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CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD

SAN DIEGO REGION

IN RE TENTATIVE CLEANUP AND ABATEMENT ORDER NO. R9-2011-0001 (formerly No. R9-2010-0002)

**BAE SYSTEMS SAN DIEGO SHIP REPAIR, INC.'S REPLY TO SAN DIEGO COASTKEEPER AND ENVIRONMENTAL HEALTH COALITION'S COMMENTS REGARDING TCAO/DTR NO. R9-2011-0001**

Presiding Officer: Grant Destache

## TABLE OF CONTENTS

## TABLE OF CONTENTS
(continued)

Page

## TABLE OF CONTENTS
(continued)

Pursuant to the Notice of Extended Comment Period and Revised Comment Format, dated May 12, 2011, and the Third Amended Order of Proceedings, dated May 18, 2011, Designated Party BAE Systems San Diego Ship Repair, Inc. ("BAE Systems") respectfully submits the following Reply to the San Diego Coastkeeper ("SDC") and Environmental Health Coalition's ("EHC") Comments and Legal Argument, submitted May 26, 2011, concerning the Draft Technical Report ("DTR") for Tentative Cleanup and Abatement Order No. R9-2011-0001 ("TCAO") for the San Diego Bay Shipyard Sediment Site, San Diego County ("Shipyard Site" or "Site").

## I. INTRODUCTION

In their May 26, 2011 comments regarding the TCAO and accompanying DTR, SDC and EHC argue that the Regional Board applied the improper legal standard in determining the appropriate cleanup level at the Shipyard Site, improperly reached the conclusion that cleanup to background is not economically feasible, improperly formulated the DTR-recommended cleanup levels, and failed to ensure that the DTR-recommended cleanup levels achieve the best water quality reasonable. Their position, however, reflects a fundamental misunderstanding of the applicable legal standards, site data, and the technical approaches used by the Regional Board in the DTR. As set forth more fully below, the Regional Board applied the correct legal standard, based its finding that cleanup to background is not economically feasible on a well-reasoned analysis of cost effectiveness, and set appropriate cleanup levels that do not unreasonably impair the beneficial uses of the water. For these reasons, which are more fully addressed below, SDC and EHC's comments lack credence and should be rejected.

## II. REPLY TO SECTION I. THE LAW REQUIRES CLEANUP TO BACKGROUND EXCEPT WHERE EVIDENCE IN THE RECORD DEMONSTRATES THAT ALTERNATIVE CLEANUP LEVELS GREATER THAN BACKGROUND WATER QUALITY ARE APPROPRIATE.

### A. Reply to Comment I.A. Cleanup to a Pollutant Level Greater than Background Conditions is Only Allowed if the Regional Board Makes Two Findings.

SDC and EHC contend there is a rebuttable presumption of cleanup to background or the most economically feasible cleanup alternative. The Act and implementing regulations, however,

do not support their position. Rather, where background is not technologically or economically feasible, the Regional Board is only required to set an alternative cleanup level where the beneficial uses of the water are not unreasonably impaired.

First, SDC and EHC's position fails to recognize that if the alternative cleanup level does not unreasonably affect the beneficial uses, it is not considered "a condition of pollution or nuisance," which is a prerequisite to the Regional Board's exercise of authority under the Act. *See* Cal. Water Code § 13304(a). The California Water Code, as well as the Federal Clean Water Act, recognize that industrial discharges are acceptable as long as they do not unreasonably impair other beneficial uses. *See, e.g., S. Fl. Water Mgmt. Dist. v. Miccosukee Tribe of Indians*, 541 U.S. 95, 102 (2004) (noting that "the [Federal Clean Water] Act prohibits 'the discharge of any pollutant by any person' unless done in compliance with some provision of the Act"). As more fully explained below and in BAE Systems' May 23, 2011 Comments, Site sediments do not pose any unacceptable risk to aquatic life, aquatic-dependent wildlife, or human health, and do not unreasonably affect the beneficial uses of the water. Because the alternative cleanup levels set forth in the DTR do not unreasonably affect the beneficial uses of the water, they are acceptable.

Second, the Regional Board is not required to determine the appropriate cleanup level irrespective of the associated costs with cleanup. In fact, the Regional Board is required to balance the impact on the environment against the technological and economical costs associated with a cleanup to determine a level of remediation that is reasonable and cost-effective. For example, California Water Code § 13304 requires dischargers to either "clean up the waste or abate the effects of the waste . . . ." Cal. Water Code § 13304(a) (emphasis added). This makes it clear that abatement of the effects of waste, rather than remediation to background, can accomplish the goals of the Porter-Cologne Water Quality Control Act in the same manner as remediation to background. The State Water Board's guidance is no different. Specifically, State Water Board Resolution No. 92-49 does not require cleanup to background unless it is both technologically and economically feasible: the Regional Board "shall . . . ensure that dischargers are required to clean up and abate the effects of discharges in a manner that promotes attainment of either background water quality or the best water quality which is reasonable if background

levels of water quality cannot be restored, considering all demands being made and to be made on those waters and the total values involved, beneficial and detrimental, economic and social, tangible and intangible . . . ." State Water Board Resolution No. 92-49, § III(G) (emphasis added).

Similarly, the Act requires that the State Water Board develop guidelines and procedures for regional boards that "include . . . [p]rocedures for identifying and utilizing the most cost-effective methods . . . for cleaning up or abating the effects of contamination or pollution." Cal. Water Code § 13307(a)(3). This makes clear that abating the effects of contamination must be tempered by cost considerations. Thus, contrary to SDC and EHC's position, the DTR correctly states that the Water Code permits "an alternative cleanup level less stringent than background sediment chemistry concentrations if attainment of background concentrations is technologically or economically infeasible – as long as the less stringent cleanup level is protective of beneficial uses." (DTR § 32.1.) As set forth more fully below, there is substantial evidence that (1) cleanup to background is not technologically or economically feasible, (2) the alternative cleanup level is protective of the beneficial uses at the site, and (3) monitored natural attenuation is the most cost-effective method for achieving the cleanup goals articulated in the TCAO.

**B. Reply to Comment I.B. Alternative Cleanup Levels Must Be a Concentration Limit Set on a Constituent-by-Constituent Basis and Must Meet Requirements in State Water Board Resolution No. 92-49.**

SDC and EHC argue that the Regional Board is required to set a concentration limit, and that this must be done on a constituent-by-constituent basis. In support of their position, SDC and EHC rely on § 2550.4 of Title 23 of the California Code of Regulations. While it is true that State Board Resolution No. 92-49, in part, incorporates the provisions of Chapter 15, the State Water Board advises implementation of those provisions only if the cleanup and abatement "involves corrective action at a waste management unit regulated by waste discharge requirements issued under Chapter 15." State Water Board Resolution No. 92-49, § III(F)(2) (emphasis added).[1] Furthermore, Chapter 15, which is titled "Discharges of Hazardous Waste to

[1] Although Section III(f)(2) provides three enumerated guidelines for implementation, it is clear by the use of the conjunction "and" in subpart (b) that the State Water Board intended that Chapter 15 be applied to corrective action at a waste management unit regulated by waste discharge requirements under Chapter 15.

Land," states in pertinent part:

> The regulations in this article apply to owners or operators of facilities that treat, store, or dispose of hazardous waste at Class I waste management units. . . . Furthermore, § 2550.4 of this article also applies to all determinations of alternative cleanup levels for unpermitted discharges to land of hazardous waste, pursuant to ¶ III.G. of SWRCB Resolution No. 92-49 . . . .

Calif. Code Regs. tit. 23 § 2550.0. The designated parties in the instant proceedings are not considered Class I waste management units, nor do the determinations at issue here relate to unpermitted discharges to land. Furthermore, the provisions contained within Chapter 15 were clearly designed to be instructive guidelines for waste treatment, storage, and disposal facilities, not for sediment remediations. Technical elements for establishing water quality protection standards, monitoring programs, and corrective action programs for releases from waste management units, like those set forth in Chapter 15, are simply not useful in the context of sediment remediation. Thus, to the extent Section 2550.4 addresses concentration limits or constituent-specific cleanup, it is limited to the context of waste discharge and monitoring requirements, and does not apply here.

To the extent that Section 2550.4 does apply, it does so only to reinforce the guidance contained in Resolution No. 92-49, and the general requirement that alternative cleanup levels set above background levels adequately protect the beneficial uses of the water. As already explained, the Regional Board is required only to ensure that the cleanup levels ultimately ordered are economically feasible and adequately protective of the beneficial uses. *See, e.g.*, State Water Resources Control Board Memorandum From Craig Wilson To John Robertus (February 22, 2002), at SAR097571- 81 ("Wilson Memo") (noting that Resolution 92-49 is flexible and making no mention of any requirement to set alternative cleanup levels or analyze economic or technological feasibility on a constituent-by-constituent basis) Contrary to SDC and EHC's position, meeting the standard of Resolution No. 92-49 does not require that cleanup levels be set or economical feasibility be assessed on a constituent-by-constituent basis. Tellingly, SDC and EHC fail to point to any decisions or other CAOs where the Regional Board, or another tribunal, construed Resolution No. 92-49 in such a way.

Finally, and perhaps most importantly, requiring remediation on a constituent-by-

constituent basis irrespective of economic feasibility, as urged by SDC and EHC, would likely result in remediation at a level more stringent than background. Not only is this not required under the Act, Resolution 92-49 specifically forbids it: "under no circumstances shall these provisions be interpreted to require cleanup and abatement which achieves water quality conditions that are better than background conditions." (Section III(F)(1) (emphasis added).)

As discussed more fully below, the DTR sets alternative levels on a constituent-by-constituent basis for both primary COCs and secondary COCs, and does so after a careful weighing of the objectives of the Act against the economic feasibility of remediating to background. Accordingly, SDC and EHC's position that the DTR is inadequate in this regard should be rejected.

