boat, FL marine growth study, Northeast fresh water growth study, 3rd party ASTM, ISO, Mill-Spec testing	Marina del Rey test panel growth study, L.A. Water Keeper patrol boat, FL marine growth study, Northeast fresh water growth study, 3rd party ASTM, ISO, Mill-Spec testing	Marina del Rey test panel growth study, L.A. Water Keeper patrol boat, FL marine growth study, Northeast fresh water growth study, 3rd party ASTM, ISO, Mill-Spec testing	None. IRTA did one years ago, but conclusions were flawed as they were based on faulty assumptions

Marina del Rey Harbor Pilot Hull Paint Conversion Program – Non-Biocide Paint Information Sheet

	Subsea Industries Ecospeed	**CeRam-Kote** CeRam-Kote 54 SST	**Ceramic Pro** Ceramic Pro Marine	**HullSpeed™** Smart Armor	**HullSpeed™** 3000-Series	**HullSpeed™** F-Series	**HullSpeed™** SuperGlide	**International Paint** Intersleek 1100SR
Company willing to offer discount for pilot program?	No	Coating price to boatyards is $125/gal, already discounted from $150/gal retail price	Yes	Yes, ~45%	Yes, ~45%	Yes, ~45%	Yes, ~45%	No
How much of a discount is the company willing to offer?	N/A	$125/gal	15% off	$993.00/5 gal $218.00/1 gal $ 65.00/1 qt	$1,111.00/5 gal $ 224.00/1 gal	$883.00/5 gal $207.00/1 gal $ 59.00/1 qt	$263.00/1 gal $ 79.00/1 qt	N/A
Contact Person/Info	Manuel Hof mhof@subind.net 323-213-5300 Andi Hermans ahermans@subind.net 323-213-5300	Bill Kraus Bill.Kraus@sbcglobal.net (858) 924-9611	Joel Accuardi, Vice President (949)303-0895 Joel@ceramicpro.com	Ian Germain Ian@gmfg.net Office: 518-581-2368 Mobile: 518-312-1167 Fax: 518-581-2369	Ian Germain Ian@gmfg.net Office: 518-581-2368 Mobile: 518-312-1167 Fax: 518-581-2369	Ian Germain Ian@gmfg.net Office: 518-581-2368 Mobile: 518-312-1167 Fax: 518-581-2369	Ian Germain Ian@gmfg.net Office: 518-581-2368 Mobile: 518-312-1167 Fax: 518-581-2369	Asheley D. Bowles Asheley.Bowles@akzonobel.com Fax: (713) 684-1348 AkzoNobel Coatings, Inc. 6001 Antoine Drive Houston, TX 77091

Appendix C

Boat Yard Information Request

Marina del Rey Harbor Pilot Hull Paint Conversion Program – Non-Biocide Paint Information Sheet – Boat Yard Questions

	Subsea Industries Ecospeed	**CeRam-Kote** CeRam-Kote 54 SST	**HullSpeed™** Smart Armor	**HullSpeed™** 3000-Series	**HullSpeed™** F-Series	**HullSpeed™** SuperGlide
The Boat Yard						
Do you have any experience applying any of these paints?	No	No	No	Yes	No	No
Have you heard positive or negative things about any these paints? Please explain	No	No	No	LA Waterkeeper does not like it.	No	No
Do you have the necessary equipment and/or training to be able to apply any of these paints?	Yes on equipment, No on training	Yes on equipment, No on training	Yes on equipment, No on training	Yes for both	Yes on equipment, No on training	Yes on equipment, No on training
Approximately how long would it take to convert a 30ft boat from copper antifouling paint to these non-biocide paints (i.e., time from haul out, stripping, paint application, to putting the boat back in the water)?	10 days	10 days	7 days	7 days	10 days	10 days
At approximately what rate could your business convert multiple 30-40ft boats from	3 boats every 2 weeks for spray application	3 boats every 2 weeks for spray application	3 per week for roll on application	3 per week for roll on application	3 boats every 2 weeks for spray application	3 boats every 2 weeks for spray application

Marina del Rey Harbor Pilot Hull Paint Conversion Program – Non-Biocide Paint Information Sheet – Boat Yard Questions

copper to non-biocide paints, assuming stripping is required? (e.g., 3 boats/week)						
Any other potential constraints or issues with any of these paints?	Will not be able to provide warranty for this product.	Will not be able to provide warranty for this product.	Will not be able to provide warranty for this product.	Will not be able to provide warranty for this product.	Will not be able to provide warranty for this product.	Will not be able to provide warranty for this product.
Any other thoughts or opinions to share about any of these paint?	May need more frequent cleaning than suggested. We question longevity claim.	May need more frequent cleaning than suggested. We question longevity claim		Very hard to clean bottom. Divers claim they need to use mechanical brushes		
	Subsea Industries Ecospeed	CeRam-Kote CeRam-Kote 54 SST	HullSpeed™ Smart Armor	HullSpeed™ 3000-Series	HullSpeed™ F-Series	HullSpeed™ SuperGlide
Windward Yacht Center						
Do you have any experience applying any of these paints?	No	No	No	No	No	
Have you heard positive or negative things about any these paints? Please explain	No	Have heard that once applied to hull bottom, it is extremely difficult to remove without damaging hull substrate	No	No	No	

Marina del Rey Harbor Pilot Hull Paint Conversion Program – Non-Biocide Paint Information Sheet – Boat Yard Questions

Do you have the necessary equipment and/or training to be able to apply any of these paints?	Yes	Yes	Yes	Yes	Yes	
Approximately how long would it take to convert a 30ft boat from copper antifouling paint to these non-biocide paints (i.e., time from haul out, stripping, paint application, to putting the boat back in the water)?	14 working days	14 working days	14 working days	14 working days	14 working days	
At approximately what rate could your business convert multiple 30-40ft boats from copper to non-biocide paints, assuming stripping is required? (e.g., 3 boats/week)	4 boats every 2 weeks	4 boats every 2 weeks	4 boats every 2 weeks	4 boats every 2 weeks	4 boats every 2 weeks	
Any other potential constraints or issues with any of these paints?	Drying times and curing temperatures	Drying times and curing temperatures	Drying times and curing temperatures	Drying times and curing temperatures	Drying times and curing temperatures	
Any other thoughts or opinions to share about any of these paint?	My only concern is that once applied, can reapplication take place without	My only concern is that once applied, can reapplication take place without	My only concern is that once applied, can reapplication take place without	My only concern is that once applied, can reapplication take place without	My only concern is that once applied, can reapplication take place without	

