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File No. 048876-0002

May 26, 2011

BY HAND DELIVERY AND E-MAIL

Frank Melbourn
California Regional Water Quality Control Board
San Diego Region 9174 Sky Park Court, Suite 100
San Diego, California 92123

Re: In re: Tentative Cleanup and Abatement Order No. R9-2011-0001

Dear Mr. Melbourne:

Please find enclosed three disks containing documents for submittal to the Shipyard Administrative Record by National Steel and Shipbuilding Company. Please note that the disk titled "Chollas File Records, Toxic Pollutants in Sediment at the Mouth of Chollas Creek TMDL Project" is an exact copy of a disk produced by the Cleanup Team on October 12, 2010.

Best regards,

Kelly E. Richardson
of LATHAM & WATKINS LLP

Enclosures

cc: Catherine Hagan, Esq. (via e-mail, w/out enclosures)
Designated Parties (via e-mail, w/out enclosures)

SD\789437.1

PROOF OF SERVICE

I am employed in the County of San Diego, State of California. I am over the age of 18 years and not a party to this action. My business address is Latham & Watkins LLP, 600 West Broadway, Suite 1800, San Diego, CA 92101-3375.

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Frank Melbourn Catherine Hagan California Regional Water Quality Control Board, San Diego Region 9174 Sky Park Court, Suite 100 San Diego, CA 92123-4340 fmelbourn@waterboards.ca.gov chagan@waterboards.ca.gov Telephone: (858) 467-2958 Fax: (858) 571-6972	

I declare that I am employed in the office of a member of the Bar of, or permitted to practice before, this Court at whose direction the service was made and declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Executed on **May 26, 2011**, at San Diego, California.

Andrea Rasco

Andrea Rasco

NATIONAL STEEL AND SHIPBUILDING COMPANY'S MOTION IN LIMINE TO EXCLUDE EXPERT TESTIMONY OF DONALD MACDONALD

Submitted by: Date: May 26, 2011

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CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD

SAN DIEGO REGION

IN THE MATTER OF: TENTATIVE CLEANUP AND ABATEMENT ORDER NO. R9-2011-0001 (formerly No. R9-2010-0002)	**NASSCO'S MOTION IN LIMINE TO EXCLUDE THE EXPERT TESTIMONY OF DONALD MACDONALD**

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I.

INTRODUCTION

Designated Party National Steel and Shipbuilding Company ("NASSCO") respectfully moves the Presiding Officer to exclude from the record the testimony and reports of Mr. Donald MacDonald, the Environmental Health Coalition's ("EHC") and San Diego Coastkeeper's ("Coastkeeper") designated expert witness on the issues of environmental toxicology and chemistry, ecosystem-based resource management, water quality/water use interactions, and sediment quality assessment, due to Mr. MacDonald's intentional destruction of evidence in violation of relevant discovery orders and law governing these proceedings, and due to his admitted lack of expertise in the subject matters for which he is testifying. NASSCO has been prejudiced by Mr. MacDonald's conduct and will be further prejudiced if Mr. MacDonald's testimony is not stricken from the record.

California Code of Civil Procedure Section 2034.270, which was specifically incorporated in this proceeding by the Presiding Officer's "Order Issuing Final Discovery Plan for Tentative Cleanup and Abatement Order No. R9-2010-0002 and Associated Draft Technical Report," dated February 18, 2010 (Ex. 1, "Discovery Plan"), requires parties to produce "all discoverable reports and writings . . . made by any designated expert." However, Mr. MacDonald has unethically disregarded this basic requirement to preserve, and produce, all of the reports and writings underlying his opinions,[1] and, at his deposition, brazenly confessed that he intentionally destroyed key evidence related to the development of his reports, including notes, draft reports, and peer-review comments on his work. <u>See</u> Ex. 2, Deposition of Donald MacDonald ("MacDonald Depo"), at 46:21-47:3. It is well-established that the expert opinion of any witness who has unreasonably failed to produce reports and writings of expert witnesses "shall" be excluded. Cal. Code. Civ. Pro. § 2034.260. Further, spoliation of evidence is also a clear abuse of the discovery process, warranting terminating sanctions. To allow Mr.

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[1] This is not the first time Mr. MacDonald has acted unethically with regard to proffering "expert" testimony in sediment cases. In <u>United States v. Montrose Chemical Corporation of California</u>, Mr. MacDonald was excluded, and the party he represented was sanctioned for misconduct, when he intentionally and unethically failed to consider a study that contradicted his opinion concerning appropriate sediment concentration thresholds.

MacDonald to testify after he has intentionally destroyed important evidence underlying his report and opinions contradicts black-letter statutory and common law, is fundamentally unfair, and violates NASSCO's right to due process. Accordingly, on these grounds alone, Mr. MacDonald's testimony and reports must be stricken from the record.

Additionally, Mr. MacDonald is also not qualified to offer expert opinion on alternative remedial designs. In order to submit expert opinion, a witness must be qualified in the particular field in which he intends to offer expert opinion. Mr. MacDonald, however, is a zoologist whose experience regarding sediments is limited to sediment quality *assessment* (which is an entirely separate field from sediment remedial design). He has no experience in sediment remedial design, and has clearly stated that he does not consider himself to be an expert in remedial design and engineering. Ex. 2, MacDonald Depo, at 110:2 – 110:5; 114-13 - 115:9; 126:8 – 127:14; 130:20 – 130:25. He has also expressed a complete lack of knowledge concerning basic principles governing sediment remediation in California, including State Water Resources Control Board Resolution 92-49 ("Resolution 92-49"). Consequently, his opinions regarding remedial design and engineering—including his opinions concerning the scope of the footprint described in Tentative Cleanup and Abatement Order No. R9-2011-0001 ("TCAO") and Draft Technical Report ("DTR") and his proposed alternative analysis—have little or no probative value, and will only serve to confuse and mislead the San Diego Regional Water Quality Control Board members ("Board").

For these reasons, pursuant to California Evidence Code Sections 350, 352, 720, and 801-805, and California Code of Civil Procedure Section 2034.300, NASSCO brings this motion in limine for an order excluding Mr. MacDonald's proffered expert testimony from this proceeding, including but not limited to his report entitled "Development of a Sediment Remediation Footprint to Address Risks to Benthic Invertebrates and Fish in the Vicinity of the Shipyards Site in San Diego Bay, California," dated October, 2009 (Ex. 3, "MacDonald's Proposed Alternative Remediation Footprint") and his report entitled "Review and Evaluation of Tentative Cleanup-Up and Abatement Order (No. R9-2011-0001) for the Shipyard Sediment Site, San Diego Bay, San Diego, California," dated March 11, 2011 (Ex. 4, "March 2011 Report").

II.

BACKGROUND

In October 2009, Mr. MacDonald, who is EHC's and Coastkeeper's designated expert witness on the topics of "environmental toxicology and chemistry, ecosystem-based resource management, water quality/water use interactions, and sediment quality assessment, including contaminated sediment and remedial plans," submitted an "expert report" to the record entitled "Development of a Sediment Remediation Footprint to Address Risks to Benthic Invertebrates and Fish in the Vicinity of the Shipyards Site in San Diego Bay, California." (Ex. 3, MacDonald's Proposed Alternative Remediation Footprint). In this report, Mr. MacDonald purports to "support revision of the Order by the Regional Board by identifying a remediation footprint for the Shipyards Site that would address impacts on benthic invertebrates and benthic fish utilizing aquatic habitats in the vicinity of the site." Ex. 3, MacDonald's Proposed Remediation Footprint, at 1 [SAR378390]. Specifically, the report presents an analysis of data, a site assessment, and a cleanup proposal for the Site, including a proposed remedial footprint that is intended to "identif[y] the polygons that require remediation to address risks to benthic invertebrates and/or fish." Id., at 38 [SAR378427].

Mr. MacDonald also submitted a second report in March 2011 at the close of discovery, *after his deposition*, which similarly recommended a significant expansion of the proposed remedial footprint articulated in the TCAO, as well as numerous additional requirements for remedial and post-remedial monitoring at the Site.

During the discovery process, NASSCO repeatedly requested that EHC and Coastkeeper produce Mr. MacDonald's complete expert file related to his opinions in this matter, including drafts and writings related to his Alternative Remediation Footprint; however, it subsequently became clear at Mr. MacDonald's deposition that significant portions of Mr. MacDonald's file had been purposely destroyed, and therefore could not be produced as required. See Ex. 2, MacDonald Depo, at 46:21-47:3 (indicating portions of expert file had been destroyed); 456:14 – 457:8 (demanding production of Mr. MacDonald's expert file). Additionally, Mr. MacDonald was unable to provide key information concerning how he prepared his report that would typically be expected from a qualified expert witness. Id., at 456:21 – 456:25. He also refused to provide any information whatsoever concerning the opinions he intended to set forth in his second report, which was subsequently submitted to the record on March 11, 2011. Id., at 115:15 – 117:22.

For the reasons discussed below, as a zoologist with a bachelor of science degree and no relevant experience in sediment remedial design in California or elsewhere (including the related fields of economic feasibility, technological feasibility, and post-remedial monitoring), Mr. MacDonald is not qualified to recommend "expert opinions" regarding an alternative remedial footprint to the Board, and his reports and testimony pertaining thereto should be excluded from the record.

III.

LEGAL STANDARDS

A. Expert Witnesses Are Required To Produce Reports and Writings

The Discovery Plan provides that procedures for expert witness disclosures shall be governed by California Code of Civil Procedure Sections 2034.010 *et seq.* California Code of Civil Procedure 2034.300 provides that the court "shall exclude" expert opinion testimony offered by a party who has unreasonably failed "to produce reports and writings of expert witnesses under Section 2034.070." Moreover, destruction of such evidence constitutes an abuse of the discovery process warranting sanctions, including the exclusion of Mr. MacDonald's report and testimony. Williams v. Russ, 167 Cal. App. 4th 1215, 1223 (2008) (characterizing spoliation as a "misuse of the discovery process" and upholding the imposition of terminating sanctions where relevant documents were intentionally destroyed); Cedars-Sinai Med. Ctr. v. Superior Ct., 18 Cal. 4th 1, 12 (1998) ("Destroying evidence in response to a discovery request after litigation has commenced would surely be a misuse of discovery within the meaning of [California Code of Civil Procedure Section] 2023, as would such destruction in anticipation of a discovery request.").