### C. Reply to Comment I.C. The Regional Board's Findings Must be Supported By Evidence in the Record.

SDC and EHC correctly note that the Regional Board's findings must be supported by the weight of the evidence in the record. Their position, however, that the Regional Board's alternative cleanup levels are insufficiently protective, and the corresponding implication that cleanup to background on a constituent-by-constituent basis is technologically and economically feasible, are without merit. As set forth more fully below, the Regional Board has complied with the State Water Board Resolution No. 92-49 in setting alternative cleanup levels that do not unreasonably interfere with the beneficial uses of the water and are economically feasible.

## III. REPLY TO SECTION II. THE ORDER'S CONCLUSION THAT CLEANUP TO BACKGROUND WATER QUALITY LEVELS IS ECONOMICALLY INFEASIBLE IS ARBITRARY AND CAPRICIOUS AND NOT SUPPORTED BY SUBSTANTIAL EVIDENCE IN THE RECORD.

Contrary to SDC and EHC's position, the Regional Board and the other Designated Parties have complied with the State Water Board Resolution No. 92-49. As already noted, the law allows designated parties to remediate a site based on alternative cleanup levels, rather than to background, if the parties can demonstrate that it is economically infeasible to remediate a site to background. Not only do the TCAO and accompanying DTR demonstrate that it is economically infeasible to remediate the site to background, but two other experts, Arcadis, Inc. ("Arcadis") and Integral Consulting, Inc. ("Integral"), have also so opined. Arcadia and Integral

used different methodologies to assess cost-effectiveness than did the Regional Board but nonetheless each derived the same conclusion. Cleanup to background was not only substantially more expensive to achieve than cleaning to the DTR's established cleanup levels, but also cleaning to background is substantially less cost-effective than cleaning to the DTR-established cleanup levels.

SDC and EHC argue that the alternative cleanup levels set forth in the TCAO and the DTR are not appropriately protective of the Bay's beneficial uses. SDC and EHC submit an analysis that primarily focuses on the efficacy of the alternative cleanup standards as opposed to analyzing whether achieving background sediment quality is economically feasible. It is only the latter question, whether cleanup to background is economically feasible, that must be answered in assessing whether the Designated Parties have appropriately met the terms of State Water Board Resolution No. 92-49.

**A. <u>The DTR's Economic Feasibility Analysis.</u>**

Section 31 of the DTR sets forth the Regional Board's analysis of the economic feasibility of cleaning the site to background. On May 20, 2011, the Regional Board made clear in its answers to questions posed by SDC and EHC that "[t]he objective of section 31 [of the DTR] is to determine whether achieving background sediment quality is economically feasible – not what the cleanup levels will be." *See* May 20, 2011 Response to San Diego Coastkeeper and Environmental Health Coalition Economic Feasibility Questions. The Regional Board evaluated a number of criteria to determine risks, costs, and benefits associated with no action, cleanups to background sediment chemistry levels, and alternative cleanup levels greater than background concentrations. (*See* DTR Finding 31.) The criteria included factors such as total cost, volume of sediment dredged, the exposure pathway of receptors to contaminants, short- and long-term effects on beneficial uses (as they fall into the broader categories of aquatic life, aquatic-dependent wildlife and human health), effects on shipyards and associated economic activities, effects on local businesses and neighborhood quality of life, and effects on recreational, commercial, or industrial uses of aquatic resources. The Regional Board then compared these cost criteria against the benefits gained by diminishing exposure to the primary COCs to estimate

the incremental benefit gained from reducing exposure based on the incremental cost of doing so. (DTR Finding 31.) This comparison revealed that the incremental benefit of cleanup diminishes significantly with additional costs beyond a certain cleanup level, and asymptotically approaches zero as remediation approaches background. (Finding 31 of the DTR.) Based on those considerations, the DTR concludes that cleaning up to background chemistry sediment levels is not economically feasible.

The Regional Board assessed economic feasibility by ranking the 65 shipyard sediment stations according to the contaminant levels found in surficial sediment samples. This process used Triad data and site-specific median effects quotient (SS-MEQ). (DTR Finding 31.) The Regional Board then evaluated a series of cumulative cost scenarios by starting with the six most contaminated stations, then adding the six next-most contaminated stations, progressing sequentially down the list until the entire Shipyard Sediment Site was included in the scenario. (See appendix for DTR Finding 31.)

The following chart measures the incremental benefit from cleaning up various polygons, cleaning 66 polygons on a worst basis first. The benefit of remediating polygons is in exposure reduction per $10 million of cost. The chart further measures the likely cost, per million dollars, to clean up the various polygons.

Table 1

| Scenario | Number of Ranked Polygons | Incremental Probably Likely Cost per million | Cumulative Probable Likely Cost per million | Incremental Exposure Reduction per $10 million* | Cumulative Exposure Reduction per $10 million** |
|---|---|---|---|---|---|
| 1 | 6 | $13.5 | $13.5 | 12.5% | 12.5% |
| 2 | 12 | $10.8 | $24.3 | 12.3% | 12.4% |
| 3 | 18 | $08.6 | $32.9 | 12.0% | 12.3% |
| 4 | 24 | $12.0 | $44.9 | 6.6% | 10.8% |
| 5 | 30 | $24.5 | $69.4 | 4.9% | 8.7% |
| 6 | 36 | $15.8 | $85.2 | 7.1% | 8.4% |
| 7 | 42 | $16.3 | $101.5 | 6.3% | 8.1% |
| 8 | 48 | $53.6 | $155.1 | 2.6% | 6.2% |
| 9 | 54 | $29.7 | $184.8 | 1.9% | 5.5% |
| 10 | 60 | $53.1 | $237.9 | 0.6% | 4.4% |
| 11 | 66 | $50.3 | $288.2 | -0.8% | 3.5% |

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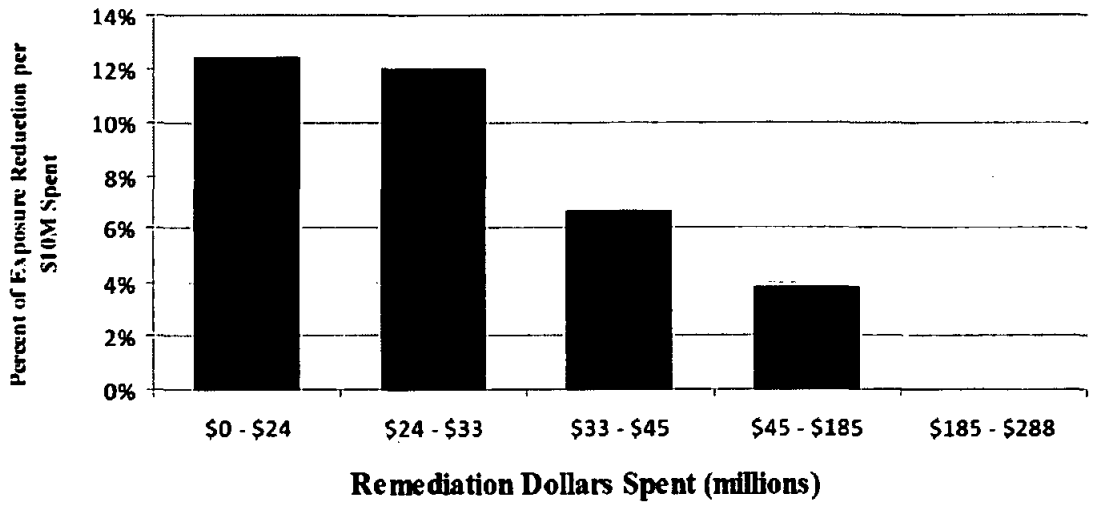
The Regional Board concluded that initial expenditures returned a relatively high exposure reduction benefit, but additional expenditures yield progressively lower returns per dollar spent on remediation. Figure 1, which is an accurate reflection of Figure 31-1 in the DTR, graphically demonstrates the percent exposure reduction versus remediation dollars spent.

**Figure 1 Percent Exposure Reduction versus Remediation Dollars Spent**




The highest net benefit per remedial dollar spent occurs for the first $33,000,000 (18 polygons remediated), based on the fact that initial exposure reduction is above 12% per $10,000,000 spent. Beyond $33,000,000, however, the exposure reduction per dollar spent drops consistently as the cost of remediation increases. For cleanup to background, overall exposure reduction is only 3.5% per $10,0000,000 spent, and there is effectively no net exposure reduction for the last sets of polygons that would be included in such a remediation. Figure 2 illustrates the increasing costs and diminishing benefits associated with cleanup to background. Data shown in this figure are from Table 1.

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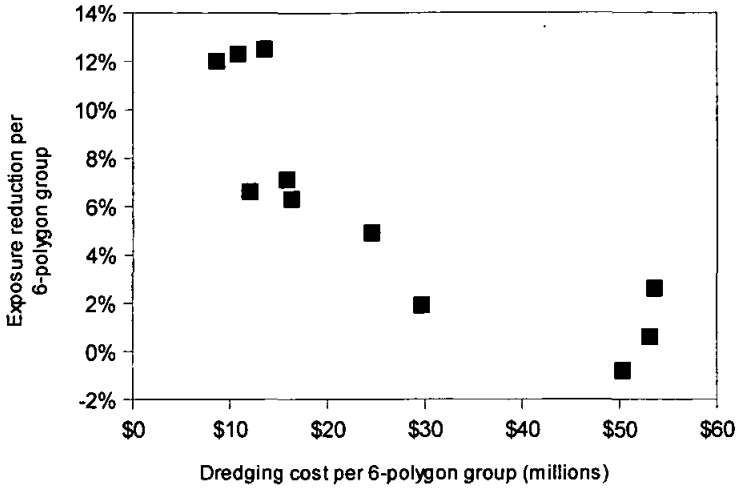
**Figure 2**




The data table above shows the incremental and cumulative benefits and costs of conducting a sequential, "worst-first" cleanup of shipyard sediments. Remediation of the polygons with the highest chemical concentrations—those in the upper left of the figure—would yield not only the greatest exposure reduction (more than 12% for each set of polygons), but also the most cost-effective cleanup. Remediation of the polygons in the lower right of the figure, which would be the last addressed in a cleanup to background, would produce little or no exposure reduction, yet would be among the most costly to clean up. The marginal benefit of cleaning up to background is small or zero, whereas the marginal costs are the highest.