Marina del Rey Harbor Pilot Hull Paint Conversion Program – Non-Biocide Paint Information Sheet – Boat Yard Questions

	stripping, or can other products be applied without stripping?	stripping, or can other products be applied without stripping	stripping, or can other products be applied without stripping	stripping, or can other products be applied without stripping	stripping, or can other products be applied without stripping	

Marina del Rey Harbor Pilot Hull Paint Conversion Program

Boat Yard Hull Paint Questions – Ceramic Pro

	Ceramic Pro Ceramic Pro Marine
What is paint base?	Ceramic
Hard or soft non-biocide?	Hard non-biocide
Recommended boat type/usage for paint?	All vessels
Application method?	Rolled, brushed or sponged
Any restrictions on hull composition/ material?	No
Special application requirements or equipment?	No
Would the local boat yards need paint application training/certification for this paint?	Business licenses and insurance
Is the company willing to provide paint application training to the local boat yards, if needed, as part of the program?	yes
VOC?	Compliant; 39.998%
Does boat hull need to be stripped?	The hull would need to be stripped of copper or other antifouling paint prior to application
Special primer required?	Yes – primer with silica dioxide. Sold with the coating.
Number of paint coats recommended?	one
Provide details on drying times and curing temperatures	24 hour dry time curing about 37 degrees F
Price per gallon?	Sold by the liter @$2000 a liter covers 10 24ft boats
Approx. pricing per foot?	Starting price $45 linear ft
Frequency of winter hull cleaning in Marina del Rey Harbor (Southern CA) assuming limited use?	monthly
Frequency of summer hull cleaning in Marina del Rey Harbor (Southern CA) assuming limited use?	Bi weekly
Special cleaning requirements or recommendations?	Soft bristled brushed
What type of warranty is offered?	No
How long before repainting is recommended?	Every 3-5 years
Repainting application process (compared to initial painting)	Repainting only requires cleaning and reapplication

Marina del Rey Harbor Pilot Hull Paint Conversion Program

	Ceramic Pro Ceramic Pro Marine
Can other paint products be applied over it (to replace it) without stripping the paint from the hull?	No, the product must be stripped prior to any other paint being applied
Once applied, is it difficult to intentionally remove the paint without damaging the hull?	No
References for boatyards that have applied the paint?	Pavati boats, Nor-tech, MTI, Skater Boats, US Coast Guard, Domin8r boats
What studies involving this paint have been completed?	IMO Certificate, Bureau Veritas Marine and offshore division
Company willing to offer discount for pilot program?	Yes
How much of a discount is the company willing to offer?	15% off
Contact Person/Info	Joel Accuardi, Vice President (949)303-0895 Joel@ceramicpro.com
Do you have any experience applying this paint/coating?	No
Have you heard positive or negative things about this paint/coating? Please explain	See “Potential Constraints” below
Do you have the necessary equipment and/or training to be able to apply this paint/coating?	Yes
Approximately how long would it take to convert a 30ft boat from copper antifouling paint to this paint/coating (i.e., time from haul out, stripping, paint application, to putting the boat back in the water)?	1 week
At approximately what rate could your business convert multiple 30-40ft boats from copper paint to this paint/coating, assuming stripping is required? (e.g., 3 boats/week)	1/week
Any other potential constraints or issues with this paint/coating?	This product is a clear coat paint and will not cover any blemishes, repairs, or defects in the hull remaining after stripping. Although this paint may be acceptable for application to brand new boat hulls, it will very likely not be acceptable to boats that have been stripped primarily for cosmetic reasons. Stripped boats could pay to have new gel coat added prior to the application of this product, however, the cost would be significantly greater, perhaps triple.
Any other thoughts or opinions to share about this paint/coating?	Most boaters will not like this product for cosmetic reasons.

Appendix D

Hull Cleaner Information Request

Marina del Rey Harbor Pilot Hull Paint Conversion Program – Non-Biocide Paint Information Sheet – Hull Cleaner Questions

	Below The Waterline Diving Service	Del Rey Divers
Do you have experience cleaning any of these paints?	No	Is not familiar with the paints
What are the unique in-water hull cleaning requirements for these non-biocide paints using best management practices?	We will have to see	Would need to determine
Do you have the necessary equipment and/or training to be able to clean a hull painted with any of these paints (according to manufacturer cleaning recommendations and best management practices)? For example, the Ecospeed paint requires the appropriate hydraulic equipment combined with specific brushes.	Yes	
In your experience, how frequently would you recommend in–water hull cleaning in Marina del Rey Harbor for these non-biocide paints in the summer?	Will have to monitor the paints anti-fouling properties and report	Would need to send a diver to clean them on a regular basis to determine frequency (at least every 7-10 days)
In your experience, how frequently would you recommend in–water hull cleaning in Marina del Rey Harbor for these non-biocide paints in the winter?	Will have to monitor the paints anti-fouling properties and report	Would need to send a diver to clean them on a regular basis to determine frequency (at least every 7-10 days)
In your experience, how long do these paints typically last before needing repainting?	Will need to monitor	
Approximately, how much would a single in-water hull cleaning cost using manufacturer recommended cleaning methods and best management practices for a 30ft boat painted with any of these non-biocide hull paints?		
Any other thoughts or opinions to share about any of these paints?	Would like to be involved. Is researching and developing a non-toxic anti-fouling paint, and hoping to have useable samples by summer	
Hull Cleaning Contact Person/Info	Ian Roberts (Owner) Below The Waterline Diving Service, LLC (310) 918-5631 info@btwdive.com	Steve Goldberg Del Rey Divers 310-822-8200 aquatecture1@verizon.net