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B. A Witness Must Possess Special Knowledge, Skill, Experience, Training, or Education To Testify As An Expert

"[A]ll adjudicative proceedings before the State Board, the Regional Boards, or hearing officers or panels appointed by any of those Boards shall be governed by, [among other codes and regulations,] . . . sections 801 – 805 of the Evidence Code, and section 11513 of the Government Code." 23 Cal. Code Regs. § 648.

Government Code section 11513 provides that, in general, an adjudicative hearing need not be conducted according to technical rules relating to evidence and witnesses, and that "any relevant evidence shall be admitted *if it is the sort of evidence on which responsible persons are accustomed to rely in the conduct of serious affairs*, regardless of the existence of any common law or statutory rule which might make improper the admission of the evidence over objection in civil actions." Evidence Code section 801 sets forth certain additional admissibility requirements applicable to opinion testimony from expert witnesses in administrative proceedings, beyond the generalized threshold provided in Government Code 11513. Specifically, Section 801(b) sets forth three separate but related tests that a matter must meet to serve as a proper basis for an expert opinion. First, the information used must be based on matter (including the expert's special knowledge, skill, experience, training, and education) that comes from (a) the witness's personal observation, (b) the witness's personal knowledge, or (c) an assumption of facts finding support in the evidence. Second, the matter upon which the expert bases his opinion must be of a type upon which the expert may reasonably rely. Third, an expert may not base his opinion upon any matter held to be improper as the basis of an expert opinion by constitutional, statutory, or decisional law.

Where an expert bases an opinion in whole or in significant part upon a matter that does not meet Section 801's requirements, the Court may, "and upon objection *shall*, exclude [such] testimony . . . ." Evid. Code § 803 (emphasis added). To qualify as an expert, a witness must have "special knowledge, skill, experience, training, or education sufficient to qualify him as an expert on the subject to which his testimony relates." Cal. Evid. Code § 720(a), *see also* Cal. Evid. Code § 801. Further, once an expert's qualifications are established, an expert witness may not offer opinions beyond the scope of the witness' expertise. *See* Putensen v. Clay Adams, Inc., 12 Cal. App. 3d 1062, 1080-81 (1970). Mr. MacDonald does so here. Thus, under Evidence Code Sections 720, 801 and 803, the Board is *obligated* to exclude expert opinion that is unreliable or based upon improper matter, including expert opinion from a witness who does not possess "special knowledge, skill, experience, training, or education" on the subject to which he intends to testify (here, sediment remediation engineering and design in California).

IV.

ARGUMENT

A. Mr. MacDonald Purposely Destroyed Reports And Writings Required To Be Produced For These CAO Proceedings

The production of Mr. MacDonald's complete expert file is mandated under the CCP's expert discovery provisions, which require disclosure of "all discoverable reports and writings" of a testifying expert. CCP §§ 2034.210; 2034.270. Additionally, Mr. MacDonald's deposition subpoena contained a comprehensive set of document requests encompassing his complete expert file in this matter, including but not limited to requests for (1) Mr. MacDonald's "expert report" including all drafts, (2) all documents Mr. MacDonald reviewed, relied on or considered in preparing his "expert report", (3) all documents Mr. MacDonald prepared or reviewed relating to the Site, CAO or DTR, and (4) all of Mr. MacDonald's communications concerning his "expert report", the Site, CAO or DTR. These categories of documents were also demanded on the record at Mr. MacDonald's deposition, to the extent they had not already been produced. Ex. 2, MacDonald Depo, at 457:3 – 457:8.

However, it is clear from Mr. MacDonald's deposition testimony that substantial portions of Mr. MacDonald's expert file have been purposely and improperly destroyed. Specifically, Mr. MacDonald testified that it was his standard practice to routinely destroy key evidence related to the development of his "expert report", including notes, draft reports, and peer-review comments on the report. See Ex. 2, MacDonald Depo, at 46:21-47:3. During his deposition, Mr. MacDonald attempted to argue incoherently that he had not actually "destroyed" these materials because they merely had been "recycled," and, according to Mr. MacDonald, the materials "may still be in existence in some recycling area somewhere." See id. at 68:2-69:2. But during the meet and confer process preceding NASSCO's motion to compel, Mr. MacDonald's counsel acknowledged that the "recycled" materials have been destroyed, cannot be recovered, and will not be produced.

By destroying the parties' ability to access the full body of evidence relevant to Mr. MacDonald's opinions and reports, Mr. MacDonald's misconduct has unfairly deprived NASSCO, and others, of the ability to fully defend their interests in these proceedings. NASSCO is already prejudiced to the extent that the spoliated files supported NASSCO's positions. To allow Mr. MacDonald to offer up self-serving opinions and reports, after having destroyed drafts, peer review critiques, notes, and other writings that may have refuted his conclusions is fundamentally unfair and serves only to compound the prejudicial effects of Mr. MacDonald's ethical breach.

Accordingly, because Mr. MacDonald has destroyed evidence, EHC and Coastkeeper have unreasonably failed to produce the reports and writings of Mr. MacDonald that are required to be produced under Section 2034.070. The Presiding Officer is therefore required to exclude Mr. MacDonald's testimony pursuant to the terms of the Discovery Plan, the California Code of Civil Procedure, and common law principles addressing intentional spoliation of evidence.

B. Mr. MacDonald Has Been Excluded From Testifying In Other Sediment Cases Due To His Unethical Use Of Data

Mr. MacDonald's improper destruction of key documents in this matter is not Mr. MacDonald's first ethical breach. Mr. MacDonald has also been excluded as an expert in The United States v. Montrose Chemical Corporation of California case or "Montrose/NOAA" federal court matter in Los Angeles, California, which is the only other sediment case he has worked on in California.

In Montrose/NOAA, Mr. MacDonald was hired to conduct a literature review of sediment studies, and derive threshold concentrations for contaminants in sediments above which sediment-dwelling organisms would purportedly be injured. Ex. 5, Memorandum of Points and Authorities In Support of DDT Defendants' Motion For Sanctions Due To Government

Misconduct, at 23-24. However, in conducting his review, he deliberately ignored a crucial study conducted in the exact location at issue showing that there were no toxic effects from contaminant concentrations many times higher than Mr. MacDonald's proposed threshold. Ex. 5, Memorandum of Points and Authorities In Support of DDT Defendants' Motion For Sanctions Due To Government Misconduct, at 23. As a result, Mr. MacDonald's testimony was subsequently excluded in the Montrose/NOAA case due to this unethical exclusion of a report contradicting his conclusions. Ex. 6, Order Re: Sanctions Against State of California; Ex. 7, Minutes for Hearing on Sanctions Against Government Due to Governmental Misconduct; Ex. 8, [Alternative Proposed] Order Awarding Relief On Defendants' Motion For Sanctions.

As in Montrose/NOAA, Mr. MacDonald should not be afforded the opportunity to benefit from his misconduct, and should similarly be excluded here.

C. <u>Mr. MacDonald Is Not Qualified To Offer An Opinion On Sediment Remedial Design or The Mechanics of Sediment Cleanup</u>

Mr. MacDonald is not qualified to offer an opinion on the mechanics, engineering or scientific principles relating to sediment cleanup or sediment remedial design. A witness may qualify as an expert only if that person has special knowledge, skill, experience, training, or education sufficient to qualify as an expert on the subject to which the testimony relates. Cal. Evid. Code § 720(a). Further, an expert's qualifications must be established with respect to the subject matter of his testimony, requiring the presiding officer to make a case-specific analysis of a witness's qualifications in light of the facts of the case, the subject of the witness's testimony, and the witness's specific qualifications. *See e.g.*, <u>Putensen</u>, 12 Cal. App. 3d at 1080-81 (professional held not to be expert on the particular subject to which his testimony was directed); <u>Kolta v. Regents of University of California</u>, 115 Cal. App. 4th 283 (2004) (courts have an obligation to contain expert testimony within the area of professed expertise and to require adequate foundation for the opinion). The fact that a purported expert may be qualified in one field vaguely related to another does not mean he is qualified in the other field. <u>California Shoppers, Inc. v. Royal Globe Ins. Co.</u>, 175 Cal. App. 3d 1, 66-67 (1985).

The field of "sediment quality assessment" involves characterizing sediments and performing risk assessments to determine the probability that particular adverse effects will, or will not, occur as a result of the presence of contaminants. By contrast, "sediment remedial design" and "sediment remediation" refer to a phase of remediation action that follows sediment quality assessment, and involves the development of a proposed remediation and a cleanup footprint—including the drafting of feasibility studies, engineering drawings, and specifications for the same. Here, Mr. MacDonald seeks to conflate the two distinct fields of "sediment quality assessment" and "sediment remedial design" in order to qualify himself as an "expert" in the latter field, and introduce his proposed footprint. This is inappropriate and contrary to the standards for expert qualification set forth by California statute. Thus, for the reasons set forth below, Mr. MacDonald's Alternative Remediation Footprint, and any related testimony should be excluded from the record:

1. *Mr. MacDonald Lacks The Requisite Special Knowledge, Skill, Experience, Training and Education To Opine On Sediment Remedial Design*

Mr. MacDonald earned a B.S. in Zoology, and has since become a self-professed "specialist" in "environmental toxicology and chemistry, ecosystem-based resource management, water quality/water use interactions, and sediment quality *assessment*." Ex. 3, MacDonald's Proposed Remediation Footprint, Curriculum Vitae at A1-1 [SAR378462] (emphasis added). He is not an expert in sediment remedial design or engineering, and has never designed a remediation. *See* Ex. 2, MacDonald Depo, at 110:2 – 110:5; 114-13 - 115:9; 126:8 – 127:14; 130:20 – 130:25; 287:17 – 287:20. He is also not an engineer; he has no expertise in feasibility studies or remedial action plans for sediment remediation; and he has never taught any courses in sediment remedial design. Id. During the past 25 years of his professional life, Mr. MacDonald has never before been retained to design a sediment remediation. Ex. 2, MacDonald Depo, at 153:21 – 154:19.

In fact, Mr. MacDonald specifically testified that his experience in sediment quality assessments does not include expertise in developing cleanup goals, or designing, evaluating, and selecting a preferred remedial option:

/ / /

Q. You said you didn't do feasibility studies. What did you mean by that?

A. So a feasibility study has a specific definition, for example, under CERCLA, as part of the overall assessment and remediation process. And it involves a series of steps of taking the preliminary remediation goals and translating those into cleanup goals and going through the process of evaluating various remedial options, and then ultimately coming up with a preferred remedial option that would be applied to a site.