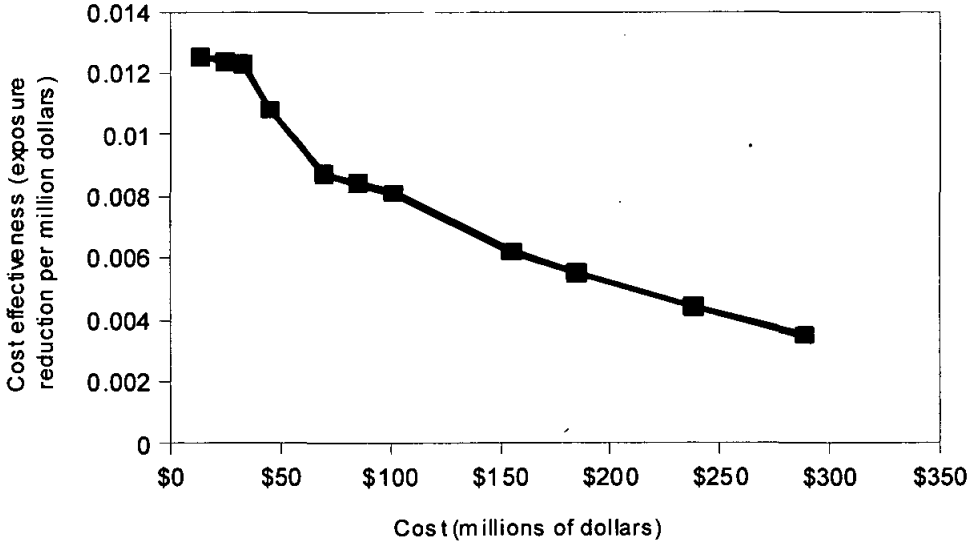
Further expenditures eventually reach a point where exposures reduction benefits become negligible. SDC and EHC assert that the Regional Board needs to identify the exact point where exposure reductions become negligible. The Regional Board is not so required. The objective of Finding 31 is merely to determine whether achieving background sediment quantity is economically feasible. It is sufficient to point where the incremental cost of achieving further reductions and contaminant concentrations exceed the incremental benefit of so doing.

In several of their comments, SDC and EHC claim that cleanup scenarios costing more than the remedial footprint identified in the DTR are, or may be, economically feasible. Included in these comments is the criticism that the grouping scenarios in Figure 31-1 of the DTR (Figure 1 above) have obscured the relationship between costs and benefits. These comments are based

on a desire to analyze individual alternative cleanup levels rather than to address the essential question before the Regional Board, whether achieving background sediment quality is economically feasible.

The Regional Board therefore correctly concluded that, based on the incremental costs versus incremental benefits, cleanup to background sediment quality levels is not economically feasible. In addition to evaluating incremental cost effectiveness, as illustrated in the preceding figure and discussion, the data in Table 1 can also be used to calculate the overall cost effectiveness of each scenario. Overall cost effectiveness refers to the total exposure reduction per million dollars spent for an entire cleanup scenario rather than for incremental areas of a cleanup. This measure of cost effectiveness can then be contrasted with the total cost of each different scenario as shown in the following figure.

**Figure 3**




Cost effectiveness, expressed as the fractional reduction in exposure per million dollars spent, is shown in the Y axis of Figure 3. Cost is shown on the X axis. The data points are those tabulated in the May 20, 2011 Response to San Diego Coastkeeper and Environmental Health Coalition's Economic Feasibility Questions.

In this figure, the polygons at the upper left have the highest chemical concentrations, and thus are the most cost-effective to remediate. Cost effectiveness decreases steeply for more

extensive remedial scenarios. Moving from left to right across this figure (i.e., to successively larger cleanup areas), a consistent drop in cost effectiveness is seen. This occurs even though the larger scenarios include the areas that are most cost-effective to remediate. As with the evaluation of incremental cost effectiveness, overall cost effectiveness drops most rapidly after the first three groups of polygons have been remediated. The decreasing cost-effectiveness with increasing costs is the basis of the Regional Board's determination that cleanup to background is not cost effective. This is summarized in Section 32.7.1 of the DTR as follows: "The highest net benefit per remedial dollar spent occurs for the first $33,000,000." After this point, the cost effectiveness of further dredging actions drops steeply. Cleanup scenarios costing more than approximately $33,000,000 (which corresponds to the proposed remedy) are considerably less cost effective. Cleanup to background is only about one third as cost effective as the proposed remedy, at a cost that is almost ten times higher. The Regional Board's determination that cleanup to background is not economically feasible relative to the proposed remedial footprint is well supported by the analysis of cost effectiveness.

### B. Additional Economic Feasibility Analysis Confirm Cleaning to Background Is Not Economically Feasible

Arcadis and Integral undertook two additional economic feasibility analyses, and while they used slightly different methodologies, both concluded that a cleanup based on the DTR's alternative cleanup standards was far more cost effective than cleaning to background.

#### 1. Arcadis Evaluation.

Arcadis, in its March 11, 2011 Expert Report on Economic Feasibility Shipyard Settlement Site ("Arcadis Report"), presented cost and benefit information for three alternative cleanup scenarios: the DTR-recommended Option, cleanup to background ("Background Remedial Option"), and cleanup to a third alternative ("Alternative Remedial Option"). The Alternative remedial Option establishes alternative cleanup standards that are protective of designated beneficial uses by eliminating the shipyards as designated impaired waterways under the Clean Water Act. Arcadis applied an Office of Management and Budget cost-effectiveness guidance analysis in evaluating its three options. Arcadis' analysis of the first two options is

similar in approach to those used by the Regional Board in the DTR. The approach for implementing the Alternative Remedial Option is similar to the approach provided for the other two options, with the exception of exhibiting a reduced remedial footprint. Under the Alternative Remedial Option, 12 polygons will be targeted for remediation as compared to 23 polygons for the DTR-recommended Option and 66 for the Background Remedial Option.

As is allowed under State Water Board Resolution No. 92-49, Arcadis' analysis included consideration of social costs, habitat impacts and business costs associated with the different cleanup options. Arcadis' analysis of non-dredge related costs was premised on an assumption that a remediation project of this magnitude would necessarily generate social costs that the Regional Board did not factor into its economic feasibility analysis. Such costs include impacts on the community, habitat, and businesses. The magnitude and duration of these impacts is directly related to the size and duration of the selected remedial option. (Arcadis 2011.) Potential community impacts associated with remedial implementation include noise, increased traffic, air quality, and the potential for release of contaminants into the bay. The Alternative Remedial Option would have a little less than half of the trucks and mileage required for the DTR-recommended option and approximately 6% of the trucks and mileage required for the Background Remedial Option. The DTR-recommended option will require 12% of the trucks and mileage required for the Background Remedial Option. In short, the Background Remedial Option would have a significantly larger impact on traffic than the other two options, leading to significantly greater risks of accidents and accident-related injuries. (Arcadis 2011.)

Dredging will resuspend contaminated sediment which will act to elevate the suspended solids and the concentration of contaminants in the water column. While remedial design will include measures to reduce the potential for suspension, resuspension cannot be eliminated completely. The potential for resuspension is a function of remedial method and quantity and will therefore be far greater for the Background Remedial Option than the other two remedial options. Furthermore, the Background Remedial Option would have the greatest potential for air emissions over the impact period of time.

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The three remedial options would have varying degrees of impact on the habitat. The Background Remedial Option may impact as much as 25% to 30% more eelgrass beds than the DTR-recommended Option. (Arcadis (2011) at 26.) Furthermore, dredging may have other habitat effects. For example, the increase in water depth may reduce the food available to diving ducks, such as the surf scoter.

Arcadis identifies many of the ways in which the Background Remedial Option, due to the length and breath of remedial activity, will affect the shipyards. Because the shipyards at the Site are the only shipyards in California that are capable of providing both dry docking and pier-side berthing, interruptions and delays in ship construction/maintenance activities could affect the shipyard's ability to fulfill many contracts. Inabilities to fully utilize shipyard assets could have significant financial implications to the shipyards themselves, their employees, and the community's tax base. (*See* Arcadis (2011) at 27-28.)

Benefits were expressed in terms of proportional reduction in the surface area-weighted average concentration ("SWAC") relative to background—i.e., the same general approach as the DTR. Arcadis found that costs relative to benefits increased disproportionately for a cleanup to background when comparted to the cleanup recommended in the DTR.

Figure 4 below, which is an accurate replication of Figure 5 in the Arcadis report, demonstrates the incremental costs and incremental reduction in exposure relative to background levels, measured in percent of the five primary COCs for the increasingly larger remedial footprints. The cost per exposure reduction (measured relative to background levels) increased from about $900,000 under the Alternative Remedial Option (smallest remedial footprint) to about $2,300,000 under the DTR-recommended Option. The incremental cost per exposure reduction under the Background Remedial Option increased to almost $4,400,000 (using a 3% discount rate). The incremental cost per exposure reduction increases in cost by almost 100%, if a cleanup to background is commenced. The differential in cost per exposure reduction increases even more when social, habitat and business impacts are factored into the analysis.