Appendix E

Performance Assessment Rating Descriptions

Example Descriptions for Hull Cleaning Assessments

Fouling Growth

Rating	Fouling Growth
0	No silting, biofilm or fouling growth present.
1	Light silting or biofilm. Little to no discoloration; paint surface still clearly visible beneath.
2	Heavy biofilm; Light to moderate silting as indicated by discoloration (a solid, discernible, physical layer); Painted surface may be slightly obscured.
3	Low to medium levels of fouling present; Dark algae impregnation; Hard growth may be present (tubeworms, barnacles, bryozoans, etc.); Painted surface definitely obscured.
4	Medium to high levels of fouling present; Hard growth present, such as tubeworms, barnacles, bryozoans, etc.; Macrofoulers may include mature forms that may be densely grouped; Paint surface no longer visible beneath fouling in areas.
5	High levels of fouling present; Lengthy, soft algae and hard, tube worms and possibly barnacles impregnating the coatings; Macrofoulers may be densely grouped; Coral2 growth can be seen to extend out from the hull; Paint surface no longer visible beneath fouling.

Coating Condition

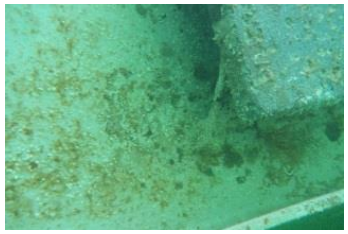
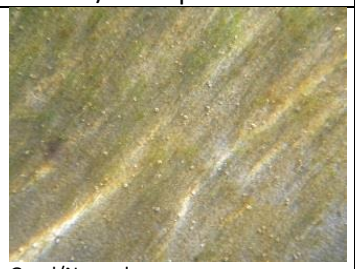
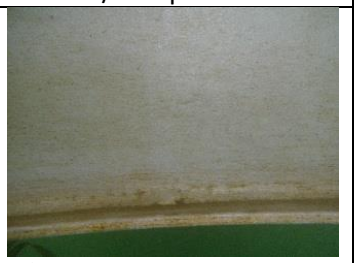
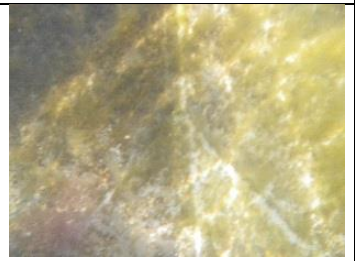
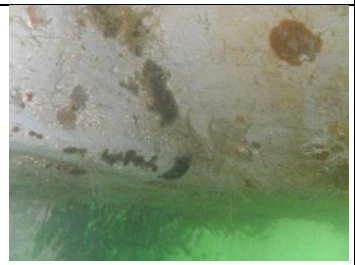
Rating	Coating Description
1	Antifouling paint intact, new or slick finish. May have a mottled pattern of light and dark portions of the original paint color.
2	Shine is gone or surface lightly etched. No physical failures.
3	Physical failure on up to 20% of boat hull. Coating may be missing from slightly curved or flat areas to expose underlying coating. Coating has visible swirl marks within the outermost layer, not extending into any underlying layers of paint.
4	Physical failure of coating on 20-50% of boat bottom. Coating missing from slightly curved or flat areas to expose underlying coating. Coating missing from intact blisters or blisters which have ruptured to expose underlying coating layer(s). Visible swirl marks expose underlying coating layer.
5	Physical failure of coating on over 50% of boat bottom. Coating missing from intact blisters or blisters which have ruptured to expose underlying coating layer(s). Visible swirl marks expose underlying coating layer.

Appendix F

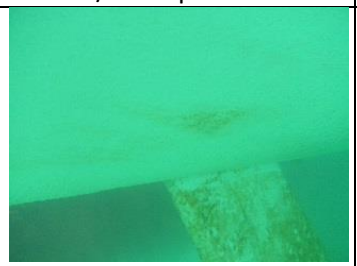
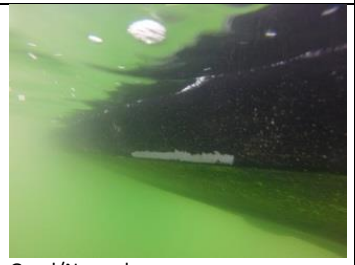
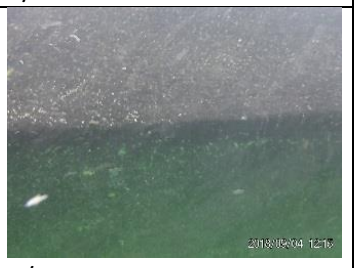
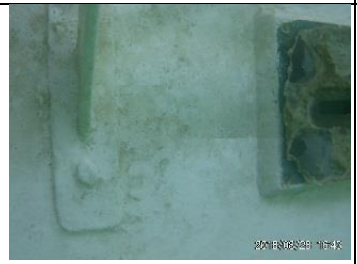
Fouling Photo Summary Table

Marina del Rey Harbor Pilot Paint Study – Paint Performance Inspections

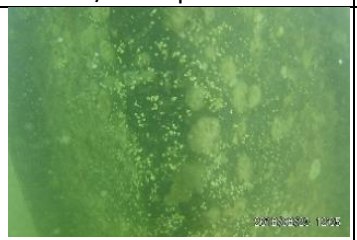
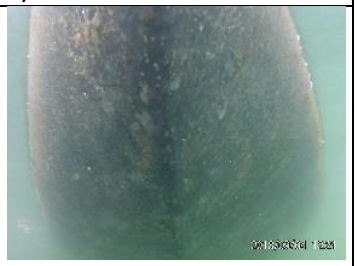
Rating Code = Paint Condition/Level of Growth