Q. Okay. But you don't do that?

A. That is not an area where I have a primary responsibility. I would consult with folks that are involved in a feasibility study and provide data and information, input from time to time. But that is not my primary focus area, no.

Ex. 2, MacDonald Depo, at 126:23 - 127:14.

Thus, while Mr. MacDonald tackles an assortment of issues, even he does not specifically hold himself out as an expert, or even a specialist, in sediment remedial design or planning. Ex. 3, MacDonald's Proposed Remediation Footprint, Curriculum Vitae at A1-1 [SAR378462]; Ex. 2, MacDonald Depo, at 110:2 – 110:5; 114-13 - 115:9; 126:8 – 127:14. Instead, he seeks to conflate the distinct fields of "sediment assessment" and "sediment remedial design" in order to justify opining on an alternative footprint—despite admitting that, in his opinion, it is possible to be an expert in "sediment quality assessment" *without ever having worked on a sediment remediation footprint*. See Ex. 2, MacDonald Depo, at 62:18 - 65:24 ("And so [the fact] that Dr. Fairey hasn't worked on a remediation footprint, given that it's unique to this case, has no bearing on whether or not Dr. Fairey is an expert in the area of sediment quality assessment."). Accordingly, it is clear that expertise in "sediment quality assessment" would not *per se* qualify an expert to opine on the remedial design of a footprint, unless that expert is also qualified—through specialized knowledge, education, training, or experience—in sediment remediation or sediment remedial design.

a. *Mr. MacDonald Is Not Educated In The Field Of Sediment Remediation, Or Sediment Remedial Design*

To the extent Mr. MacDonald holds himself out as an expert with respect to sediment remediation, Mr. MacDonald's proffered qualifications consist only of a B.S. in Zoology, and his subsequent employment history in the field of sediment quality assessment. Ex. 2, MacDonald Depo, at 149:16 – 150:8. Zoology is a branch of biology that relates to the animal kingdom, including the structure, embryology, evolution, classification, habits, and distribution of animals, and involves an entirely different subject matter than sediment remediation. Accordingly, an undergraduate degree, or even expertise, in zoology—*which is a separate and distinct scientific field from sediment remediation*—does not qualify Mr. MacDonald to offer opinions regarding an alternate remedial footprint.

Moreover, Mr. MacDonald has no formal university education pertaining to sediments, or otherwise, beyond his bachelors degree in Zoology. Ex. 2, MacDonald Depo, at 280:7 – 281:17. He holds no graduate degrees in any subject, and he did not take any undergraduate classes related to sediment issues. Id. at 280:25 – 281:17. Rather, the only university education, training, or experience in sediment sciences that Mr. MacDonald can cite in support of his "expertise" in sediment science is a summer job collecting field samples of sediments—which he tacitly admits is insufficient to qualify him as an expert in sediment remediation or sediment remedial design:

> Q. Do you believe that your college education equips you on issues of sediment remediation?
>
> A. My college – my university education, it's not a college education. It's a university education. During my time at university, *there was little time – I spent some time doing sediment work but not very much.*
>
> Q. What did you – what courses did you take at the university that in any way related to sediment issues?

A. This would have been work that I did during the summer while working with – at the university doing field work in the collection of various types of sediment samples and the like for various studies.

Q. Were the – was the summer work part of a formal course at the university?

A. No.

Id., at 280:25 – 281:17 (emphasis added). Likewise, he has never taught any full-length college courses on sediment remediation issues, and his teaching experience in the field of sediments is limited to co-teaching a one-week college course on intertidal ecology in the 1980s, and a handful of one- to two-day continuing education courses for practitioners. Id., at 279:23 – 280:6, 283:14 – 285:4; 285:16 – 286:10. Accordingly, Mr. MacDonald's education is insufficient to qualify him as an expert in sediments generally, let alone in specialized fields such as sediment remediation and sediment remedial design.

b. *Mr. MacDonald's Employment History and Experience In Sediment Assessment or Sediment Quality Objectives Do Not Qualify Him To Offer Expert Opinions On Sediment Remediation Design and Alternate Remedial Footprints*

Mr. MacDonald's experience and employment history also do not qualify him to propose an alternative remedial footprint for the Site. At best, Mr. MacDonald can be said to have experience in sediment assessment and the development of sediment quality objectives. However, the fact that a purported expert may be qualified in one field vaguely related to another does not mean he is qualified in the other field. California Shoppers, Inc. v. Royal Globe Ins. Co., 175 Cal. App. 3d at 66-67. Accordingly, even if Mr. MacDonald is qualified in sediment assessment (which NASSCO does not concede), it does not follow that he may offer opinions in any other field related to sediments. This includes, but is not limited to, (i) sediment remediation or sediment remedial design; (ii) economic or technological feasibility; (iii) post-remedial monitoring; (iv) the TCAO footprint; and (v) the development of an alternate remedial footprint for the Site.

(1) *<u>Mr. MacDonald's Employment History And Experience Do Not Qualify Him As An Expert In Sediment Remediation or Sediment Remedial Design</u>*

Mr. MacDonald consistently attempts to conflate the distinct fields of "sediment assessment" and "sediment remediation" in order to justify opining on an alternative footprint, despite recognizing that (1) one can be an expert in sediment quality assessment *without ever having worked on a sediment remediation footprint*, and (2) even "sediment remediation" and the design of "sediment remediation footprints" are not entirely coextensive fields. *See* Ex. 2, MacDonald Depo, at 62:23 - 65:24 (emphasis added), 17:6 – 17:13 (distinguishing between "sediment remediation" generally, and "sediment remediation footprints"). Thus, even by Mr. MacDonald's own testimony, experience in sediment quality assessment or sediment remediation does not necessarily translate into particular expertise in sediment remedial design or in recommending a preferred footprint, since the latter fields are distinct subspecialties of sediment remediation.

Although Mr. MacDonald cites some general experience with sediment remediation or remedial design, his involvement at such sites typically consists of ecological risk assessment and natural resource damage assessments, rather than the mechanics of actually designing the sediment cleanup and related footprint. <u>Id.</u>, at 16:23 – 16:25 (characterizing his work as "supporting" the development of a remedial action plan), 23:3 – 23:22 ("[T]he kind of work that I do at contaminated sites is – it falls into a couple of categories, including ecologic resource assessment and natural resources damage assessment. Those are the two common areas I work with. And within each of those areas, there are a broad range of activities."). Mr. MacDonald also lacks experience with sediment remediation and remedial design specific to California. <u>Id.</u>, at 287:21 – 288:6 (suggesting four sites as forming the basis for his experience in sediment remedial design, none of which is in California, and only one of which has actually

///

///

been remediated).[2] This is significant because California has unique procedures in place governing sediment remediation, including but not limited to Water Code Section 13304 and Resolution 92-49, which set forth the applicable policies and procedures governing the sediment remediation in California (and which Mr. MacDonald wholly failed to consider in developing his proposed footprint). See Id., at 190:10 – 191:12.

(2) *Mr. MacDonald's Employment History And Experience Do Not Qualify Him As An Expert In Economic, Feasibility, Technological Feasibility, Or Post-Remedial Monitoring*

Mr. MacDonald is not an expert in the particular fields of economic feasibility, technological feasibility or post-remedial monitoring program design, nor has he been offered as such. Ex. 9, San Diego Coastkeeper's and Environmental Health Coalition's Motion to Amend Expert and Non-Expert Witness Designations, dated August 6, 2010 ("CK/EHC's Motion to Amend") (containing no reference to economic feasibility, technological feasibility, or post-remedial monitoring "expertise"). In fact, he has never conducted economic or technological feasibility analyses of the type required under Resolution 92-49, and he even expressed confusion regarding the basic meaning of those terms (both of which are terms of art under Resolution 92-49):

> Q. Have you ever performed an economic feasibility analysis as part of your sediment quality work?
>
> A. What do you mean by "economic feasibility analysis"?

[2] In fact, Mr. MacDonald cites only two projects as forming the basis for his "expertise" in regional California sediment quality issues, generally: (1) the instant matter and (2) Montrose/NOAA. Ex. 2, MacDonald Depo, at 360:20 – 361:19. However, it is patently circular for Mr. MacDonald to reason that his work on the San Diego Bay matter provides a sufficient basis to qualify him as an expert in this same matter—especially when it is the only sediment remediation project he has worked on in California. (The Montrose/NOAA case is an insufficient basis for establishing Mr. MacDonald's sediment remediation expertise because (1) it did not require Mr. MacDonald to design a sediment remediation footprint, and, as discussed above, (2) Mr. MacDonald's proffered expert testimony was excluded due to his unethical use of data. Thus, there is absolutely no evidence indicating that Mr. MacDonald is qualified to opine on sediment remediation issues in California).

* * * * *

> Q. [I]'m trying to understand where you personally draw the line in terms of your – your expertise. I understand you don't do feasibility studies. Do you do – so do you do any technical feasibility studies as part of your – part of your work?
>
> A. What do you mean by "technical feasibility"?

Ex. 2, MacDonald Depo, at 126:15 – 126:18 (discussing technological feasibility); 191:13 – 195:6 (describing the only economic feasibility assessment he has conducted as not "the kind of analysis that an economist might do," and noting that it was done once the physical cleanup was in progress and was not reduced to a written report), see also id. at 192:8 – 192:12 ("So I wouldn't say that it was the kind of analysis that an economist might do, which is a variety of – I just don't know, you know, how typically that kind of evaluation would be done in, sort of, the context of what you're thinking."). Further, Mr. MacDonald's *curriculum vitae* ("CV") and summary of qualifications contain no references whatsoever to any expertise in economic or technological feasibility, and he openly admits that feasibility studies are "not [his] primary focus area." See Ex. 3, MacDonald's Proposed Remediation Footprint at Curriculum Vitae; Ex. 4, March 2011 Report, at 5-7; Ex. 2, MacDonald Depo, at 126:23 – 127:14.

Similarly, while Mr. MacDonald asserts that he has "look[ed] at" post-remedial risks in other matters, and "feel[s] qualified" to discuss remedial monitoring, he was unable or unwilling to discuss the particular bases for his claims of expertise in those areas, or the details of his opinions regarding the remedial and post-remedial monitoring plans contained in the TCAO and DTR. Ex. 2, MacDonald Depo, at 288:7 – 290:9. Instead, he simply cited his work on a range of monitoring and assessment programs in the past, without offering specifics. Id., at 288:15 – 288:24. Vague claims of having worked on other monitoring and assessment programs in the past, without more, are clearly insufficient under California Code of Civil Procedure § 720(a) to establish expertise in remedial or post-remedial sediment monitoring.