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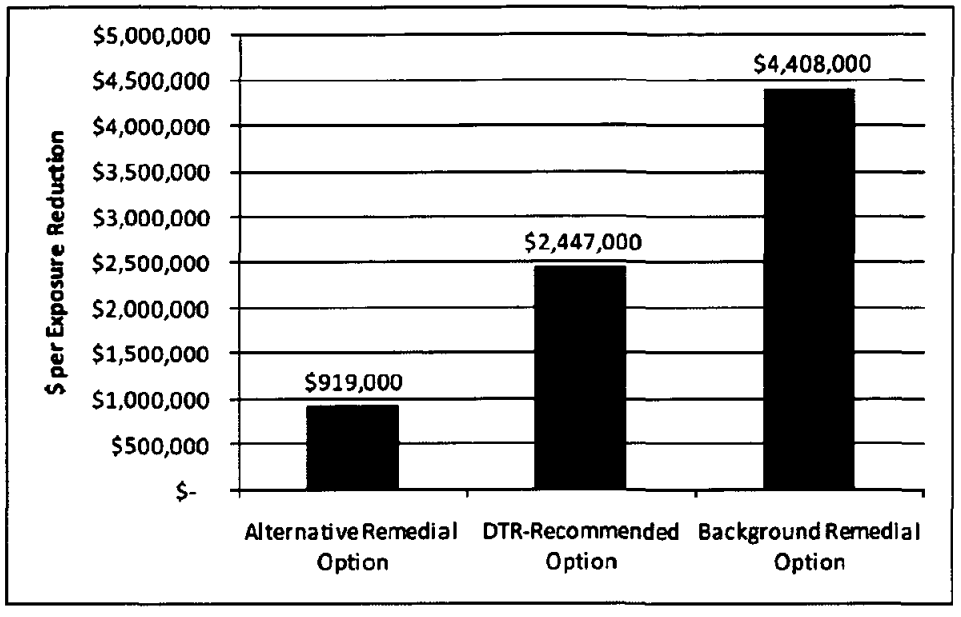
**Figure 4**

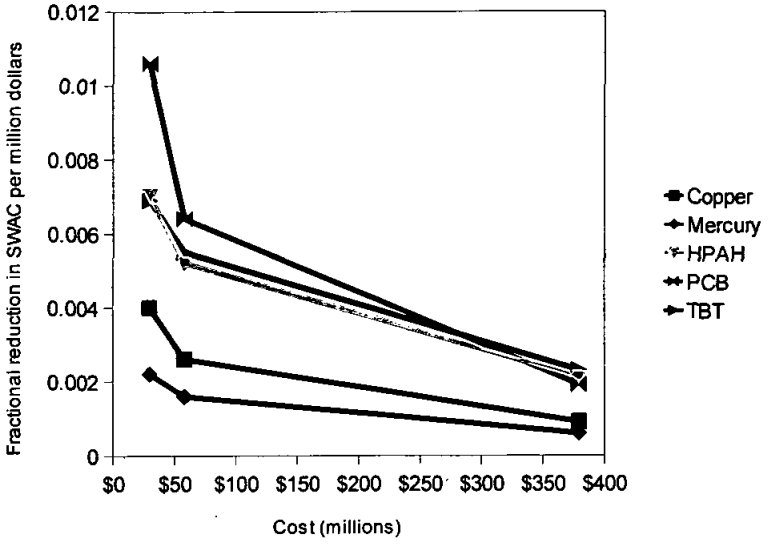



2. Integral Evaluation.

Integral, in its March 11, 2011 Evaluation of Alternative Cost Effectiveness Calculation Approaches for the Remedial Alternatives of the San Diego Shipyard Site, presented further analysis of these alternatives, including three different methods of assessing chemical-specific cost effectiveness. Integral calculated (in three different ways) the chemical-specific cost effectiveness for each of the primary COCs identified in the DTR. The fractional reduction in the SWAC per million dollars spent was used as the measure of effectiveness. Chemical specific cost-effectiveness for the three alternatives evaluated is illustrated in Figure 5 below, which is a replication of Table 3 in the Integral report. Three data points are shown in this figure for every chemical. These data points correspond to the three different remedial options evaluated: Arcadis' Alternative Remedial Option, the DTR-recommended Option, and cleanup to background, in order by increasing cost. In this figure the Y axis represents the cost effectiveness of each remedial alternative, expressed as the fractional reduction in SWAC per million dollars spent. The X axis is the cost for the three different remedial options. For each of the five COCs, the highest cost effectiveness is achieved with Arcadis' Alternative Remedial Option, moderate cost effectiveness is achieved with the DTR-recommended alternative, and the lowest cost

effectiveness is associated with the cleanup to background.

**Figure 5**




These results of chemical-specific cost effectiveness calculations show that the DTR-recommended Option is less cost-effective than Arcadis' Alternative Remedial Option, but is more cost effective than cleanup to background for all chemicals. This conclusion is consistent across all methods of interpreting cost effectiveness. Further, it is important to note that none of these methods of interpreting cost effectiveness account for the social costs, such as the impact to the community, habitat, and businesses, that will be generated as a result of the cleanup level ultimately adopted by the Regional Board. Therefore, it is likely that the actual costs associated with each of the available options are understated, and the lack of cost effectiveness of cleaning to background is that much greater when all remediation costs, social and actual, are fully taken into account. Nevertheless, consistent with the determination in the DTR that cleanup to the proposed footprint is more economically feasible than cleanup to background, cleanup to the proposed footprint is more cost effective for each of the primary COCs at the Shipyard Site.

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## IV. REPLY TO SECTION III. THE ORDER FAILS TO MEET LEGAL REQUIREMENTS FOR CLEANUP TO POLLUTANT LEVELS GREATER THAN BACKGROUND.[2]

- SDC and EHC assert that "*the monitoring plans—both during and post-remediation—do not actually require that the alternative cleanup levels be met.*"

The statement is false, because the monitoring plans require the Alternative Cleanup Levels to be met within the constraints imposed by the natural variability typically encountered when making measurements of sediment chemical concentrations in environmental samples.

### A. Reply to Comment III.A. The Site-Wide Alternative Cleanup Levels Were Calculated Based on Remediating to Background Pollutant Levels.

- SDC and EHC assert that "*the cleanup must ensure that remediated areas are cleaned to background conditions or cleaner.*"

The TCAO does specify that the remediated areas be cleaned to background conditions within the constraints imposed by the natural variability typically encountered when making measurements of sediment chemical concentrations in environmental samples.

### B. Reply to Comment III.B. The Remediation Monitoring Fails to Require Remedial Areas to Achieve Background Levels.

- SDC and EHC assert that "*the Order and DTR set out a process that allows the remediated areas to be 20% more polluted than background pollutant levels.*"

As explained in the DTR, the rationale for the 120% background rule is to address the natural variability typically encountered when making measurements of sediment chemical concentrations in environmental samples. This rationale is appropriate, given the technical constraints imposed by environmental sampling and analysis.

1. Reply to Comment III.B.1. The "120% of background" could lead to site-wide pollutant concentrations above the Alternative Clean-up Levels.

- SDC and EHC assert that "*the DTR and record present no evidence demonstrating that site-wide remediation goals will be met if the concentrations of pollutants in all of the remediated areas are at 120% of background levels.*" SDC and EHC note that the Site-wide SWACs for all five COCs would exceed their Alternative Cleanup Levels. SDC and EHC then state that the 120% background rule is "*arbitrary and capricious and fails to ensure that alternative cleanup levels are achieved.*"

The DTR clearly states that the rationale for the 120% background rule is to address the

[2] Note that several comments in the third section of the SDC and EHC's comments are erroneously labeled as section "II". BAE Systems' responses herein to comments contained in SDC and EHC's third section are identified the correct section number, or "III".

natural variability in sediment chemical concentrations found in the environment. As stated in Section 34 of the DTR, "*Environmental data has natural variability which does not represent a true difference from expected values. Therefore, if remedial monitoring results are within an acceptable range of the expected outcome, the remedial actions will be considered successful.*" The 120% background rule is therefore an appropriate recognition of the realities of environmental sampling and analysis.

The SDC and EHC analysis presented in Table 2 of the comments is flawed because it is based on the highly improbable scenario that concentrations of all five primary COCs would be found at 120% of their background levels throughout the entire remedial footprint. A much more likely scenario is that only a subset of the COCs would be found at 120% of their background levels, and that this would occur only in a portion of the footprint rather than throughout the entire area. Even if the highly unlikely scenario presented in Table 2 of the SDC and EHC comments is found, the magnitude of the exceedance of the Alternative Screening Cleanup Level for each COC is very small, ranging from 0.6 to 1.5 %. To illustrate this fact, the Alternative Cleanup Level for each COC and the Site-wide post-remediation SWAC calculated by SDC and EHC are presented below in that order:

- Copper: 159 vs. 161 mg/kg;
- Mercury: 0.68 vs. 0.69 mg/kg;
- HPAHs: 2,451 vs. 2,466 ug/kg;
- Total PCBs: 194 vs. 196 ug/kg; and
- TBT: 110 vs. 111ug/kg.

These differences are not only within the range of natural variability, they are within the range of measurement (laboratory) variability for these chemicals. Therefore, exceedances of the Alternative Cleanup Levels under the most extreme conditions possible at the Site would not substantially increase risks to aquatic receptors.

2. Reply to Comment III.B.2. The Regional Board cannot approve the Order and DTR with the 120% of background second-pass rule because it fails to ensure that Alternative Cleanup Levels will not be exceeded.

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- SDC and EHC (2011) state that "*To make the alternative cleanup levels concentration limits, the Order must ensure that remediated areas are remediated to background pollutant concentrations.*"

This assertion is invalid. The TCAO does specify that the remediated areas be cleaned to background conditions within the constraints imposed by the natural variability typically encountered when making measurements of sediment chemical concentrations in environmental samples.

3. Reply to Comment III.B.3. The "120% of background" decision rule violates the Order's corrective action directive.

- SDC and EHC state that attainment of the Alternative Cleanup Levels "*can only be guaranteed if the remedial areas achieve background pollutant levels, the 120% background redredging trigger violates the Order's remediation directive.*"

As discussed previously, the 120% background rule appropriately addresses the reality of natural variability of sediment chemical concentrations in the environment. The assertion by SDC and EHC is therefore incorrect.

4. Reply to Comment III.B.4. The "120% of background" decision rule for a second dredging pass is ambiguous.

- SDC and EHC state that "*the language in the Order setting the 120% background level allowance leaves open the possibility that every Contaminant of Concern had to exceed 120% of background in order to warrant a second dredging pass.*"

The assertion is incorrect since the TCAO clearly states in Section A.2.a that "*the dredging shall remediate the sediment in the dredge remedial area to the concentrations in the table below for primary COCs.*" The table referred to in the TCAO statement presents the Post-Remediation Dredge Area Concentration for each of the five primary COCs. It, therefore, is clear that if any one of the five COCs exceeds its Post-Remediation Dredge Area Concentration, corrective action will be evaluated. The SDC and EHC assertion is incorrect.