Boat	Boat ID Photo	8/16 Inspection	8/21 Inspection	8/28 Inspection	9/4 Inspection
32 *Hullspeed 3000* **4/9/18**		  Good/Normal	 Good/Normal	 Good/Normal	 2/3
27 *Hullspeed 3000* **6/11/18**		N/A	N/A	N/A	N/A
10 *Ceramkote* **5/22/18**		 Fair/Excessive	 Fair/Excessive	 Fair/Excessive	 3/4
55 *Hullspeed 3000* **5/22/18**		 Fair/Excessive	 Fair/Excessive	 Fair/Excessive	 3/4

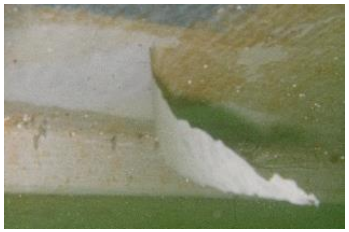
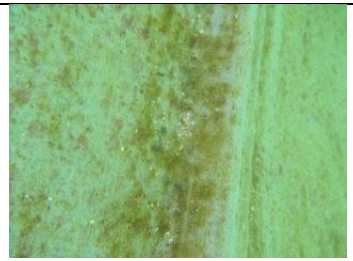
Marina del Rey Harbor Pilot Paint Study – Paint Performance Inspections

Boat	Boat ID Photo	8/16 Inspection	8/21 Inspection	8/28 Inspection	9/4 Inspection
CF 3309 *Intersleek 1100SR* **7/10/18**		 Excellent/Light	 Excellent/Normal	 Excellent/Normal	 1/1
4314 (#1) *Hullspeed F-Series*		 Good/Normal	 Good/Normal	 Good/Normal	 2/3
4311 (#2) *Intersleek 1100SR* **6/11/18**		 Excellent/Normal	 Excellent/Light	 Excellent/Normal	 1/1
4315 (Jimmy Henry) *Hullspeed 3000* **4/24/18**		 Good/Normal	 Good/Normal	 Good/Excessive	 2/1

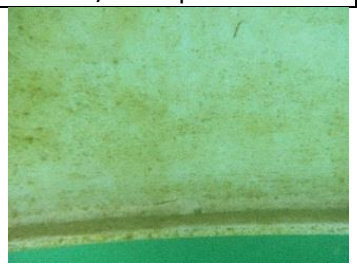
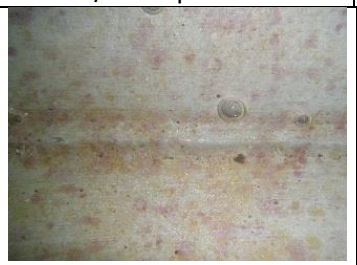
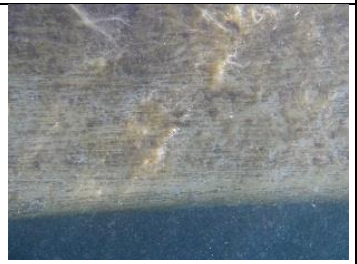
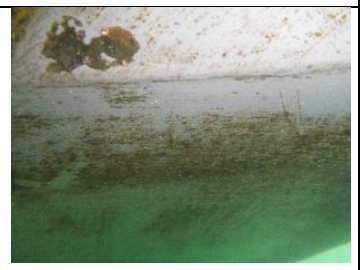
Marina del Rey Harbor Pilot Paint Study – Paint Performance Inspections

Boat	Boat ID Photo	8/16 Inspection	8/21 Inspection	8/28 Inspection	9/4 Inspection
1386 *Hullspeed* *F-Series* **6/10/18**	 	 Good/Excessive	 Good/Excessive	 Good/Normal	 2/3
SX1541 *Ceramkote* **6/11/18**		 Good/Normal	 Good/Normal	 Good/Normal	 2/3
SZ0717 *Hullspeed* *F-Series* **6/25/18**		 Fair/Excessive	 Fair/Excessive	 Fair/Excessive	 5/3
SD4820 *Hullspeed* *3000/CK* *(jet drives)* **5/10/18**		 Good/Normal	 Good/Normal	 Good/Normal	 2/3

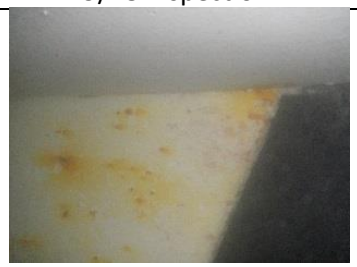
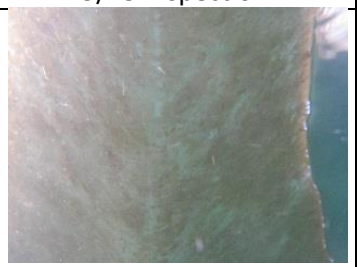
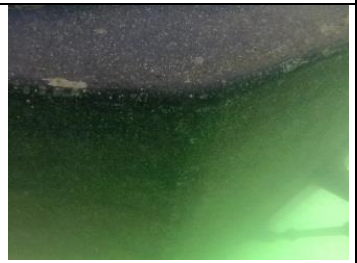
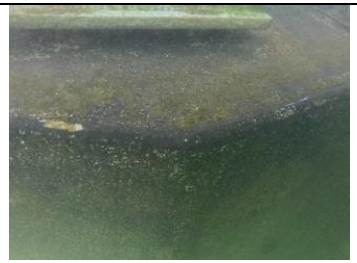
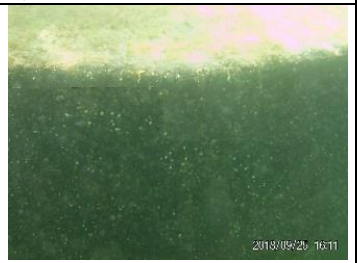
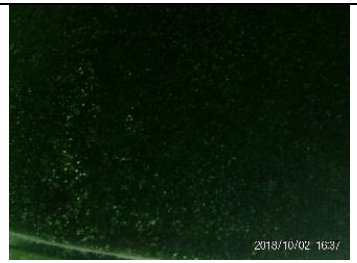
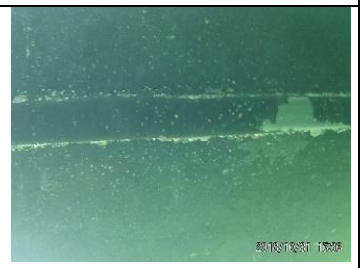
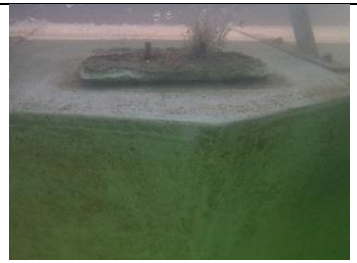
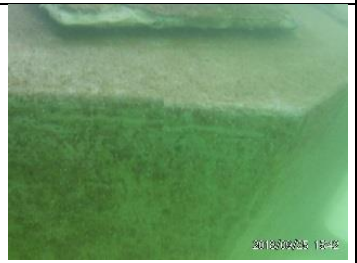
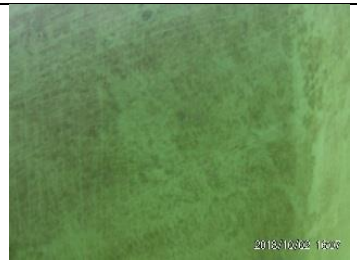
Marina del Rey Harbor Pilot Paint Study – Paint Performance Inspections