However, despite Mr. MacDonald's clear lack of expertise in sediment remedial design, economic feasibility, technological feasibility, and post-remedial monitoring, EHC and

Coastkeeper invite the Board to consider his proposal for a sediment remediation footprint for the Site. See Ex. 9, CK/EHC's Motion to Amend, Declaration of Jill Witkowski at ¶ 3 (designating Mr. MacDonald as an expert in environmental toxicology and chemistry, ecosystem-based resource management, water quality/water use interactions, and sediment quality assessment, *including contaminated sediment and remedial plans*.) (emphasis added); MacDonald's Proposed Alternative Remediation Footprint (setting forth a proposed cleanup footprint for the Site). However, the alternative remedial footprint, which Mr. MacDonald explicitly suggests should be adopted by the Regional Board, contains several fatal flaws. Ex. 3, MacDonald's Proposed Alternative Remediation Footprint, at 36; Ex. 2, MacDonald Depo, at 108:3 – 108:8 ("[T]hese are recommendations that I offered to the San Diego Coastkeepers and that we anticipated – that I anticipated that they would offer to the Regional Board to help them make decisions about what were the highest priority areas."). Specifically, because of his lack of expert qualifications in sediment remediation, Mr. MacDonald ignores key regulatory and scientific concepts in developing his proposed remedial footprint; including, but not limited to, the following:

- Mr. MacDonald ignored Water Code Section 13304 and State Board Resolution 92-49 in developing his proposed footprint. Id.; Ex. 2, MacDonald Depo, at 190:10 – 191:12 (admitting that is not familiar with Resolution 92-49).
- Mr. MacDonald's approach for assessing sediments at the Site is based on the California Sediment Quality Objectives, from which the cleanup is explicitly exempted by law (and which are not intended to serve as cleanup levels). *See* Ex. 10, Water Quality Control Plan for Enclosed Bays and Estuaries - Part 1 Sediment (Aug. 25, 2009), at 1 [SAR387083].
- Mr. MacDonald's triad analysis is not based on any comparison to background levels, even though background or "reference data" are available for the Site. Ex. 3, MacDonald's Alternative Remediation Footprint, at 29-30 [SAR378418-SAR378419].
- Mr. MacDonald's methodology for designating polygons for remediation uses

the maximum result for either P_{MAX} or pore water (rather than an average), and fails to accurately predict the actual toxicity of Site sediments when compared to actual amphipod survival in Site sediments. *Compare* Ex. 3, MacDonald's Alternative Remediation Footprint, at Table 1 [SAR378434-SAR378437] *with* Ex. 11, Draft Technical Report In Support of Tentative Cleanup and Abatement Order No. R9-2011-0001, at Table 18-8 [SAR382950].

In sum, as a zoologist with no relevant professional experience in the area of sediment remedial design, engineering, or feasibility studies, Mr. MacDonald lacks the specialized knowledge, skill, experience, training, or education necessary to design in California a remedial footprint in accordance with Section 13304 and Resolution 92-49, and he is not qualified to recommend an alternative remediation footprint for this Site. See Cal. Evid. Code §§ 720(a), 801, 803 (providing that the admissibility of expert opinion testimony turns in part on whether the expert has appropriate qualifications, *i.e.*, some special skill, experience, training or education in the subject matter); Kolta v. Regents of University of California, 115 Cal. App. 4th at 283 (excluding witness from testifying beyond his expertise). Accordingly, Mr. MacDonald should be precluded from offering testimony regarding alternative remedial footprints for the Site and his two reports must be excluded from the record.

V.

CONCLUSION:

The Board Should Bar Mr. MacDonald's Testimony and Strike His Two Reports From The Record

In sum, because Mr. MacDonald has no expertise in sediment remedial design in California, bases his findings on unreasonable and unsubstantiated methods, and has failed to produce his reports and writings as required by the Discovery Plan, the Presiding Officer should bar his testimony under Evidence Code Sections 720, 801, and 803, and California Code of Civil Procedure Section 2034.300. Accordingly, NASSCO hereby moves for an order excluding any and all testimony, references to testimony, or argument relating to the testimony of Mr. MacDonald regarding his proposed alternative remediation footprint for the Shipyard

Sediment Site, including both of his "expert reports", on the grounds that (1) Mr. MacDonald lacks the requisite knowledge, skill, experience, training, and education to testify properly on this subject and therefore the testimony is inadmissible, and (2) even if Mr. MacDonald were so qualified, EHC and Coastkeeper have failed to produce discoverable reports and writings made by Mr. MacDonald in the course of preparing his opinions.

Dated: May 26, 2011

Respectfully submitted,

LATHAM & WATKINS, LLP

By ______________________

Kelly E. Richardson
Attorneys for Designated Party
NATIONAL STEEL AND SHIPBUILDING COMPANY

EXHIBIT 1

California Regional Water Quality Control Board
San Diego Region

Linda S. Adams
Secretary for Environmental Protection

Over 50 Years Serving San Diego, Orange, and Riverside Counties
Recipient of the 2004 Environmental Award for Outstanding Achievement from USEPA

Arnold Schwarzenegger
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TO: Designated Parties and Interested Persons

FROM: David King, Presiding Officer for Prehearing Proceedings
Tentative Cleanup and Abatement Order No. R9-2005-0126
SAN DIEGO REGIONAL WATER QUALITY CONTROL BOARD

DATE: February 18, 2010

SUBJECT: ORDER ISSUING FINAL DISCOVERY PLAN FOR TENTATIVE CLEANUP AND ABATEMENT ORDER NO. R9-2010-0002 AND ASSOCIATED DRAFT TECHNICAL REPORT

In my Order dated January 29, 2010, I extended the discovery period for Tentative Cleanup and Abatement Order No. R9-2010-0002 (TCAO) and the associated Draft Technical Report (DTR) until August 23, 2010, to run parallel with the California Environmental Quality Act (CEQA) process underway for the TCAO and DTR. I requested that the designated parties submit a discovery plan for my review and that any parties unwilling or unable to reach a joint stipulation submit a separate plan. The discovery plan was to account for all anticipated discovery on the tentative CAO, whether relative to cleanup levels or liability (determination of responsible parties, not allocation of that responsibility) and any necessary discovery on CEQA-related issues.

By close of business February 11, 2010, I received a plan submitted by the "mediation parties," which I infer has the support of all designated parties remaining in the mediation except for the City of San Diego, which submitted its own plan. The City of San Diego's plan differs from the "mediation parties'" plan only in that it proposes that the scope of discovery on liability issues include successor liability issues. As reflected in the attached Final Discovery Plan, I agree with the City of San Diego that successor liability issues are appropriately included within the scope of discovery for this matter.

San Diego Coastkeeper and Environmental Health Coalition (Environmental Groups) did not submit a new proposal, having submitted a discovery alternative in their January 27, 2010, letter concerning extension of the schedule. The San Diego Unified Port District (Port District) notified the San Diego Water Board and all designated parties that like the Environmental Groups, it has withdrawn from the mediation. It has not agreed to the "mediation parties" proposed discovery plan but reserves its right to conduct appropriate discovery.

Having reviewed the designated parties' submittals, this Order approves the attached plan as the Final Discovery Plan (Plan) for the above proceedings. The Plan largely approves the mediation parties' plan, with inclusion of successor liability within the scope of discovery as proposed by the City of San Diego and with other discrete changes. The Plan governs discovery to be conducted by all designated parties to the proceeding, whether or not they continue to be participants in the mediation.

The Port District is incorrect when it states that I previously determined that no discovery is appropriate on allocation. To the contrary, the designated parties are free to conduct concurrent discovery on allocation issues and to agree to procedures governing that discovery process. This Plan, however, applies only to discovery on cleanup levels and liability (determination of responsible parties and successor liability issues). Determination of the allocation of responsibility among the responsible parties is not necessary prior to the consideration of the TCAO for adoption by the full Board.

The Plan clarifies that the San Diego Water Board has designated the Cleanup Team as a party to this proceeding and that the Cleanup Team has responsibility for responding to discovery directed to the San Diego Water Board or the Cleanup Team unless it is unqualified or ineligible to respond. Discovery that seeks to inquire into the thought processes of the San Diego Water Board's decision-makers or their advisors with regard to this pending proceeding is not appropriate. The Plan also explicitly notes the Presiding Officer for Prehearing Proceedings' authority to issue protective orders and to quash subpoenas in appropriate cases. Finally, the Plan specifies that all designated party witnesses, whether expert or non-expert, must be disclosed by June 22, 2010.

As previously indicated, a hearing schedule and comment deadline for the TCAO and DTR will be established in a future communication.

Attachment

SAN DIEGO REGIONAL WATER QUALITY CONTROL BOARD

TENTATIVE CLEANUP AND ABATEMENT ORDER NO. R9-2010-0002 AND

DRAFT TECHNICAL REPORT

FINAL DISCOVERY PLAN FOR CLEANUP LEVELS AND LIABILITY ISSUES

I. TYPES OF PERMISSIBLE DISCOVERY

Procedures for written discovery and expert witness disclosures shall generally be governed by applicable Code of Civil Procedure ("CCP") sections, as modified herein and subject to the Discovery Schedule set forth in Section III.I., *infra*. *See* CCP §§ 2030.010 *et seq.* (Interrogatories); 2031.010 *et seq.* (Inspection and Production of Documents); 2033.010 *et seq.* (Requests for Admission); 2034.010 *et seq.* (Expert Witness Information).

Depositions and subpoenas duces tecum to be governed by Chapter 4.5, Article 11 (Subpoenas), of the California Administrative Procedures Act, which authorizes the use of subpoenas and subpoenas duces tecum (for production of documents) in administrative adjudications. Gov. Code § 11450.10(a).

A. Form Interrogatories

1. 30 days to respond, unless the Presiding Officer (or designated Discovery Referee) lengthens or shortens time for response, or parties agree in writing to extend time. CCP § 2030.260 – 2030.270.

B. Special Interrogatories

1. 30 days to respond, unless the Presiding Officer (or designated Discovery Referee) lengthens or shortens time for response, or parties agree in writing to extend time. CCP § 2030.260 – 2030.270.

2. The number of interrogatories is not limited at this time:

   a. CCP limits parties to 35 special interrogatories, unless a greater number of interrogatories is warranted because of: (1) the complexity or quantity of the existing and potential issues in the case; (2) the financial burden of conducting the discovery entailed by oral deposition; (3) expedience to provide responding party time to conduct investigation. CCP § 2030.30 – 2030.50.

   b. Such circumstances under (1) and (3) above exist in the present case.