**C. <u>Reply to Comment III.C. The Post Remedial Monitoring Fails to Evaluate Whether Alternative Cleanup Levels are Achieved.</u>**

This comment is invalid for the reasons provided below.

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1. Reply to Comment III.C.1. The Order sets the "Remedial Goals" as compliance with "Trigger Concentrations" above the Alternative Cleanup Levels—and in some cases ABOVE existing pollutant levels.

- SDC and EHC state that "*because the Order sets the remediation goals as compliance with the "Trigger Concentration" instead of the alternative cleanup levels, the Order is actually setting the "Trigger Concentration" as the concentration limit for each pollutant.*"

SDC/EHC statement is erroneous. It fails to recognize the natural variability encountered when measuring sediment chemical concentrations in the environment. As stated in Section 34 of the DTR, "*Environmental data has natural variability which does not represent a true difference from expected values.*" Therefore, the Trigger Concentrations were appropriately designed to address the degree of natural variability expected to be found associated with measurements of the Alternative Cleanup Levels at the Shipyard Site, based on the area-weighted variability of the measured COC concentrations in the non-remediated areas. If the Trigger Concentrations were actually the concentration limits for each COC, as SDC and EHC assert, then higher Trigger Concentrations would be necessary to accommodate the degree of natural variation expected to be found associated with the chemical measurements.

2. Reply to Comment III.C.2. The Post Remedial Monitoring program will mask ongoing pollutant problems.

- SDC and EHC state that "*Given the current design of the program, the Regional Board will not be able to assess whether the alternative cleanup levels were achieved and the remediation was successful.*"

SDC and EHC's statement is incorrect. The TCAO and DTR specify a robust post-remediation monitoring program comprised of multiple lines of evidence that address sediment chemical concentrations and potential biological effects. For example, sediment chemistry samples will be collected from all 65 polygons at the Shipyard Site, and composited into six groups to evaluate SWACs for the five primary COCs. The stratification scheme for sediment compositing will provide valuable interpretive information on the spatial distribution of COC concentrations throughout the site that would not be available if only a single site-wide SWAC was evaluated.

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In addition, the five stations selected for the combined evaluations of sediment chemistry and sediment toxicity were the only five stations in the remedial footprint found to have likely impairment based on the Triad analyses described in the DTR. (*See* DTR Finding 18.). Therefore, they represent the highest priority areas for remediation, and are appropriately identified for monitoring of sediment chemistry and toxicity to evaluate benthic exposure. Finally, bioaccumulation will be evaluated at nine stations distributed along the entire length of the remedial footprint, and will provide a relatively complete assessment of potential bioaccumulation throughout the site. In addition, the specified bioaccumulation test (i.e., the 28-day test with *Macoma nasuta*) has been proven to be an effective tool for evaluating bioaccumulation from sediment in other studies.

a. Reply to Comment III.C.2.a. The Post Remedial Monitoring program fails to require samples from each polygon at the site.

- SDC and EHC state that "*the sediment sampling requirements described in the Order will provide data on the average levels of five pollutants in the top 2 cm of sediment contained within only six polygon groups. This means that the Order fails to require the Dischargers to collect data needed to evaluate whether the clean-up goals have been met for the whole site.*"

This statement is incorrect. Because the stratification scheme described in Section 32.2.1 of the DTR will subdivide the overall Shipyard Site into six polygon groups, it will allow SWACs to be calculated for those different subsections of the site, as well as for the overall site. This stratification scheme will provide valuable interpretive information on the spatial distribution of COC concentrations throughout the site, which would not be available if only a single site-wide SWAC was evaluated. The six polygon groups include three polygons in each of the northern and southern halves of the overall site, and the three polygons within each half of the overall site represent the remedial footprint, the polygons adjacent to or proximal to the remedial footprint, and the polygons distant from the footprint. Therefore, contrary to SDC and EHC's assertion, the stratification and compositing scheme specified in the DTR will document the true spatial extent of COC concentrations throughout the Shipyard Site, rather than mask that distribution.

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b. Reply to Comment III.C.2.b. Compositing surface sediment into six polygon groups will mask the true extent of contamination remaining at the Shipyard Sediment Site.

- SDC and EHC state that "*the Post Remedial Monitoring plan will not provide the data to verify whether the remediation has been effective in protecting human health and aquatic-dependent wildlife.*"

As described in the response to Comment III.C.2.a above, the stratification scheme that will be used at the Shipyards Site will provide valuable interpretive information on the spatial distribution of COC concentrations throughout the site that would not be available if only a single site-wide SWAC was evaluated.

3. Reply to Comment III.C.3. Failure to assure that the Alternative Cleanup Levels are met through the remediation process renders the cleanup illegal.

- SDC and EHC state that "*the Order allows the cleanup to achieve a less-stringent "Trigger Concentration" level of pollutant that effectively sets the cleanup levels significantly higher than background pollutant levels.*"

As described in the response to Comment III.C.1, the Trigger Concentrations were appropriately designed to address the degree of natural variability expected to be found associated with measurements of the Alternative Cleanup Levels at the Shipyard Site. If the Trigger Concentrations were actually the cleanup levels, as SDC and EHC assert, higher Trigger Concentrations would be necessary to accommodate the degree of natural variation expected to be found associated with the chemical measurements. SDC and EHC's assertion is therefore invalid.

- SDC and EHC also state that "*exceeding the "Trigger Concentrations" does not actually trigger any additional remediation.*"

SDC and EHC's statement is incorrect. As stated in Section D of the TCAO, the purpose of the Trigger Exceedance Investigation and Characterization is "*to determine the cause(s) of the exceedance*" and to recommend "*an approach, or combination of approaches, for addressing the exceedance(s).*" The TCAO therefore lays out a rational approach with numerous details to evaluate the underlying cause of any exceedance of a Trigger Concentration, so that it can be addressed in the present, and prevented in the future. The Regional Board will review all of this information and determine the best path forward. SDC and EHC's implication that the process is flawed is therefore invalid.

## V. REPLY TO SECTION IV. THE PROPOSED CLEANUP FAILS TO REQUIRE THE BEST WATER QUALITY REASONABLE.

This comment is invalid for the reasons provided below.

### A. Reply to Comment IV.A. Narrative Alternative Cleanup Levels for Aquatic Life Cannot Ensure that These Beneficial Uses will not be Unreasonably Affected at the Shipyard Sediment Site.

- SDC and EHC state that "*without appropriate numeric limits for fish and benthic invertebrates, there will be no way to quantitatively measure compliance with measures to protect fish and benthic invertebrates.*"

The statement implies that sufficient information will not be collected in the post-remediation monitoring program to protect benthic macroinvertebrates and fish. As discussed previously, the monitoring program is comprised of multiple lines of evidence that address sediment chemical concentrations and potential biological effects. The evaluations of biological effects will include direct measurements of sediment toxicity (i.e., using the 10-day amphipod survival test with *Eohaustorius estuarius*, and the 48-hour bivalve larvae development test using the mussel *Mytilus galloprovincialis*) and bioaccumulation (i.e., using the 28-d test with the clam *Macoma nasuta*). In addition, sediment chemical concentrations will be compared with site-specific sediment quality values designed to be protective of benthic macroinvertebrate communities (i.e., the SS-MEQ and the 60% LAET values). The concerns for fish are unwarranted because risks to fish were not found to be an issue at the Shipyard Site under baseline conditions, based on extensive site-specific evaluations using the abundant and benthic-feeding spotted sand bass as the key indicator species (Exponent 2003).

### B. Reply to Comment IV.B. The Proposed Remedial Footprint is Too Small to Ensure that the Remaining Pollutant Levels will not Unreasonably Affect Present and Anticipated Beneficial Uses of San Diego Bay.

This comment is invalid for the reasons provided below.

1. Reply to Comment IV.B.1. Problems with the development of the Proposed Remedial Footprint results in a cleanup that achieves less than the best water quality reasonable.

SDC and EHC make numerous statements under this comment. Responses to each of those statements are presented below.

- SDC and EHC (2011) state that "*an insufficient number of samples were collected*

*to accurately determine the nature and extent of contamination at the 148-acre Shipyard Site, given the variability of contaminants at the site."*

This assertion is incorrect. The station distribution scheme was consistent with the manner in which most schemes are designed at contaminated sediment sites. That is, stations are distributed with the highest density near sources where the highest COC concentrations are expected (especially in depositional environments), and with lower densities in areas removed from the sources, where contaminants are expected to be more widely dispersed by waves and currents. At the Shipyard Site, it was expected that most contaminant sources would be located near the shoreline, and that the piers would create depositional environments that would facilitate deposition of contaminants near the sources, resulting in patchy distributions with elevated concentrations. In contrast, contaminant sources were not expected to be found outside the pier lines, and in those locations, contaminants would be dispersed by waves and currents in San Diego Bay, and their concentrations in sediments would be lower and more evenly distributed. Therefore, most of the 65 stations (i.e., 43) at the Shipyard Site were located within the pier line of the site, and the station distribution scheme was consistent with the scheme commonly used at contaminated sediment sites.

Moreover, the sediment chemistry results of the 2001/2002 sampling at the Shipyard Site confirmed the assumptions used to design the station distribution scheme. That is, the chemical concentrations presented in Table A33-3 of the DTR and the concentration contours presented in Figures 4-3 to 4-21 of Exponent (2003) show that the highest concentrations were generally found within the pier line and lower, more evenly distributed concentrations were found outside the pier line. Therefore, the station distribution scheme used at the Shipyard site is considered adequate to characterize the nature and extent of sediment contamination.

Because there are no firm rules or agency guidance on the number of stations that should be sampled at a contaminated sediment site (i.e., because each site is different), the number used to characterize a particular site is usually determined using the best professional judgment of the scientists, regulatory staff, and responsible parties involved with site. These decisions take into account the site-specific nature of sources and transport mechanisms, and the effort and costs

involved in both the site investigation and potential cleanup actions. Because this was the process used to develop the station distribution scheme for the Shipyard Site, the station densities are considered adequate to characterize the nature and extent of sediment contamination, and to develop a remedial footprint.