Boat	Boat ID Photo	8/16 Inspection	8/21 Inspection	8/28 Inspection	9/4 Inspection
SD5996 *Hullspeed 3000/CK (jet drives)* **6/29/18**	Out for Repairs	Out for Repairs	Out for Repairs	Out for Repairs	Out
SX1015 *Intersleek 1100SR* **8/9/18**		 Excellent/Light	 Excellent/Light	 Excellent/Light	 1/1
BW#14 *Hullspeed 3000* **6/11/18**		  Fair/Excessive	 Fair/Normal	 Fair/Excessive	 3/3
FB310 *Hullspeed 3000* **4/24/18**		  Fair/Excessive	 Fair/Normal	 Fair/Excessive	 3/3

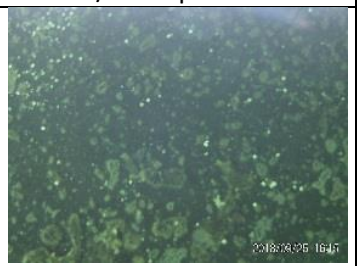
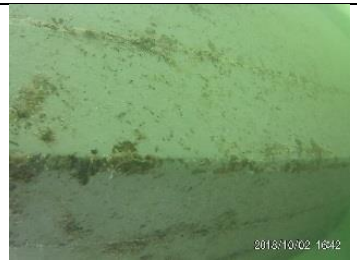
Marina del Rey Harbor Pilot Paint Study – Paint Performance Inspections

Boat	9/11 Inspection	9/18 Inspection	9/25 Inspection	10/2	10/30
32 *Hullspeed 3000* **4/9/18**	 2/2	 2/2	 2/3	 2/2	 4/2
27 *Hullspeed 3000* **6/11/18**	N/A	N/A	N/A	N/A	Out
10 *Ceramkote* **5/22/18**	 3/3	 3/3	 3/3	 3/2	 3/2
55 *Hullspeed 3000* **5/22/18**	 4/3	 4/3	 4/3	 4/3	 3/3

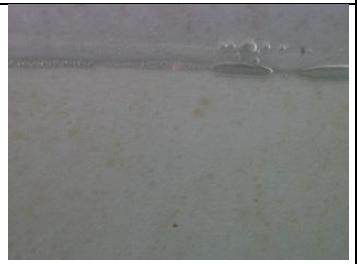
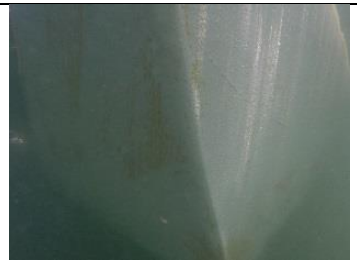
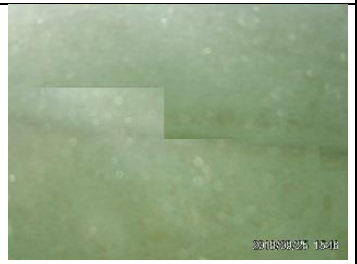
Marina del Rey Harbor Pilot Paint Study – Paint Performance Inspections

Boat	9/11 Inspection	9/18 Inspection	9/25 Inspection	10/2	10/30
CF 3309 *Intersleek 1100SR* **7/10/18**	 1/2	 1/2	 1/2	 1/2	Out
4314 (#1) *Ceramkote* **7/3/18**	 2/2	 2/2	 2/3	 2/3	 2/3
4311 (#2) *Intersleek 1100SR* **6/11/18**	 2/1	 2/1	 2/1	 2/1	 2/2
4315 (Jimmy Henry) *Hullspeed 3000* **4/24/18**	 3/3	 3/3	 3/4	 3/3	 3/1

Marina del Rey Harbor Pilot Paint Study – Paint Performance Inspections

Boat	9/11 Inspection	9/18 Inspection	9/25 Inspection	10/2	10/30
1386 *Hullspeed 3000* **6/10/18**	 3/2	 3/2	 3/2	 3/1	 3/2
SX1541 *Ceramkote* **6/11/18**	 2/2	 2/2	 2/2	 2/3	 2/1
SZ0717 *Hullspeed F-Series* **6/25/18**	 3/4	 3/4	 3/4	 3/3	 3/2
SD4820 *Hullspeed 3000/CK (jet drives)* **5/10/18**	 2/2	 2/2	 4/1	 2/2	 2/1

Marina del Rey Harbor Pilot Paint Study – Paint Performance Inspections

Boat	9/11 Inspection	9/18 Inspection	9/25 Inspection	10/2	10/30
SD5996 *Hullspeed 3000/CK (jet drives)* **6/29/18**	Out	Out	Out	Out	 1/1
SX1015 *Intersleek 1100SR* **8/9/18**	 1/1	 1/1	 1/1	 1/1	 1/1
BW#14 *Hullspeed 3000* **6/11/18**	 3/3	 3/3	 3/3	 3/3	 3/2
FB310 *Hullspeed 3000* **4/24/18**	 3/3	 3/3	 3/3	 3/3	Out