C. Requests For Document Production

1. Requests for documents pertaining to the Tentative Cleanup and Abatement Order ("CAO"), Draft Technical Report ("DTR"), and these proceedings (including relevant e-mails and other electronic data from Regional Board staff that have been involved in the sediment investigation or the development of the Tentative CAO and DTR).

2. Includes electronically-stored information.

3. 30 days to respond, unless the Presiding Officer (or designated Discovery Referee) lengthens or shortens time for response, or parties agree in writing to extend time. CCP § 2031.260 – 2031.270.

D. Requests For Admission

1. 30 days to respond, unless the Presiding Officer (or designated Discovery Referee) lengthens or shortens time for response, or parties agree in writing to extend time. CCP § 2033.250 – 2033.260.

2. Requests for Admission should not be limited:

   a. CCP limits parties to 35 RFAs that do not relate to the genuineness of documents, unless the greater number is warranted by the complexity or quantity of existing and potential issues in the case. CCP § 2033.030 – 2033.050.

   b. The complexity and quantity of issues in this case warrant exceeding 35 RFAs.

E. Depositions and Subpoenas Duces Tecum

1. Deposition subpoenas to be issued by Presiding Officer or designated Discovery Referee for witnesses who submit evidence in the proceedings or have knowledge of the proceedings. This should include non-designated parties that present more than "policy" statements. Cal. Code Regs. tit. 23, § 648.1(d). Deposition notices shall be sufficient for designated party witnesses. Subpoenas must be issued for non-designated party witnesses, including experts, former employees, third parties, etc.

2. Right to depositions includes right to take "person most knowledgeable" depositions.

3. Deposition subpoenas for non-designated party witnesses shall be issued by the Presiding Officer or designated Discovery Referee

and, if denied, reasons for denial shall be provided in writing to the requesting party.

4. Deposition notices and subpoenas are subject to motions for protective order, including motions to quash, and the Presiding Officer may quash deposition notices or subpoenas on motion by a party or on Presiding Officer's own motion to protect witnesses from unreasonable or oppressive demands. (Gov. Code § 11450.30.) .

F. Other

1. August 23, 2010 is the last day to complete discovery; hearing date to be scheduled by the Presiding Officer at least 30 days following discovery cutoff.

2. Timing and process for discovery motions shall be established as needed by the Presiding Officer (or designated Discovery Referee) at the request of any designated party.

II. PRESERVATION OF PROCEDURAL AND DUE PROCESS RIGHTS

A. General Principles Underlying the Discovery Plan

1. The Designated Parties are entitled to the procedural and due process safeguards provided in Title 23 of the California Code of Regulations ("CCR"), Division 3, Chapter 1.5, Sections 648, *et seq.*, in Chapter 4.5 of the California Administrative Procedure Act ("APA") (Cal. Gov't Code § 11400, et seq), in Section 11513 of Chapter 5 of the APA (Cal. Gov't Code § 11513), and in the State and federal constitutions.

2. The Regional Board Cleanup Team is designated by the Regional Board as a party for purposes of this proceeding, and the procedural requirements of the Discovery Plan apply to it as well. Cal. Govt. Code § 11405.60 (defining a "party" to include "the agency that is taking action"). The Cleanup Team is responsible for responding to all discovery directed to the Cleanup Team and/or the Regional Board except for matters for which the Cleanup Team is ineligible or unqualified to respond.

B. Certain Key Rights Must Be Preserved

1. Retention of right to depose authors of any scientific or expert reports submitted into the record. Public comment in the form of policy statements can be accepted as long as public comment is open, but submission of expert evidence must adhere to discovery schedule to preserve all parties' procedural and due process rights.

2. Retention of right to cross-examine anyone who is permitted to

submit comments containing evidence beyond policy-statements. Parties shall retain the right to cross-examine anyone who is permitted to submit comments containing evidence beyond policy-statements.

C. Discovery Referee

1. Presiding Officer appoints Timothy Gallagher as designated Discovery Referee.

2. Decisions by the Discovery Referee may be appealed to the Presiding Officer.

III. DISCOVERY PLAN

A. Discovery on liability issues are strictly limited to the naming of PRPs as dischargers and successor liability (liability) issues. Discovery regarding cleanup levels shall include any issues upon which the Cleanup and Abatement Order and Draft Technical Report are based. Discovery on allocation of responsibility issues is not prohibited nor is it governed by this Discovery Plan. Designated parties are free to agree to procedures to govern discovery on allocation of responsibility issues.

B. Parties may propound written discovery related to liability and cleanup levels issues no sooner than ten (10) days after the Presiding Officer approves a discovery plan, or March 8, 2010, whichever is later.

C. Parties will have thirty (30) days to respond to written discovery requests.

D. Parties may commence depositions forty-five (45) days after written discovery has commenced.

E. Expert and non-expert witness designations by all designated parties are due no later than 5 p.m. on June 22, 2010.

F. Expert counter-designations are due within fifteen (15) days after expert designations are exchanged.

G. Discovery shall be concluded no later than 5 p.m. on August 23, 2010.

H. Service shall be by electronic mail and deemed served the next business day.

I. Schedule

Timeframe	Event
February 11, 2010	All proposed discovery plans submitted to the Presiding Officer
February 18, 2010	Presiding Officer approves final discovery plan
March 8, 2010	First day for parties to propound written discovery requests on cleanup levels and liability
April 22, 2010	Commencement of deposition period on cleanup levels and liability
June 22, 2010	Deadline for expert and non-expert witness designations due for cleanup levels and liability issues
July 7, 2010	Expert counter-designations due for experts' opinion on cleanup levels and liability
August 23, 2010	Last day to take discovery on cleanup and liability issues

EXHIBIT 2

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD

SAN DIEGO REGION

IN RE THE MATTER OF	)
	)
TENTATIVE CLEANUP AND ABATEMENT	)
ORDER NO. R9-2011-0001	)
	)
	)
	)

VIDEOTAPED DEPOSITION OF DONALD MACDONALD

Volume I, Pages 1 - 248

San Diego, California

October 20, 2010

Reported By: Anne M. Zarkos, RPR, CRR,
CSR No. 13095

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Also Present: Thomas C. Ginn, Ph.D.
Scott Becker, Ph.D.
Jason M. Conder, Ph.D.

were you called upon to testify as to sediment remediation? 09:14:21 09:14:25
A. No. 09:14:28
Q. What areas were you called upon to testify as an expert? 09:14:30 09:14:33
A. Well, it was some time ago, so it's hard to recollect exactly. It was a long deposition, and I don't recall all the details. But by and large, I was discussing a document that I'd produced for NOAA to support that case. 09:14:33 09:14:37 09:14:43 09:14:48 09:14:53
Q. You were retained by NOAA in that matter? 09:14:54
A. Yes, that's correct. 09:14:57
Q. And as part of that testimony, you were not asked to design a remediation footprint; is that -- is that fair? 09:14:59 09:15:02 09:15:05
A. That's correct. 09:15:06
Q. Is this the first case in which you've been retained as an expert where you've been asked to offer opinions as to a site remediation footprint? 09:15:07 09:15:09 09:15:13
A. No. 09:15:17
Q. What other case have you been retained in where you offered opinions as to sediment remediation? 09:15:18 09:15:21
A. A variety of cases. For example, in the Calcasieu Estuary site. 09:15:25 09:15:33
Q. Say that again. 09:15:35

A. Calcasieu Estuary. 09:15:35
Q. Could you spell that? 09:15:37
A. C-a-l-c-a-s-i-e-u. 09:15:39
Q. When was that? 09:15:45
A. We started that process in about year 2000, I believe. And we're still working on that case. 09:15:48 09:15:54
Q. Okay. What else? 09:16:00
A. In the matter of Quathiaski Cove. 09:16:03
Q. Could you spell that? 09:16:06
A. Yes, I can. Q-u-a-t-h-i-a-s-k-i. 09:16:08
Q. And where is that located? 09:16:24
A. It's located in British Columbia. 09:16:25
Q. And was the Calcasieu Estuary also in Canada? 09:16:28
A. It's located in Louisiana. 09:16:34
Q. And what time frame, with respect to the -- pronounce that name again. 09:16:36 09:16:42
A. Quathiaski Cove. 09:16:43
Q. At what time frame were you offering opinions as to sediment contamination and cleanup? 09:16:45 09:16:48
A. I believe we started that project in 2000 and roughly '2 or '3, somewhere around that time. That matter is still ongoing. 09:16:53 09:16:56 09:17:06
Indiana Harbor is another site that we've supported the remedial -- development of a remedial action plan. That's Grand Calumet River in Gary, 09:17:10 09:17:14 09:17:17

Indiana. 09:17:24

Q. Do you recall any other sites other than the four that you've just listed where you've been asked to offer opinions as to sediment remediation footprints or sediment remediation? 09:17:28 09:17:30 09:17:32 09:17:37

A. Just to be clear, the term "footprint" here is -- is fairly unique to this particular matter. And so if you use that -- that term, I'll probably answer no in many cases when, in fact, an answer might be yes. 09:17:38 09:17:41 09:17:44 09:17:50

So -- and it's just because of the terminology that you're using. So if you use a more general term like "sediment remediation," then that will be more inclusive of -- of other matters. 09:17:53 09:17:54 09:17:57 09:18:02

Q. And I do want to be clear. So let's -- let me try to rephrase it. 09:18:03 09:18:05

If I were to ask you in what other matters have you been retained as an expert and offered opinions as to the cleanup of a contaminated area of sediment, the design of the cleanup, how many matters would that involve? 09:18:06 09:18:10 09:18:13 09:18:19 09:18:23