- SDC and EHC state that "*ranking the polygons from most- to least-contaminated using the Composite Surface Weighted Average Concentration (SWAC) Value fails to consider the potential adverse effects on human health or the environment*," and that "*the method also ignores concentrations of other contaminants—such as lead, zinc, and low molecular weight PAHs.*"

The first assertion is invalid because, as described in Section 33.1.2 of the DTR, the composite SWACs were based on all five primary COCs at each station. The composite values therefore provided quantitative estimates of the degree of chemical contamination at all Shipyard stations, which allowed the stations to be ranked with respect to the magnitude of risks that they posed to human health and the environment on the basis of chemical contamination. The second assertion made by SDC and EHC is invalid because, as described in Section 29.3 of the DTR, the secondary COCs at the Shipyard site generally exhibited strong positive correlations with one or more of the primary COCs, indicating that they would be addressed in a common remedial footprint. Therefore, the co-occurrence evaluation conducted in the DTR ensured that the secondary COCs were accounted for in the remedial footprint.

- SDC and EHC state that "*the Proposed Remedial Footprint arbitrarily excludes 15 polygons that are more contaminated—from a sediment chemistry standpoint—than the least-contaminated polygon in the Proposed Remedial Footprint.*"

Although SDC and EHC (2011) did not identify the 15 polygons referred to in the statement, they refer to MacDonald (2011), in which the 15 polygons were those with Composite SWAC Ranking Values greater than 5.5. SDC and EHC's assertion is invalid, however, because the DTR clearly states on Page 33-1 that, "*The polygons were ranked based on a number of factors including likely impaired stations, composite surface-area weighted average concentrations for the five primary COCs, site-specific median effects quotient (SS-MEQ) for non-Triad stations, and highest concentration of individual primary COCs*". Therefore, the selection of the polygons to include in the remedial footprint was based on multiple lines of

evidence, as opposed to a single line of evidence such as the Composite SWAC Ranking Values. As shown in Table 33-1 of the DTR, the 23 polygons with the highest Composite SWAC Ranking Values were included in the remedial footprint (see third column of the table), and all of those polygons had values of 7.6 or greater. Polygon NA09 was added to this group primarily because it had the 10th highest concentration of mercury (i.e., a primary COC) of all the polygons (see Table 33-4 of the DTR). Therefore, the SWAC Value of 5.5 was not the primary line of evidence used to include Polygon NA09 in the remedial footprint, and a SWAC Value of 5.5 was not used as a standalone justification for including any polygon in the remedial footprint, as MacDonald (2011) implied. SDC and EHC's assertion is therefore invalid.

- SDC and EHC state that "*the DTR fails to explain why the Site Specific Median Effects Quotient (SS-MEQ) is used to evaluate sediment chemistry in the non-Triad sediment samples, when the metric used for the Triad sediment samples (SQGQ1) is reliable.*"

The SS-MEQ was specifically developed to be an environmentally protective site-specific predictor of both non-likely and likely impairment at the Shipyard Site. The switch from the SQG1 to the SS-MEQ was therefore justified because the SQG1 values are generic guidelines that do not explicitly consider the site-specific conditions at the Shipyard Site. By contrast, the SS-MEQ was based exclusively on chemical and biological data collected at the site and therefore is a more appropriate site-specific sediment assessment tool than the SQG1.

- SDC and EHC state that "*the DTR and record provide no evidence demonstrating how or why 0.9 was chosen as the "optimal threshold.*"

The methods used to develop and evaluate the SS-MEQ are clearly described in the text of Section 32.5.2 of the DTR, and all of the related underlying data are presented in Table A32-11 of the DTR. As noted in the DTR, a threshold value of 0.9 had an overall reliability of 70 percent. In addition, the other measures of predictive reliability of the SS-MEQ threshold of 0.9 presented in Tables 32-21 and A32-11 of the DTR show that the threshold is biased toward being environmentally protective. That is, its ability to accurately predict locations that are not likely impaired (referred to as non-likely efficiency in Table A32-11 of the DTR) was 94 percent (i.e., 16 of 17 predictions). The only polygon erroneously predicted to not be likely impaired was

NA22, which had a SS-MEQ of only 0.35. As stated in Section 32.5.2 of the DTR, however, there is substantial evidence of non-COC related impairment from physical disturbance in that polygon. The ability of the threshold SS-MEQ of 0.9 to accurately predict likely impairment (referred to as likely efficiency in Table A32-11 of the DTR) was only 38 percent (i.e., 5 of 13 predictions). That is, the SS-MEQ threshold of 0.9 predicted impairment at a substantial number of locations without impairment, as well as stations with impairment. These results indicate that there is a very high degree of confidence that polygons with SS-MEQ values less than 0.9 are not likely to be impaired. Therefore, the decision to include all polygons with SS-MEQ less than 0.9 in the remedial footprint is environmentally protective. In contrast, there is much less confidence that polygons with SS-MEQ values greater than 0.9 are likely to be impaired. Therefore, the conservative decision to include all polygons with SS-MEQ values greater than 0.9 in the remedial footprint is also environmentally protective, because over half of those polygons may not be impaired. Contrary to the SDC and EHC (2011) assertion, the information presented above indicates that the threshold SS-MEQ of 0.9 is an environmentally protective predictor of both the presence and absence of impairment at the Shipyard Site.

- SDC and EHC state that "*the 60% Lowest Apparent Effects Threshold for classifying sediment samples as "Likely" impacted is too high.*"

The apparent basis for this assertion is the evaluation conducted by MacDonald (2011), in which he showed that the 60% LAET values were greater than the ERM values of Long et al. (1995). That comparison is flawed, however, because the LAET values were derived as site-specific values that reflect the mixtures of chemicals at the Shipyard Site, in addition to other important factors such as the site-specific bioavailability and bioaccessibility of those chemicals. By contrast, the ERM values were derived from sediment chemistry and toxicity data collected throughout the U.S., without any consideration of bioavailability or bioaccessibility. They are therefore only suitable as initial screening values for a site, rather than values that can reliably predict the presence or absence of sediment toxicity on a site-specific basis. In fact, Long et al. (1995) recognized the limited usefulness of the ERM values when they concluded that the values "*should be used as informal screening tools in environmental assessments,*" and "*they are not*

*intended to preclude the use of toxicity tests or other measures of biological effects.*" Because the ERM values are generic screening values that do not consider bioavailability, it is not surprising that the 60%LAET values are greater than the ERM values, as the former values reflect the site-specific conditions that occur at the Shipyard Site. Therefore, SDC and EHC's assertion has no bearing on the usefulness of the site-specific 60% LAETs for identifying stations that are likely impaired at the site.

- SDC and EHC state that "*the DTR failed to explicitly consider the potential effects exposure to contaminated sediments would have on fish with small home ranges.*"

This assertion is inaccurate. The species selected for detailed evaluation at the Shipyard Site was the spotted sand bass (*Paralabrax maculatofasciatus*) because, as stated in Exponent (2003), this species preys primarily on benthic macroinvertebrates, exhibits limited spatial movements, and is abundant in numerous kinds of habitats within San Diego Bay, including the Shipyard Site, as documented during the fish sampling effort prior to the 2001/2001 sampling events. These characteristics of the spotted sand bass make it an appropriate species for assessing contaminant exposure at the Shipyard Site. This determination is reinforced by the results of tissue chemistry analyses. Spotted sand bass were collected at four locations, inside and outside the leaseholds of both shipyards, and the results showed that chemical concentrations in fish tissue from inside the leaseholds were greater than concentrations in fish collected immediately outside the leaseholds (Exponent 2003). The data therefore clearly indicate that spotted sand bass are sensitive to spatial differences in sediment chemistry concentrations at the Shipyard Site. Although gobies were identified as a possible alternative species for use at the Shipyard Site, they were not found at the site during an extensive sampling effort prior to the 2001/2002 sampling event. As stated on Page 2-7 of the Exponent (2003) report, "*attempts were also made to collect gobies, without success at either site.*" Representatives from the California Department of Fish and Game observed the fish collection effort and agreed that gobies were absent or rare at the Shipyard Site.

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2. Reply to Comment IV.B.2. The Proposed Remedial Footprint excludes eight polygons that, under the DTR's own methodology, should have been included.

- SDC and EHC state that "*Polygons NA22, NA01, NA04, NA07, NA16, SW06, SW18, and SW29 should have been included in the Proposed Remedial Footprint and should be added to the final remedial footprint.*"

This statement is invalid for the reasons provided below.

a. Reply to Comment IV.B.2.a. The Proposed Remedial Footprint improperly excludes NA22.

- SDC and EHC state that "*NA22 has improperly been excluded from the Proposed Remedial Footprint.*"

Section 33 of the TCAO states that NA22 is being evaluated in the Mouth of Chollas Creek TMDL, and therefore is not considered part of the Shipyards Site for the purposes of the TCAO. Thus, NA22 was properly removed from the remedial footprint.

b. Reply to Comment IV.B.2.b. The Proposed Remedial Footprint excludes—NA01, NA04, NA07, NA16, SW06, SW18 and SW29—which pose unacceptable risks to fish and the benthic community.

- SDC and EHC state that "*the DTR arbitrarily excluded at least a dozen polygons from the Proposed Remedial Footprint without explanation,*" and that the seven polygons identified in the comment should be added to the remedial footprint.

Multiple site-specific indicators of sediment quality indicated that these polygons do not warrant inclusion in the remedial footprint, as follows:

- **NA01:** Not likely impaired based on Triad analysis, no primary COCs exceeded their 60%LAET values, the SS-MEQ (0.69) was less than the threshold of 0.9.
- **NA04:** Not likely impaired based on Triad analysis, no primary COCs exceeded their 60%LAET values, the SS-MEQ (0.69) was less than the threshold of 0.9.
- **NA07:** Not likely impaired based on Triad analysis.
- **NA16:** Not likely impaired based on Triad analysis, no primary COCs exceeded their 60%LAET values, the SS-MEQ (0.69) was less than the threshold of 0.9.
- **SW06:** Not likely impaired based on the supplemental Triad analysis, no primary COCs exceeded their 60%LAET values, the SS-MEQ (0.63) was less than the threshold of 0.9.