Appendix G

Performance Assessment
Ratings Summary Table

#	Boat Type	ID / CF #	Non-Biocide Paint	Department	Dock Location	Length	Bidder	Vessel Usage			Hull Cleaning Frequency Per Month		
								Average # Days Per Week	Average # Hours Per Day	Average Speed (mph)	Winter	Summer	Paint Color
1	Munson Landing Craft - aluminum	32	Hullspeed 3000	DBH	13552 Fiji Way, DBH Dock	30	B	3	4	15	1	2	Grey
2	I/O V hull (old coast guard boat)	27	Hullspeed 3000	DBH	13553 Fiji Way, DBH Dock	27	B	2	3	10	1	2	-
3	Debris Boat - aluminum	10	CeramKote	DBH	13554 Fiji Way, DBH Dock	24	W	5	5	7	1	2	Grey
4	Debris Boat w/conveyor	55	Hullspeed 3000	DBH	13555 Fiji Way, DBH Dock	22	B	2	2	5	1	2	Grey
5	MacGregor Sailboat	CF 3309 XC	Intersleek 1100SR	W.A.T.E.R. Program	13650 Mindanao Way, Boathouse	25	W	5	4	5	1	2	White
6	MacGregor Sailboat	CF 4540 HF	Intersleek 1100SR	W.A.T.E.R. Program	13650 Mindanao Way, Boathouse	25	W	5	4	5	1	2	-
7	1988 Seaway	4314	Hullspeed F-Series	Sheriff	13851 Fiji way, MDR Sheriff Station	29	W	4	3	5	2	2	Black
8	1988 Seaway	4311	Intersleek 1100SR	Sheriff	13851 Fiji way, MDR Sheriff Station	29	B	4	3	5	2	2	White
9	1988 Seaway	4315	Hullspeed 3000	Sheriff	13851 Fiji way, MDR Sheriff Station	29	B	4	3	5	2	2	Grey
10	1969 Drake	1386	Hullspeed F-Series	Sheriff	13483 Fiji way, County Work Dock	30	W	2	3	5	2	2	Black
11	2003 Safe Boat	SX1541	CeramKote	Sheriff	13851 Fiji way, MDR Sheriff Station	25	W	3	2	25	2	2	White
12	2001 Catalina (sailboat)	SZ0717 (4474XC)	Hullspeed F-Series	Sheriff	13851 Fiji way, MDR Sheriff Station	22	W	1	1	8	2	2	Black?
13	2005 Moose (twin hull)	SD4820	HullspeedS 3000 (hull)/ CeramKote (Jet Drives)	Sheriff	13851 Fiji way, MDR Sheriff Station	33.5	B	4	3	5	2	2	Grey
14	2007 Moose (twin hull)	SD5996	HullspeedS 3000 (hull)/ CeramKote (Jet Drives)	Sheriff	13851 Fiji way, MDR Sheriff Station	35.5	B	4	3	5	2	2	-
15	1972 Monarch	SX1015	Intersleek 1100SR	Sheriff	13851 Fiji way, MDR Sheriff Station	42	W	5	4	15	2	2	Grey/ White
16	Rescue boat	BW#14	Hullspeed 3000	Lifeguard	4433 Admiralty, Fire Station 110	32	B	1	2	26	2	2	Grey
17	Fire boat	FB310	Hullspeed 3000	Fire	4434 Admiralty, Fire Station 110	41	B	2	2	26	2	2	Grey

#	Boat Type	ID / CF #	Non-Biocide Paint	Inspection #1: August 14, 2018				Inspection #2: August 21, 2018				Inspection #3: August 28, 2018			
				Paint Condition	Level of Growth	Date of Last Cleaning	S&K Notes	Paint Condition	Level of Growth	Date of Last Cleaning	S&K Notes	Paint Condition	Level of Growth	Date of Last Cleaning	S&K Notes
1	Munson Landing Craft - aluminum	32	Hullspeed 3000	Good	Normal	Aug. 13-17		Good	Normal	Aug. 13-17		Good	Normal	Aug. 13-17	
2	I/O V hull (old coast guard boat)	27	Hullspeed 3000	-	-	Aug. 13-17	Out of Water	-	-	Aug. 13-17	Out	-	-	Aug. 13-17	Out
3	Debris Boat - aluminum	10	CeramKote	Fair	Excessive	Aug. 13-17		Fair	Excessive	Aug. 13-17		Fair	Excessive	Aug. 13-17	
4	Debris Boat w/conveyor	55	Hullspeed 3000	Fair	Excessive	Aug. 13-17		Fair	Excessive	Aug. 13-17		Fair	Excessive	Aug. 13-17	
5	MacGregor Sailboat	CF 3309 XC	Intersleek 1100SR	Excellent	Light	Aug. 13-17		Excellent	Normal	Aug. 13-17		Excellent	Normal	Aug. 13-17	
6	MacGregor Sailboat	CF 4540 HF	Intersleek 1100SR	Not being tracked.				Not being tracked.				Not being tracked.			
7	1988 Seaway	4314	Hullspeed F-Series	Good	Normal	Aug. 13-17		Good	Normal	Aug. 13-17		Good	Normal	Aug. 13-17	
8	1988 Seaway	4311	Intersleek 1100SR	Excellent	Normal	Aug. 13-17		Excellent	Light	Aug. 13-17		Excellent	Normal	Aug. 13-17	
9	1988 Seaway	4315	Hullspeed 3000	Good	Normal	Aug. 13-17		Good	Normal	Aug. 13-17		Good	Excessive	Aug. 13-17	
10	1969 Drake	1386	Hullspeed F-Series	Good	Excessive	Aug. 13-17		Good	Excessive	Aug. 13-17		Good	Normal	Aug. 13-17	
11	2003 Safe Boat	SX1541	CeramKote	Good	Normal	Aug. 13-17	Out of Water	Good	Normal	Aug. 13-17		Good	Normal	Aug. 13-17	
12	2001 Catalina (sailboat)	SZ0717 (4474XC)	Hullspeed F-Series	Fair	Excessive	Aug. 13-17		Fair	Excessive	Aug. 13-17		Fair	Excessive	Aug. 13-17	
13	2005 Moose (twin hull)	SD4820	HullspeedS 3000 (hull)/ CeramKote (Jet Drives)	Good	Normal	Aug. 13-17		Good	Normal	Aug. 13-17		Good	Normal	Aug. 13-17	
14	2007 Moose (twin hull)	SD5996	HullspeedS 3000 (hull)/ CeramKote (Jet Drives)	Excellent	Light	Aug. 13-17	In Yard	Excellent	-	Aug. 13-17		Excellent	-	Aug. 13-17	
15	1972 Monarch	SX1015	Intersleek 1100SR	Excellent	Light	Aug. 13-17		Excellent	Light	Aug. 13-17		Excellent	Light	Aug. 13-17	
16	Rescue boat	BW#14	Hullspeed 3000	Fair	Excessive	Aug. 13-17		Fair	Normal	Aug. 20		Fair	Excessive	Aug. 20	
17	Fire boat	FB310	Hullspeed 3000	Fair	Excessive	Aug. 4-10		Fair	Normal	Aug. 20		Fair	Excessive	Aug. 20	