A. Do you mean the engineering design? Is that what you're referring to? 09:18:23 09:18:26

Q. Well, let's start with that. Have you been -- have you ever -- 09:18:28 09:18:30

A. I'm not an engineer. And so I don't do 09:18:31

engineering design. So what do you mean? 09:18:35
Q. I want to know whether you've been retained as an expert to help anyone come up with the appropriate cleanup, whether it's the standards or whether how much sediment needs to be removed from a particular site. 09:18:38 09:18:40 09:18:44 09:18:48
A. Yes. Okay. 09:18:51
Q. So with -- with respect to that question, how many of these sites have you been involved in the sediment cleanup aspect? 09:18:52 09:18:54 09:18:57
A. All of them. 09:19:00
Q. All of them. 09:19:00
And what was confusing to you is when I used the -- the terminology "footprint"? 09:19:03 09:19:05
A. Yes. 09:19:06
Q. Why was that? 09:19:07
A. Because it -- that indicates -- that's a very specific term and, in this case, means a particular thing. It's not a term that is used in other cleanups that I've been a part of, the term "footprint." 09:19:08 09:19:13 09:19:17 09:19:21
Q. So you've never been involved in trying to delineate the areal extent of a sediment remediation? 09:19:25 09:19:28
A. Oh, absolutely. It's -- the term "footprint" is the -- was the challenge, as I indicated. 09:19:34 09:19:36
Q. I see. 09:19:39
In any of the four projects that you listed, has 09:19:42

there been a sediment remediation that's been undertaken 09:19:45
and completed? 09:19:49
A. Yes. 09:19:50
Q. Which ones? 09:19:50
A. Quathiaski Cove. 09:19:52
Q. And did that involve dredging? 09:19:53
A. Yes, it did. 09:19:56
Q. How much? 09:19:57
A. In terms of cubic meters, I can't recall 09:19:59
offhand. We remediated an area of approximately 5 acres, 09:20:03
plus some subtidal sediments. And I just don't recall 09:20:11
offhand what that -- what that -- it was under -- I can't 09:20:16
remember what the cubic meters was that we ended up 09:20:19
moving in that case. 09:20:24
Q. Who were you working for in that project? 09:20:25
A. I was working for Weston Foods. 09:20:27
Q. And was Weston Foods the responsible party 09:20:30
undertaking the cleanup? 09:20:34
A. Yes. 09:20:38
Q. And what were your specific duties? 09:20:39
A. My specific duties were to conduct a screening 09:20:41
level risk assessment of the site, to conduct a detailed 09:20:43
or baseline ecological risk assessment of the site, to 09:20:48
identify the areas that needed to be remediated, to 09:20:52
identify cleanup goals, and to oversee the remediation 09:20:56

that was done at that time. 09:21:00

Q. Did you prepare a report in connection with the 09:21:03
Weston Foods remediation? 09:21:07

A. Several reports. 09:21:14

Q. And what type of reports did you prepare? 09:21:17

A. A variety of reports. One was a screening level 09:21:20
risk assessment report. One was a baseline ecological 09:21:24
risk assessment report. I prepared several field 09:21:27
sampling plans, several quality assurance project plans, 09:21:31
one or more health and safety plans. 09:21:34

I prepared an application for a certificate of 09:21:38
compliance to demonstrate that the site had been 09:21:40
appropriately remediated. 09:21:44

There may have been other reports that I'm not 09:21:47
remembering offhand that will be reflected in my 09:21:49
curriculum vitae, if you wanted to -- 09:21:52

Q. Were you involved in establishing the cleanup 09:21:56
standards? 09:21:58

A. Yes. 09:21:58

Q. And how do those cleanup standards compare to 09:21:59
the proposed cleanup standards at the Shipyard Site? 09:22:02

MR. GONZALEZ: Objection. Lacks foundation. 09:22:06

THE WITNESS: I don't have those cleanup 09:22:09
standards for the Quathiaski Cove before me right now. 09:22:11
And so I would not be in a place to compare those. 09:22:15

BY MR. HOWARD: 09:22:18

Q. Do you have those reports on Quathiaski Cove back in your office? 09:22:19 09:22:22

A. Yes, I do. 09:22:23

Q. And were any of the reports that you prepared in terms of Quathiaski Cove or the other three projects that you outlined a basis for your opinions in this case? 09:22:24 09:22:27 09:22:32

A. I'm sorry. Could you rephrase that question? 09:22:37

Q. Were any of the reports that you prepared in terms of Quathiaski Cove or any of the other projects that you listed a basis for the opinions that you're rendering in this matter? 09:22:41 09:22:43 09:22:50 09:22:55

A. I think I understand what your question is. And the answer is yes, to the extent that over a period of time in developing my expertise in this area, I've developed a series of protocols and procedures for assessing contaminated sediments. And those types of protocols and procedures and approaches are ones that I apply at a variety of sites around Canada and the United States. 09:22:59 09:23:02 09:23:08 09:23:11 09:23:14 09:23:20 09:23:23 09:23:28

So to the extent that the conditions here called for similar approaches, then yes, those approaches have been used at other sites may have been applicable here as well. 09:23:28 09:23:31 09:23:36 09:23:40

Q. Did you apply the same approach that you're 09:23:41

proposing here at the Shipyard Site at any of the four sites that you outlined to me that you've worked on in terms of sediment contamination issues? 09:23:44 09:23:47 09:23:53

A. So the approach that -- that I've used here is -- is a fairly broad set of concepts and steps in the process. So I guess what we would need to do is sort of narrow that down a little bit, maybe talk about the pieces before -- before we would answer yes or no to that particular question. 09:23:56 09:24:00 09:24:08 09:24:11 09:24:13 09:24:19

Q. Okay. That's fair enough. We'll come back to that. 09:24:20 09:24:22

Have you ever testified in court before? 09:24:24

A. Yes. 09:24:26

Q. And what was that in connection with? 09:24:27

A. That was in the matter of Regina vs. Harrison Hot Springs Hotel. 09:24:30 09:24:35

Q. Did that involve sediment issues? 09:24:37

A. That was related to -- it was a water quality issue. 09:24:39 09:24:41

Q. So in terms of -- so in terms of sediment contamination issues, I understand you've testified in one case; that's the Montrose/NOAA case. 09:24:43 09:24:47 09:24:50

A. Correct. 09:24:54

Q. And that you've worked on four other sediment contamination projects in your career. 09:24:54 09:24:57

A. No, that's not correct. 09:25:00
Q. Okay. So help me out. 09:25:01
How many other sediment contamination projects 09:25:03
have you worked on in your career? 09:25:07
A. Oh, my. 09:25:09
Q. Give me -- and if you don't know the specific 09:25:10
number, give me a reasonable estimate. 09:25:12
A. Somewhere in the order of 20 to 30 sites, 09:25:20
probably. 09:25:22
Q. And in those 20 to 30 sites, were you called 09:25:27
upon to develop cleanup levels? Were you called upon to 09:25:31
develop remediation goals? 09:25:34
Is there a common theme to what you were -- you 09:25:39
were doing with those 20 to 30 sites, or were they all 09:25:41
different? 09:25:45
MR. GONZALEZ: Objection. Compound. 09:25:45
THE WITNESS: What are -- the kind of work that 09:25:46
I do at contaminated sites is -- it falls into a couple 09:25:51
of categories, including ecologic resource assessment and 09:25:55
natural resource damage assessment. Those are the two 09:26:02
common areas I work with. And within each of those 09:26:05
areas, there are a broad range of activities. 09:26:08
BY MR. HOWARD: 09:26:16
Q. Have you ever worked on a contaminated 09:26:18
Shipyard Site before? 09:26:20

The output of that process typically is the information that goes directly into these tables. So I will look at the output from those types of calculations, review it, make certain changes to it. Those changes get incorporated into electronic draft. The earlier drafts get recycled. The -- so yeah. That's our -- the normal way that we would proceed in producing a report. 09:54:50 09:54:52 09:54:55 09:55:01 09:55:06 09:55:09 09:55:16

Q. Okay. And are those electronic files still in existence? 09:55:19 09:55:23

A. We have the database in existence, absolutely. And the -- the Excel spreadsheets are essentially what you see in the back of this report. 09:55:24 09:55:27 09:55:32

Q. Okay. 09:55:34

A. So the electronic version or the hard copy is -- is what you have already. 09:55:35 09:55:38

Q. Have those been produced to the attorneys in this case? 09:55:42 09:55:44

A. Yes. In the -- from the standpoint that this report was produced, those Excel -- a hard copy of those Excel spreadsheets have been produced, yes. 09:55:45 09:55:48 09:55:52

Q. When you're taking notes and sketching out ideas and theories, do you keep -- do you keep your notes in a file? 09:55:54 09:55:58 09:56:01

A. I do not, no. Those get recycled. 09:56:01

Q. When you say "recycled," do you mean destroyed? 09:56:04

A. I mean that they go into the recycle bin. And 09:56:06
then my son comes in once a week, and he takes them out 09:56:09
to the recycling, and that's the end of them. 09:56:12

Q. When you were designated as an expert, were you 09:56:16
instructed not to destroy work product that are a part of 09:56:19
this case? 09:56:25

A. Yeah. We do not destroy work product as part of 09:56:26
the case. We retain -- we have a system for document 09:56:28
retention. And we follow that system. And so -- 09:56:33

Q. What is your -- what is your document retention 09:56:38
policy with respect to an active case? 09:56:40

A. We have a -- we actually don't have a policy. 09:56:47
We have something called a standard operating procedure 09:56:49
for document retention. And what that involves, it's -- 09:56:51
it has a series of pieces to it, essentially. And 09:56:54
there's a chunk that relates to electronic files. 09:56:57

So an electronic file will come into the office. 09:57:03
It will -- let's say it's an email. It will get sorted 09:57:07
according to the project that it's associated with. And 09:57:12
then that will go into, for example, a San Diego 09:57:15
retaining filing system, essentially, electronic filing 09:57:19
system. And in the same way that any electronic 09:57:25
documents that come in, those go into the San Diego 09:57:28
filing system, San Diego Bay filing system. 09:57:31

If we print those hard-copy reports or if 09:57:36

A. No, I would not agree with that. 10:18:38
Q. So you would dispute his comment in this email? 10:18:40
A. I would dispute your characterization of that comment. 10:18:43 10:18:47
Q. Okay. Let me read the comment just so that we're clear on what -- what Mr. Fairey is saying. And I want to get your reaction. 10:18:47 10:18:53 10:18:56
He's saying, "I haven't done a remediation footprint before, so I read this from more of a novice perspective than an expert." 10:18:57 10:19:00 10:19:03
Your understanding is that Mr. Fairey is an expert in remediation footprints? Is that your understanding? 10:19:06 10:19:08 10:19:12
A. My understanding is that Dr. Fairey is an expert in sediment quality assessment of which "remediation footprint," again being unique to this case -- we've already discussed that. I think we've determined that. 10:19:13 10:19:19 10:19:25 10:19:27
And so that Dr. Fairey hasn't worked on a remediation footprint, given that it's unique -- that terminology is unique to this case, has no bearing on whether or not Dr. Fairey is an expert in the area of sediment quality assessment. 10:19:31 10:19:37 10:19:41 10:19:44 10:19:46
Q. Can one be an expert in sediment quality assessment and not be an expert -- and not be an expert in sediment remediation? 10:19:48 10:19:50 10:19:55