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- **SW18:** Not likely impaired based on Triad analysis, no primary COCs exceeded their 60%LAET values, the SS-MEQ (0.62) was less than the threshold of 0.9.
- **SW29:** No primary COCs exceeded their 60%LAET values, the SS-MEQ (0.71) was less than the threshold of 0.9.

Based on the information presented above, SDC and EHC's assertion that the seven polygons should be included in the remedial footprint is invalid with respect to risks to benthic macroinvertebrate communities.

With respect to fish, the concerns are unwarranted because risks to fish were not found to be an issue at the Shipyard Site under baseline conditions, based on the results of extensive site-specific evaluations using the abundant and benthic-feeding spotted sand bass as the key indicator species (Exponent 2003). MacDonald (2009) conducted a hypothetical risk analysis based on gobies, which were not found at the Shipyard Site during the extensive fish collection efforts that were conducted prior to the 2001/2002 sampling events at the site (Exponent 2003). That analysis was flawed for numerous reasons, however, and has no relevance for determining which polygons warrant inclusion in the remedial footprint. Some of the major methodological flaws in the hypothetical analysis conducted by MacDonald (2009) are as follows:

- **Indicators Species:** As discussed above, the selection of gobies as the indicator species was inappropriate because they are not found at the Shipyard Site.
- **Toxicity Reference Value (TRV):** MacDonald (2009) used a study by Orn et al. (1998) to develop the TRV for PCBs in fish. However, that study was based on zebrafish (*Danio rerio*) which, as a tropical freshwater species, are not found in San Diego Bay, and thus has questionable relevance to the marine fish species that reside in the Bay.
- **Toxicity Endpoint:** MacDonald (2009) selected reproduction as the endpoint for developing the TRV for PCBs, and developed the TRV based on ovary weight and the gonad somatic index (GSI). However, he ignored the fact that other reproductive endpoints (i.e., percentage of spawning females, mean number of eggs per female, and median hatching time), as well as early mortality showed no significant reductions in

response to exposure to PCBs.

- **Biota Sediment Accumulation Factor (BSAF):** MacDonald (2009) used a BSAF determined for spotted sand bass in an unpublished memo by Zeeman (2004).
- **Lipid Content:** MacDonald (2009) assumed the lipid content of the gobies was 4 percent, based on the naked goby (*Gobiosona bosc*) and presented in an unpublished presentation by Lederhouse et al. (2007).
- **Moisture Content:** MacDonald (2009) assumed a whole-body moisture content of 80 percent for fish to convert the wet weight PCB concentrations presented in Orn et al. (1998) to dry weight.

In summary, MacDonald (2009) conducted a hypothetical analysis that predicted PCB concentrations in gobies, a species that does not occur at the Shipyard Site, using a TRV developed from a freshwater zebrafish, an unpublished BSAF based on sand bass, an unpublished lipid content based on the naked goby, and an assumed 80 percent moisture content in whole bodies of fish. Each one of the above items has uncertainties attached to it, which MacDonald (2009) did not attempt to quantify or even acknowledge. Given each of the uncertainties in MacDonald's hypothetical analysis, as well as the cumulative nature of them all, it is clear that the results of the hypothetical analysis conducted by MacDonald (2009) cannot be used to assess risk to fish at the Shipyard Site in a meaningful manner. In addition, such a hypothetical analysis is irrelevant because the extensive amount of site-specific information on the barred sand bass showed that risks to fish were not an issue at the Shipyard Site under baseline conditions.

### C. Reply to Comment IV.C. The Remediation Monitoring is Insufficient to Assess Remedial Activities' Impacts on Water Quality, to Evaluate the Effectiveness of Remedial Measures, or to Identify the Need for Further Dredging to Achieve Clean-up Goals at the Shipyard Sediment Site.

This comment is invalid for the reasons provided below.

1. Reply to Comment IV.C.1. The water quality component of the Remediation Monitoring program fails to provide safeguards to ensure data collected reveals actual water quality conditions.

- SDC and EHC state that "*the water quality component of the Remediation Monitoring Program falls short in two ways: (1) some of the requirements are specific but are not designed to collect data to accurately reflect water quality*

*impacts during remediation and (2) some requirements are vague, allowing Dischargers to collect data in a way that masks the true water quality impacts during dredging.*"

As described in the TCAO, the detailed specifications of the water quality monitoring program will be specified in the Remediation Monitoring Plan, as part of the Remedial Action Plan, which will be prepared within 90 days from adoption of the CAO. The specifications presented in the Remediation Monitoring Plan will then be reviewed for technical adequacy. As stated in the TCAO, "*the water quality monitoring must be sufficient to demonstrate that implementation of the selected remedial activities do not result in violations of water quality standards outside the construction area.*" The final specifications of the water quality monitoring program will therefore be designed to meet that stated objective.

2. Reply to Comment IV.C.2. The sediment component of the Remediation Monitoring program fails to require data collection to confirm Cleanup Levels are achieved.

- SDC and EHC state that "*the sediment portion of the Remediation Monitoring program fails to require Dischargers to collect data in an amount and through methods sufficient to competently measure compliance with the alternative clean-up levels.*"

As described for the water quality monitoring program above, the detailed specifications of the sediment monitoring program will be specified in the Remediation Monitoring Plan, and will then be reviewed for technical adequacy. As stated in the TCAO, "*the sediment monitoring must be sufficient to confirm that the selected remedial activities have achieved target cleanup levels within the remedial footprint.*" The final specifications of the sediment monitoring program will therefore be designed to meet that stated objective.

**D. <u>Reply to Comment IV.D. The Post Remedial Monitoring Program is Poorly Designed and Will not Require Data Collection to Accurately Evaluate Post-Remediation Conditions.</u>**

SDC and EHC make numerous statements in this comment. Responses to each of those statements are presented below.

- SDC and EHC state that "*NA22 must be included in any Remedial Monitoring because it is a part of the Shipyard Sediment Site.*"

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This statement is erroneous because, as discussed previously, Section 33 of the TCAO states that NA22 is being evaluated in the Mouth of Chollas Creek TMDL, and therefore is not considered part of the Shipyards Site for the purposes of the TCAO.

- SDC and EHC also state that "*the approach to evaluating post-remedial conditions is likely to underestimate sediment toxicity because the DTR relied on inappropriate thresholds.*"

The specifications described in Section D of the TCAO on how the monitoring results for sediment chemistry, sediment toxicity, and bioaccumulation will be evaluated are objective, quantitative, and environmentally protective. They will therefore ensure that beneficial uses in San Diego Bay will be protected in the future.

- SDC and EHC state that "*requiring sediment samples to be collected at only five sampling stations to evaluate benthic community conditions is inadequate,*" and that "*the Post Remedial Monitoring plan should be expanded to provide a more robust basis for evaluating exposure of benthic invertebrates to contaminants at the site and for assessing sediment toxicity.*"

The five stations selected for evaluations of benthic exposure were the only five stations in the remedial footprint found to have likely impairment based on the Triad analyses described in the DTR (see Section 18 of the DTR). Therefore they represent the highest priority areas for remediation and are appropriately identified for monitoring of sediment chemistry and toxicity to evaluate benthic exposure. It should also be recognized that subsamples of sediment from all 65 polygons will be archived as part of the sediment compositing analysis, and will therefore be available for future chemical analysis if necessary.

- SDC and EHC state that "*the Post Remedial Monitoring program's bioaccumulation requirements are insufficient,*" and that "*because the bioaccumulation criteria are not effects-based, they will not be useful for determining if conditions at the Shipyard Sediment Site will be unreasonably affecting San Diego Bay beneficial uses.*"

Attachments 3 and 4 to the TCAO show that the nine stations selected for bioaccumulation analysis are distributed along the entire length of the remedial footprint, and thereby will provide a relatively complete assessment of potential bioaccumulation throughout the site. In addition, the bioaccumulation criteria specified in Section D of the TCAO were designed to document that bioaccumulation levels are responding to the sediment remediation and are showing a decreasing trend in Year 2, relative to post-remediation levels, and decreasing or

continuous trends in Years 5 and 10. The bioaccumulation evaluations were therefore designed appropriately for their intended use.

- SDC and EHC state that "*the Order fails to include rules specifying what actions the Dischargers must take in several situations, including (1) if sediment chemistry results for the post-remediation sediment samples exceed the thresholds included in the Order and (2) if toxicity to one or more species is observed during the Post Remedial sampling and testing.*"

In Section D of the TCAO, the decision rule for sediment chemistry is identified as "*sediment chemistry below SS-MEQ and the 60% LAET thresholds.*" If these criteria are not achieved, the Regional Board will then evaluate whether further actions at the site are warranted. In addition, in Section D of the TCAO, the rule for sediment toxicity is identified as "*toxicity not significantly different from conditions at the reference stations described in Finding 17.*" If this criterion is not achieved, the Regional Board will then evaluate whether further actions at the site are warranted.

- SDC and EHC state that "*the Order does not list the triggers that will be used for evaluating sediment chemistry for benthic exposure.*"

In Section D of the TCAO, the decision rule for sediment chemistry is identified as "*sediment chemistry below SS-MEQ and the 60% LAET thresholds.*" If these criteria are not achieved, the Regional Board will then evaluate whether further actions at the site are warranted.

**E. <u>Reply to Comment IV.E. The DTR Contains Incorrect Statements.</u>**

- SDC and EHC state that "*the DTR incorrectly claims that the Proposed Remedial Footprint 'captures 100 percent of triad "Likely" . . . impacted stations,'*" and that "*this claim is incorrect because the Proposed Remedial Footprint excludes NA22.*"

As discussed previously, Section 33 of the TCAO states that NA22 is being evaluated in the Mouth of Chollas Creek TMDL, and therefore is not considered part of the Shipyards Site for the purposes of the TCAO.