#	Boat Type	ID / CF #	Non-Biocide Paint	Inspection #4: September 4, 2018				Inspection #5: September 11, 2018				Inspection #6: September 18, 2018			
				Paint Condition	Level of Growth	Date of Last Cleaning	S&K Notes	Paint Condition	Level of Growth	Date of Last Cleaning	S&K Notes	Paint Condition	Level of Growth	Date of Last Cleaning	S&K Notes
1	Munson Landing Craft - aluminum	32	Hullspeed 3000	2	3	Aug. 29		2	2	Aug. 29		2	2	Sept. 12	
2	I/O V hull (old coast guard boat)	27	Hullspeed 3000	-	-	Aug. 29	Out	-	-	Aug. 29	Out	-	-	Sept. 12	Out
3	Debris Boat - aluminum	10	CeramKote	3	4	Aug. 29		3	3	Aug. 29		3	3	Sept. 12	
4	Debris Boat w/conveyor	55	Hullspeed 3000	3	4	Aug. 29		4	3	Aug. 29		4	3	Sept. 12	
5	MacGregor Sailboat	CF 3309 XC	Intersleek 1100SR	1	1	Aug. 29		1	2	Aug. 29		1	2	Sept. 12	
6	MacGregor Sailboat	CF 4540 HF	Intersleek 1100SR	Not being tracked.		Aug. 29		Not being ranked		Aug. 29		Not being ranked		Sept. 12	
7	1988 Seaway	4314	Hullspeed F-Series	2	3	Aug. 29		2	2	Aug. 29		2	2	Sept. 12	
8	1988 Seaway	4311	Intersleek 1100SR	1	1	Aug. 29		2	1	Aug. 29		2	1	Sept. 12	
9	1988 Seaway	4315	Hullspeed 3000	2	1	Aug. 29		3	2	Aug. 29		3	3	Sept. 12	
10	1969 Drake	1386	Hullspeed F-Series	2	3	Aug. 29		3	2	Aug. 29		3	2	Sept. 12	
11	2003 Safe Boat	SX1541	CeramKote	2	3	Aug. 29	<lifted in pic>	2	2	Aug. 29	<lifted in pic>	2	2	Sept. 12	
12	2001 Catalina (sailboat)	SZ0717 (4474XC)	Hullspeed F-Series	5	3	Aug. 29		3	2	Aug. 29		3	4	Sept. 12	
13	2005 Moose (twin hull)	SD4820	HullspeedS 3000 (hull)/ CeramKote (Jet Drives)	2	3	Aug. 29		2	2	Aug. 29		2	2	Sept. 12	
14	2007 Moose (twin hull)	SD5996	HullspeedS 3000 (hull)/ CeramKote (Jet Drives)	-	-	Aug. 29	Out	-	-	Aug. 29	Out	-	-	Sept. 12	Out
15	1972 Monarch	SX1015	Intersleek 1100SR	1	1	Aug. 29		1	1	Aug. 29		1	1	Sept. 12	
16	Rescue boat	BW#14	Hullspeed 3000	4	3	Aug. 20		3	3	Sept. 5		3	3	Sept. 5	
17	Fire boat	FB310	Hullspeed 3000	4	3	Aug. 20		3	3	Sept. 5		3	3	Sept. 5	

#	Boat Type	ID / CF #	Non-Biocide Paint	Inspection #7: September 25, 2018				Inspection #8: October 2, 2018				Inspection #9: October 30, 2018			
				Paint Condition	Level of Growth	Date of Last Cleaning	S&K Notes	Paint Condition	Level of Growth	Date of Last Cleaning	S&K Notes	Paint Condition	Level of Growth	Date of Last Cleaning	S&K Notes
1	Munson Landing Craft - aluminum	32	Hullspeed 3000	2	3	Sept. 12		2	2	Sept. 26		4	2		
2	I/O V hull (old coast guard boat)	27	Hullspeed 3000	-	-	Sept. 12	Out	-	-	Sept. 26	Out	-	-		Out
3	Debris Boat - aluminum	10	CeramKote	3	3	Sept. 12		3	2	Sept. 26		3	2		
4	Debris Boat w/conveyor	55	Hullspeed 3000	4	3	Sept. 12		4	3	Sept. 26		3	3		
5	MacGregor Sailboat	CF 3309 XC	Intersleek 1100SR	1	2	Sept. 12		1	2	Sept. 26		-	-		Out
6	MacGregor Sailboat	CF 4540 HF	Intersleek 1100SR	Not being ranked		Sept. 12		Not being ranked				Not being ranked			
7	1988 Seaway	4314	Hullspeed F-Series	2	3	Sept. 12		2	3	Sept. 26		2	2		
8	1988 Seaway	4311	Intersleek 1100SR	2	1	Sept. 12		2	1	Sept. 26		2	2		
9	1988 Seaway	4315	Hullspeed 3000	3	4	Sept. 12		3	3	Sept. 26		3	1		
10	1969 Drake	1386	Hullspeed F-Series	3	2	Sept. 12		3	1	Sept. 26		3	2		
11	2003 Safe Boat	SX1541	CeramKote	2	2	Sept. 12		2	3	Sept. 26		2	1		Some pics in (10/31) so
12	2001 Catalina (sailboat)	SZ0717 (4474XC)	Hullspeed F-Series	3	4	Sept. 12		3	3	Sept. 26		3	2		
13	2005 Moose (twin hull)	SD4820	HullspeedS 3000 (hull)/ CeramKote (Jet Drives)	4	1	Sept. 12		2	2	Sept. 26		2	1		Pics show Out
14	2007 Moose (twin hull)	SD5996	HullspeedS 3000 (hull)/ CeramKote (Jet Drives)	-	-	Sept. 12	Out			Sept. 26	Out	1	1		
15	1972 Monarch	SX1015	Intersleek 1100SR	1	1	Sept. 12		1	1	Sept. 26		1	1		
16	Rescue boat	BW#14	Hullspeed 3000	3	3	Sept. 18		3	3	Sept. 18		3	2		
17	Fire boat	FB310	Hullspeed 3000	3	3	Sept. 18		3	3	Sept. 18		-	-		Out