A. What do you mean by the term "expert" in this -- in the way that you've used it? 10:20:03 10:20:06

Q. Someone who's hired to offer expert report -- expert opinions in litigation, for example. 10:20:10 10:20:14

A. But what is your bar for an expert? What -- 10:20:18

Q. What's your understanding of an expert? Let's start with yours. 10:20:24 10:20:26

A. Well, my understanding of an expert is someone who has an advanced understanding of a topic beyond that which is held by a layperson, just a layperson. And in this case, that Dr. Fairey is an expert in sediment quality assessment would virtually assure that he has a working knowledge of a variety of topics that relate to sediment remediation. 10:20:27 10:20:28 10:20:34 10:20:39 10:20:44 10:20:50 10:20:54

Q. So if Mr. -- if Dr. Fairey said, Look, I'm an expert in sediment quality assessment but don't ask me about sediment remediation, that would -- that would strike you as being strange? 10:20:58 10:21:02 10:21:04 10:21:09

A. As strange, what do you mean by that? 10:21:14

Q. I guess I'm trying to define the universe of sediment quality assessment expertise and that of sediment remediation. And as I understand it, you -- your view is that the two are congruent. If you're an expert on sediment quality assessment, then by definition you're an expert on sediment remediation? Is that -- is 10:21:18 10:21:22 10:21:25 10:21:27 10:21:32 10:21:35

that your view? 10:21:39

A. Yeah. Well, we've had a discussion earlier today about what we mean by sediment remediation. And you included such things as -- as developing cleanup goals and understanding, you know, application of those cleanup goals and a variety of things like that. So it's a fairly broad area. 10:21:40 10:21:42 10:21:46 10:21:49 10:21:53 10:21:56

I know that Dr. Fairey has developed things like toxicity thresholds for sediments, essentially, that can be used as cleanup goals. So his understanding of sediment quality assessment provides him with the tools that he needs to understand at least some of the issues and concerns and activities, undertakings, related to sediment remediation. 10:21:58 10:22:02 10:22:08 10:22:11 10:22:14 10:22:18 10:22:24

So -- so, you know, without drilling down into very specific areas of expertise -- and I'm not here to represent Dr. Fairey's expertise in this area or that area. What I am telling you, though, is that he is a recognized expert in sediment quality assessment. 10:22:26 10:22:28 10:22:34 10:22:37 10:22:41

And those very same skills that provide him with that expertise in sediment quality assessment also qualify him, in my opinion, to make comments related to sediment remediation within the definition that we -- that we generated this morning. 10:22:45 10:22:48 10:22:50 10:22:54 10:22:58

Q. Did you make any changes in your May 2009 draft 10:23:01

report in response to Dr. Fairey's comments in the 10:23:06
July 13 email? 10:23:10
A. I don't recall specifically how I responded to 10:23:14
his comments in this -- in this case. I expect that I 10:23:19
read through them and incorporated the ones that seemed 10:23:24
reasonable to incorporate and did not incorporate the 10:23:26
ones that did not seem reasonable to incorporate. 10:23:29
Q. Is Dr. Fairey a -- would you consider him a 10:23:32
friend? 10:23:35
A. Oh, yes, absolutely. 10:23:35
Q. And do you consider sending the drafts to the 10:23:38
three individuals -- Dr. Fairey, Steve Bay, and 10:23:41
Jay Field -- to be a true peer review of the draft 10:23:45
report? 10:23:49
A. Absolutely. 10:23:49
Q. You chose the three individuals? 10:23:51
A. I did. 10:23:53
Q. And are all three individuals friends of yours? 10:23:54
A. I -- yeah. I would consider them all friends. 10:23:57
Q. Okay. Did your draft report go to anyone who 10:24:00
you didn't know previously as a friend? 10:24:09
A. These were the three reviewers that were 10:24:13
identified. 10:24:15
Q. And you chose the three reviewers? 10:24:16
A. I did. 10:24:19

A. That was recycled. 10:26:52
Q. You mean that was destroyed? 10:26:53
A. No. It was recycled. As I indicated, any 10:26:55
previous versions of documentation, once those comments 10:26:58
are incorporated into the current version, that document 10:27:04
gets recycled as part of our policy. 10:27:08
Q. If I asked you, I'd like to see the comments, 10:27:11
the marked-up copy of the draft report that Mr. Bay 10:27:13
provided to you, could you provide that to me? 10:27:20
A. I could not. 10:27:23
Q. And the reason being is why? 10:27:23
A. That was recycled. 10:27:25
Q. And I understand you use the terminology 10:27:27
"recycled" a lot. Did -- was that a hard copy that was 10:27:29
provided to you? 10:27:32
A. It was a hard copy, yes. 10:27:33
Q. And did that hard copy eventually end up in a 10:27:35
recycling bin? 10:27:38
A. Yes, it did. 10:27:40
Q. So that would be destroyed? 10:27:42
A. If that's the terminology that you want to use, 10:27:43
then yes. 10:27:45
Q. Is it -- is it fair to say it's no longer in 10:27:46
existence? 10:27:47
A. I don't think that's fair to say. It's probably 10:27:49

in some recycling -- it may still be in existence in some 10:27:52
recycling area somewhere. But I don't have it. 10:27:57

Q. Let's do it that way. You don't have the hard 10:28:02
copy of comments -- 10:28:04

A. I do not have the hard copy. 10:28:06

Q. Do you remember the nature of the comments that 10:28:08
Mr. Bay provided? 10:28:09

A. Generally, yes. 10:28:10

Q. Generally. Do you have any specific 10:28:12
recollection? 10:28:14

A. Generally, what I asked him was, "Could you 10:28:18
please review this document relative to the approaches 10:28:20
that were used to evaluate sediment chemistry, sediment 10:28:26
toxicity in benthic invertebrate community structure, and 10:28:29
let me know if this is reasonable relative to the work 10:28:34
that you've done in developing the sediment quality 10:28:37
objectives for the state of California?" 10:28:40

And his comment was -- generally was the work 10:28:42
that we had done was reasonable. 10:28:46

Q. Anything else? 10:28:50

A. There were editorial comments provided here or 10:28:51
there in the draft as well. 10:28:54

Q. Did he ask to you change any of the tables in 10:28:55
your draft report? 10:28:57

A. No. 10:28:59

A. Yes. That's -- the latter. 11:39:59

Q. So if I understand -- 11:40:02

A. What I mean by that, let me just be very clear, is that these are recommendations that I offered to the San Diego Coastkeepers and that we anticipated -- that I anticipated that they would offer to the Regional Board to help them make decisions about what were the highest priority areas. 11:40:04 11:40:06 11:40:10 11:40:16 11:40:19 11:40:24

I fully understood that there are a wide range of considerations that need to be sort of brought into the mix and evaluated before you can come up with a remedial footprint. But if you were to fully -- to fully address risks to benthic invertebrates and fish and be left with a remedial footprint that you were confident would not result in residual effects on benthic invertebrates and fish, then these are the polygons that you would include. 11:40:25 11:40:28 11:40:35 11:40:38 11:40:43 11:40:49 11:40:53 11:40:57 11:41:01

Q. Just for further assessment; is that -- is that correct? 11:41:02 11:41:04

A. No. These -- if you were to design a cleanup, if you were to identify a remedial footprint and you wanted to fully address risk to benthic invertebrates and fish, you would make sure that these red polygons are included. 11:41:05 11:41:08 11:41:11 11:41:17 11:41:20

Or if you felt you didn't have enough 11:41:21

information to include all of, for example, NA21, in that footprint, you would go out and might collect further information to better understand the extent of the risks within each of these polygons.

So I'm saying that if you're gonna stop today with the data that you've got and develop a remedial footprint and your goal was to make sure that you fully addressed risk to fish and benthic invertebrates so that there is a low probability that you would have residual adverse effects, then these are the polygons that you would include in your remedial footprint. Is that clear?

Q. Partially.

If I blow up Figure 3 and put it in front of you, does Figure 3 tell me where I need to go around the Shipyard Site and dredge and not dredge as of -- based on information available today?

A. It would not provide complete information on that, no.

Q. Okay. Now that's clear.

So this -- the purpose of Figure 3 is not to provide an explicit proposal to the Regional Board saying this is where one needs to dredge; this is where one does not need to dredge. That is not the purpose of this. This is designed to just prioritize where you think the greatest risks lie. Is that -- I'm just trying to understand.

MR. GONZALEZ: First, I'm gonna object. The witness has indicated he's not an expert in remedial design and engineering. I believe your question goes to an engineering question.

I'm gonna go ahead and let him answer it. But I'm gonna object that you're assuming facts not in evidence. And you haven't laid a foundation for this expert to opine on engineering questions.

MR. HOWARD: Well, Marco, that's actually an interesting point. If he -- maybe that helps.

If the scope of the expert's testimony is not to get into the mechanics of the remediation, then maybe we can -- we can truncate some of this.

But I understood the report to get into more in the nature of this is where -- this is -- these are the areas that need to be remediated. And that's where I'm trying to understand the full extent of this report, whether this is designed to say this is what you need to do, Regional Board, to remediate or whether it's something different from that.