- SDC and EHC also state that "*the San Diego Regional Board does not have authority to conduct natural resource damage assessments.*"

This statement is an unwarranted extrapolation of a single mention of "natural resources" in the TCAO, in which it is simply stated that "*Cleanup of the remedial footprint will restore any injury, destruction, or loss of natural resources.*" The statement in no way addresses service

losses, monetary damages, or any of the other parameters unique to natural resource damage assessments. The statement simply articulates that the cleanup of the remedial footprint at the Shipyard Site will improve environmental conditions such that natural resources like those evaluated in detail at the Shipyard Site (i.e., benthic macroinvertebrates, fish, and aquatic dependent wildlife) will benefit. The SDC/EHC statement is therefore irrelevant.

## VI. REPLY TO SDC AND EHC'S CONCLUSIONS

SDC and EHC draw numerous conclusions in this section that are invalid. Each of those conclusions statements are addressed in turn.

### A. Reply to SDC and EHC's Conclusion 1. The Order and DTR Must Require that the Remediation Achieve the Alternative Clean-up Levels.

- SDC and EHC state that "*the '120% of background' second-dredging pass trigger and the 'Trigger Concentrations' work together to allow the pollutant levels at the Site to exceed Alternative Cleanup Levels at the Site following remediation.*"

As discussed previously, the DTR clearly and appropriately states that the rationale for the 120% background rule is to address the natural variability encountered when making measurements of sediment chemistry in environmental samples. SDC and EHC's analysis presented in Table 2 of the comments is flawed because it is based on the highly improbable scenario that concentrations of all five primary COCs would be found at 120% of their background levels throughout the entire remedial footprint. A much more likely scenario is that only a subset of the COCs would be found at 120% of their background levels, and that this would occur only in apportion of the footprint rather than throughout the entire areas. Even if the highly unlikely scenario presented in Table 2 of SDC and EH's comments is found, the magnitude of the exceedance of the Alternative Screening Cleanup Level for each COC is very small, ranging from 0.6 to 1.5 %. Therefore, SDC and EHC's proposed conclusion is incorrect.

Furthermore, SDC and EHC's conclusion is also invalid with respect to the Trigger Concentrations because they were appropriately designed to address the degree of natural variability expected to be found associated with measurements of the Alternative Cleanup Levels at the Shipyard Site, based on the area-weighted variability of the measured COC concentrations in the non-remediated areas.

**B. Reply to SDC and EHC's Conclusion 2. The Regional Board Should Make an Independent Finding of What Level of Cleanup is Economically Feasible Based on all the Evidence in the Record Regarding Economic Feasibility.**

The purpose of the economic feasibility analysis, as stated by the Regional Board's Cleanup Team (Carrigan 2011) is solely to determine whether cleanup to background is economically feasible. The Cleanup Team has determined that cleanup to background is not economically feasible, and that the proposed footprint is economically feasible, based on the cost-effectiveness of different cleanup scenarios. The stated purpose of the economic feasibility analysis does not include or imply any requirement to evaluate the economic feasibility of all, or any, other cleanup scenarios that may be favored by SDC/EHC.

**C. Reply to SDC and EHC's Conclusion 3. The Proposed Remedial Footprint Should Be Enlarged by Eight Polygons.**

- SDC and EHC state that "*Polygon NA22 should be added to the Remedial Footprint to address the real risks pollution in this polygon poses to current beneficial uses*," and that "*NA01, NA04, NA07, NA16, SW06, SW18 and SW29 pose unacceptable risks to fish and the benthic community and should be added to the remedial footprint to address these risks.*"

As discussed previously, Section 33 of the TCAO states that NA22 is being evaluated in the Mouth of Chollas Creek TMDL, and therefore is not considered part of the Shipyard Site for the purposes of the TCAO. The other seven polygons should not be included in the remedial footprint, as discussed previously, multiple site-specific indicators of sediment quality indicated that those polygons do not warrant inclusion in the remedial footprint. The site-specific indicators are as follows:

- **NA01:** Not likely impaired based on Triad analysis, no primary COCs exceeded their 60%LAET values, the SS-MEQ (0.69) was less than the threshold of 0.9.
- **NA04:** Not likely impaired based on Triad analysis, no primary COCs exceeded their 60%LAET values, the SS-MEQ (0.69) was less than the threshold of 0.9.
- **NA07:** Not likely impaired based on Triad analysis.
- **NA16:** Not likely impaired based on Triad analysis, no primary COCs exceeded their 60%LAET values, the SS-MEQ (0.69) was less than the threshold of 0.9.
- **SW06:** Not likely impaired based on the supplemental Triad analysis, no primary

COCs exceeded their 60%LAET values, the SS-MEQ (0.63) was less than the threshold of 0.9.

- **SW18:** Not likely impaired based on Triad analysis, no primary COCs exceeded their 60%LAET values, the SS-MEQ (0.62) was less than the threshold of 0.9.
- **SW29:** No primary COCs exceeded their 60%LAET values, the SS-MEQ (0.71) was less than the threshold of 0.9.

Based on the information presented above, SDC and EHC's assertion that the seven polygons should be included in the remedial footprint is invalid with respect to risks to benthic macroinvertebrate communities.

With respect to fish, the concerns are unwarranted because risks to fish were not found to be an issue at the Shipyard Site under baseline conditions, based on the results of extensive site-specific evaluations using the abundant and benthic-feeding spotted sand bass as the key indicator species (Exponent 2003). As discussed previously, MacDonald (2009) conducted a hypothetical risk analysis based on gobies, which was flawed for numerous reasons and therefore has no bearing on determining which polygons warrant inclusion in the remedial footprint at the Shipyard Site. Briefly, MacDonald (2009) conducted a hypothetical analysis that predicted PCB concentrations in gobies, a species that does not occur at the Shipyard Site, using a TRV developed from a freshwater zebrafish, an unpublished BSAF based on sand bass, an unpublished lipid content based on the naked goby, and an assumed 80 percent moisture content in whole bodies of fish. Each one of the above items has uncertainties attached to it, which MacDonald (2009) did not attempt to quantify or even acknowledge. Given each of the uncertainties in MacDonald's hypothetical analysis, as well as the cumulative nature of them all, it is clear that the results of the hypothetical analysis conducted by MacDonald (2009) cannot be used to assess risk to fish at the Shipyard Site in a meaningful manner. In addition, such a hypothetical analysis is irrelevant because the extensive amount of site-specific information on the barred sand bass showed that risks to fish were not an issue at the Shipyard Site under baseline conditions.

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1. Cost of Remediating Eight Additional Polygons.

SDC and EHC also claim that remediating eight additional polygons will require dredging an additional 120,000 cubic yards of sediment. They "estimate" total additional dredging costs would be approximately $1.5 million, or only 2% (2.58%) of the current cleanup cost. SDC and EHC's estimate included only the cost for the dredge to remove the sediment from the bay bottom. It is unclear what SDC and EHC intended regarding all of the other costs associated with the remedial action, but there are additional substantial costs associated with any dredging, especially in a remedial action.

The June 22, 2011 declaration of Shaun Halvax, attaching a spreadsheet of cost assumptions, estimates that the cost for remediating the additional polygons is many times SDC and EHC's estimate. Mr. Halvax's declaration states he is in charge of BAE Systems' dredge activities in San Diego and other west coast locations and just completed dredging in BAE Systems' shipyard in January 2011. Mr. Halvax states that total dredging, disposal, and underpier remediation (inclusive of environmental protection measures and monitoring) will cost an estimated $23,900,000. Costs associated with remedial dredging not considered by SDC and EHC include debris management, additional dredging/cleanup pass, protection of structures, return water management, disposal, clean sand cover, and sediment sampling/water quality monitoring. Details of these additional, but necessary, costs, including unit costs and assumptions may be found in the Halvax spreadsheet.

Instead of an incremental cost of approximately $1,500,000, the more accurate cost associated with the additional 120,000 cubic yards of sediment is $23,900,000. Even then, this estimate does not include any provision for uncertainty, permitting, long-term monitoring, design, construction management, and other potential costs that may incrementally increase the total cost of the remedial effort. Rather than an incremental increase of 2.58% to the cost of the proposed remedial action, the addition of SDC and EHC's suggested polygons will increase the estimated cost by 41% over the current estimate of $58,100,000. (DTR § 32.1.1 at 32-40.) If additional polygons are dredged, as SDC and EHC urge, the likely cost of remediating the site will increase to at least $82,000,000.

**D. Reply to SDC and EHC's Conclusion 4. The Monitoring Requirements Should Be Strengthened to Ensure the Best Water Quality Reasonable.**

- SDC and EHC state that "*to ensure the cleanup achieves the 'best water quality reasonable,' the Remediation Monitoring and Post Remedial Monitoring requirements should be strengthened.*"

As discussed previously, the remediation monitoring program for the Shipyard Site provides a reliable basis for monitoring both water quality and sediment quality during remediation, and will be further developed and enhanced after the Remediation Monitoring Plan is submitted within 90 days after the CAO is adopted.

- SDC and EHC also state that "*the current Post Remedial Monitoring requirements are insufficient to evaluate the effectiveness of the remedial measures and identify the need for further remediation to achieve the clean-up goals at the Shipyard Sediment Site.*"

As discussed previously, the post remedial monitoring specifications are considered appropriate and sufficient for evaluating the effectiveness of remediation at the Shipyard Site.

**E. Reply to SDC and EHC's Conclusion 5. Additional Trigger Concentrations and Triggers for Benthic Invertebrates Should Be Added to Ensure the Best Water Quality Reasonable**

- SDC and EHC state that "*additional 'trigger concentrations' for the secondary Contaminants of Concern should be added to the Post-Remedial Monitoring requirements*," and that "*triggers addressing benthic invertebrates should be added to the Post- Remedial Monitoring requirements.*"

As discussed previously, the secondary COCs are already accounted for in the remedial footprint due to their positive correlations with one or more of the primary COCs. In addition, the methods of analyzing the post-monitoring sediment chemistry, sediment toxicity, and bioaccumulation results are clearly identified in the TCAO and are considered both appropriate and sufficient.

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## VII. CONCLUSION

As set forth above, the Regional Board applied the correct legal standard, based its finding that cleanup to background is not economically feasible on a well-reasoned analysis of cost effectiveness, and set appropriate cleanup levels that do not unreasonably impair the beneficial uses of the water. Accordingly, SDC and EHC's comments lack credence and should be rejected.

Dated: June 23, 2011

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