Appendix H

Department Interview Notes

Closing Interview Notes with Beaches & Harbors

Site Visit: 11/14/18

Attendees: Kiva Osby, David, Maral Tashjian, Brenda Ponton

- All boats receive preventative maintenance checks where they are removed from the water every 100 hours (maybe around every 2 months depending on use).
- Hulls are pressure washed during the preventative maintenance unless they had just been cleaned.
- Before the preventative maintenance there had been problems with speed (only 33 knots) but after it was 40 knots. This may have been due to the maintenance though.
- Kiva is going to do another speed test on the boats (55 and 32).
- All paints are leaving a tacky residue on the trailers when hauled out.
- Thought is the paint might have not been put on properly if coming off on the trailer
- Prior paint did not foul as much as the current paints
- 10 – Aluminum hull, used about 5 times/week, can go only up to 5 knots. Was just cleaned 2 weeks ago and had a lot of growth.
- 32 – Aluminum hull, use is about 2 times/week. Has been in the water the entire time and cleaned every other week
- 55 – Fiberglass and wood hull catamaran. Due to hull type, need to be careful of paint applied because growth can compromise the hull. Can go up to 8-10 knots but not designed for it.
- 27 – steel hull, hasn't been in the water

Sheriff Moose boats

- One hasn't been in the water, the other was in the water – just put back in.
- The one outside the water looked like the paint was scraped off (lots of scratches), and the jet drives had the paint peeling. Kiva noted the jet drives were old to begin with though.

Closing Interview Notes with Los Angeles County Fire Department

Site Visit: 11/20/18

Attendees: Eric Astourian, Brenda Ponton

- FB310 – aluminum hull
    - Paint: Hullspeed 3000
    - Used about 1/week
    - Planning a haul out in 1-2 months for annual preventative maintenance. If we want to repaint and coordinate with the haul out they can delay it though.
    - Paint completely off the blades in the back
- BW#14
    - Paint: Hullspeed 3000
    - Used 1/month
    - Not planning maintenance anytime soon
- Eric mentioned there had been another paint tried previously that was slick but it came off in the water so they went back to a biocide
- The current paint (Hullspeed) does not work as well as the copper. They used to have the hull cleaned 1/month and was just wiped but now it is cleaned every 2 weeks and needs to be scraped.

Closing Interview Notes with County Sheriff's Department

Site Visit: 12/13/18

Attendees: Daniel Abajian, Maral Tashjian, Brenda Ponton

- SD4820 – currently on a boat lift.
    - Painted with Hullspeed 300 with CeRamKote on the hull
    - Aluminum hull and jet drives
    - Diver just cleaned the hull and there are little dots of coral on it. The paint is peeling. There are scratches from the diver needing to use rough tools.
    - The boat has slowed down due to the coral. It is difficult to get it to lift/glide on the surface of the water (plane).
    - The jets are really bad with the paint peeling a lot. To paint the jets they had to dissemble the jet drive, clean then spray the jet drive (with CeRamKote). Both the hull and jet drives are aluminum,
    - Previous paint was Hydrocoat Eco (he said Interlux but our records have Petit). It worked better than the Hydrocoat on the SD4820
    - Lost speed after painting. Lost about 3-4 knots.
- SD5996 – Painted with Hullspeed. Has been out of the water for repairs until about 3 weeks ago. It was just cleaned this week and already showing growth (brown slime).
- SX1015 – Painted with Intersleek. Paint is working well
    - Boat picked up speed from 20 to 22 knots after painting
    - Aluminum hull
    - Used 5 days/wk, not M & Tu. Goes to Port of LA as well as north.
    - Took out for an emergency and it had coral on it and they just wiped it off with their hand easily. If bumped the paint can chip/scratch, but it hard to the touch and does not come off on hand when rubbed.
    - Previous paint was Hydrocoat Eco. It needed to be repainted every year.
- Seaway's – have different engines so difficult to compare spread across the three.
    - 4314 (CeRamKote) – Big block (big inboard engine)
    - 4315 (Hullspeed) – Big Block (big inboard engine)
    - 4311 (Intersleek) – Small Block (small inboard engine). Before painting, slower when idling but faster on plane. Overall now increased in speed (still slower than the big blocks when idling).
- All boats were painted with the Hydrocoat Eco as the previous paint. It came off to the touch (how it worked). It required repainting every year
- Before that paint the non-aluminum boats had copper paint which required repainting every 2-3 years.

- The way the Intersleek has been holding up, Daniel thinks it will last longer than the Hydrocoat Eco.
- There have been fuel savings – Daniel will contact the user of Monarch and get an estimate of savings the next fuel trip. He will email when received.