MR. GONZALEZ: Perhaps we could better discuss this off the record. Because my understanding is a remedial action plan has not yet been developed. There's a two-stage process whereby you first identify the

sediment quality concerns and objectives and framework. 11:44:07
And then you go to the next stage, which is developing 11:44:10
how you're going to address those. And we can talk at 11:44:13
length, if you'd like, later about that. 11:44:16

MR. HOWARD: Let's just talk about what we 11:44:18
understand what the witness's understanding of this 11:44:20
report is. 11:44:23

MR. GONZALEZ: Okay. 11:44:24

BY MR. HOWARD: 11:44:25

Q. And just so that I have a clear record, is the 11:44:25
purpose of this report to provide the regulatory 11:44:31
authorities with a plan, a footprint, for them to decide 11:44:37
where dredging has to be -- where dredging has to occur 11:44:44
and where it doesn't have to occur? Is that the purpose 11:44:48
of -- one of the purposes of this report? 11:44:51

A. I feel like we're not quite communicating here. 11:44:55
And I'm trying to figure out ways of expressing this so 11:44:58
that it's clearer in both of our minds. You know, if we 11:45:02
could do a mind meld here, we'd be in better shape. But 11:45:06
we can't do that. 11:45:10

So let me -- let me read to you from the report 11:45:11
again in another place that will maybe help -- help 11:45:15
elucidate what is meant by this. This is on page 37 of 11:45:20
the same exhibit. 11:45:26

Q. Okay. 11:45:27

A. "Figure 3 integrates the results of the benthic invertebrate and benthic fish assessments. In this figure, each Thiessen polygon was assigned a color based on the probability that impacts have occurred on benthic invertebrate community or the benthic fish community. The higher of the two risk classifications for fish or invertebrates was selected for each polygon as follows: 11:45:27 11:45:30 11:45:36 11:45:39 11:45:41 11:45:46 11:45:48

"High risk to benthic invertebrates or fish community, red. 11:45:51 11:45:55

"Moderate risk to benthic invertebrate or fish communities, yellow. 11:45:57 11:46:00

"Low or tolerable risk to benthic invertebrates or fish communities, green. 11:46:02 11:46:06

"Or uncertain risks to benthic invertebrate or fish communities, white. 11:46:08 11:46:12

"Integration of these results with the remedial footprint developed to address risks to human health and aquatic dependent wildlife will provide a robust basis for identifying a remediation footprint consistent with the RAOs" -- identified previously in this document. That is a parenthetical. I'm adding that right now. 11:46:14 11:46:17 11:46:21 11:46:25 11:46:28 11:46:33

"Such a remediation footprint is more likely to be acceptable to the public than the proposal that is currently being considered by the responsible parties. 11:46:35 11:46:39 11:46:42

"In addition, development and implementation of 11:46:45

a remedial action plan that encompasses this remedial footprint would minimize the potential for leaving CoPCs," chemicals of potential concern, "in place that would result in residual injury to natural resources at the site. The natural resource damage assessment process provides a framework for evaluating and quantifying such natural resource injuries." 11:46:47 11:46:52 11:46:54 11:47:00 11:47:03 11:47:08 11:47:11

So the purpose of this footprint is to -- as you know, during the mediation process, there was a substantial discussion about what the remedial footprint ought to look like. Those discussions were based, from my experience, primarily on -- 11:47:13 11:47:18 11:47:23 11:47:27 11:47:31

MR. CARRIGAN: Objection. I'm gonna object. Please, I don't want to hear the substance of what was discussed at the mediation. That's privileged. And there has been no showing that there is a reason to breach that privilege. 11:47:35 11:47:36 11:47:38 11:47:41 11:47:44

MR. GONZALEZ: Okay. 11:47:46

MR. HOWARD: Without getting into the discussions of the mediation -- in fact, that's -- let's just admonish everyone here, we're not gonna talk about the mediation. 11:47:51 11:47:52 11:47:55 11:47:57

BY MR. HOWARD: 11:47:58

Q. All I'm trying to understand -- and I don't want to spend 30 minutes on it because we're gonna have to get 11:47:58 11:48:01

into the detail, is just -- 11:48:04

Is Figure 3, is it or is it not your proposal 11:48:06
for a dredging remediation? 11:48:10

A. Not in the way you're characterizing it right 11:48:15
now. 11:48:17

MR. GONZALEZ: I'm also going to object. I 11:48:19
don't believe anybody has indicated that -- or the 11:48:22
witness has not indicated that dredging is the option 11:48:25
that he's recommending or anyone is recommending thus 11:48:28
far. 11:48:32

MR. HOWARD: And fair point. 11:48:33

BY MR. HOWARD: 11:48:34

Q. When you say "remediation," do you have a 11:48:34
specific type of remediation in mind? 11:48:37

A. I have not done a feasibility study for this 11:48:40
site. And so I am not in a position specifically to 11:48:44
identify the various types of remedial measures that 11:48:51
could be -- could or should be used in any or all of the 11:48:56
site. 11:48:59

So that would be the subject of a feasibility 11:49:01
study, a series of pilot studies that would -- would 11:49:03
inform those discussions. Those -- if those have been 11:49:06
done, I have not been a party to those -- that 11:49:10
documentation or those studies. 11:49:14

Q. Have you -- have you performed feasibility 11:49:16

studies for sediment remediations before? 11:49:18

A. I have -- that's not my area of specific expertise. I've worked with engineering groups that do that. We work very closely with the design of the cleanup goals and evaluation of what the remedial measures will leave in terms of residual contamination and what those post-remedial risks are likely to look at. So it's very much an integrative process. But we specifically do not do feasibility studies. 11:49:21 11:49:24 11:49:28 11:49:34 11:49:39 11:49:43 11:49:46 11:49:50

Q. Okay. So your report offers no specific type of remediation, whether that's dredging, whether that's natural remediation, or whether that's some other form of remediation. Is that a fair statement? 11:49:53 11:49:56 11:49:58 11:50:01

A. That's correct. 11:50:03

Q. And you'll be offering no opinions before the Regional Board in terms of the type of remediation that would be appropriate at the Shipyard Site? 11:50:04 11:50:06 11:50:09

A. Now, let me be clear that there -- it's as yet to be determined what my opinions will be to the board relative to topics beyond this report. 11:50:11 11:50:18 11:50:22

So since this report was produced, for example, there was a -- another draft of a Tentative Cleanup and Abatement Order. There was another draft of the DTR. And it has not been determined as of yet what the scope of my testimony will be related to any of the 11:50:25 11:50:28 11:50:31 11:50:40 11:50:44

documentation that has been provided subsequent to the 11:50:48
preparation of this report. 11:50:52
Q. So you're saying you may revise your report in 11:50:54
light of the most recent tentative -- Tentative Cleanup 11:50:57
and Abatement Order and the DTR? 11:51:00
A. I'm not saying specifically that I would do 11:51:05
that. That would be one option that would be possible. 11:51:07
More likely, we would comment in some other way. 11:51:11
Q. And what do you mean "some other way"? 11:51:16
A. Like, for example, an expert report. 11:51:17
Q. Have you been asked to prepare an additional 11:51:20
expert report? 11:51:21
A. We have discussed the potential for preparing an 11:51:22
expert report, yes, with my client. 11:51:28
Q. When was that discussed? 11:51:31
A. That was -- that discussion was initiated within 11:51:33
the last month. 11:51:38
Q. Have you reviewed the most recent Tentative 11:51:40
Cleanup and Abatement Order and DTR? 11:51:41
A. I have initiated a review of those two 11:51:48
documents. 11:51:50
Q. Okay. How much have you reviewed so far? 11:51:50
A. I have reviewed certain parts of the document -- 11:51:53
documents, plural -- in a -- I would characterize it in a 11:51:56
preliminary way. So there's a lot of -- there's a lot of 11:52:02

information in those documents. There's a lot of drilling down that needs to happen to be able to understand all of the details of those documents. I would want to be able to do that drilling to be able to develop, you know, any comments that I might have about those documents. 11:52:06 11:52:08 11:52:10 11:52:12 11:52:18 11:52:22

Q. Are you saying that you may at some point in the future supercede the October 29 -- October 2009 report with a new report? 11:52:22 11:52:25 11:52:31

A. I'm not saying that it would necessarily supercede this report. It may be an additional report that would be complementary to this report. It could supercede this report. I don't know exactly what that would look like yet. Until we get into the details of the review, it's gonna be very difficult to know what the nature of the -- the expert report would look like. 11:52:33 11:52:35 11:52:39 11:52:44 11:52:48 11:52:52 11:52:54

Q. So you're saying -- so your opinions may change that are set forth in the October 2009 report? 11:52:57 11:52:59

A. Will my opinions change? It's quite possible that individual opinions related to certain elements of the 2009 October report could change. I doubt very much the -- my opinions would substantively change. 11:53:06 11:53:11 11:53:17 11:53:21

Q. When will your review -- when do you anticipate that your review of the Tentative Cleanup and Abatement Order and the DTR will be finished? 11:53:26 11:53:28 11:53:32

In your professional judgment, is natural 01:06:36
attenuation an acceptable form of remediation on 01:06:38
occasion? 01:06:44
A. It is -- I'll answer this way and say that is 01:06:46
one of the remedial options that is always on the list of 01:06:49
remedial options that we would consider. 01:06:53
Q. You say "we." I'm asking -- 01:06:56
A. I mean me. Yes. And again, I'm not a 01:06:58
remediation engineer. I don't write remedial action 01:07:01
plans. I don't do feasibility studies. Do you 01:07:04
understand sort of what I'm talking about here? 01:07:08
Q. Yes. And that's helpful. Because I'm trying to 01:07:10
understand where you personally draw the line in terms of 01:07:13
your -- your expertise. 01:07:15
I understand you don't do feasibility studies. 01:07:16
Do you do -- so do you do any technical feasibility 01:07:19
studies as part of your -- part of your work? 01:07:23
A. What do you mean by "technical feasibility"? 01:07:26
Like that could include any range of, you know, what is 01:07:28
the technical feasibility of running this toxicity test, 01:07:31
for example. It's -- you need to be more specific, I 01:07:35
think, to understand. 01:07:38
Q. You said you didn't do feasibility studies. 01:07:39
What did you mean by that? 01:07:42
A. So a feasibility study has a specific 01:07:43

definition, for example, under CERCLA, as part of the 01:07:46
overall assessment and remediation process. And it 01:07:53
involves a series of steps of taking the preliminary 01:07:57
remediation goals and translating those into cleanup 01:08:04
goals and going through the process of evaluating various 01:08:08
remedial options, and then ultimately coming up with a 01:08:12
preferred remedial option that would be applied to a 01:08:17
site. 01:08:20

Q. Okay. But you don't do that? 01:08:20

A. That is not an area where I have a primary 01:08:24
responsibility. I would consult with folks that are 01:08:28
involved in a feasibility study and provide data and 01:08:33
information, input from time to time. But that is not my 01:08:37
primary focus area, no. 01:08:40

Q. Let me go back to Figure 3 in the maps that we 01:08:42
were talking about. And I'll explain why I was confused. 01:08:45
And I'll draw your attention to page 38 of Exhibit 800, 01:08:52
your final report. 01:08:55

And the sentence that you read to me there, it 01:09:00
states the following: "The remedial footprint presented 01:09:04
in Figure 3 identifies" -- 01:09:07

A. Slow down just a second, if you wouldn't mind. 01:09:09

Q. Second paragraph. "The remedial footprint 01:09:11
presented in Figure 3 identifies the polygons that 01:09:14
require remediation." 01:09:17

specific quantity? 01:12:30

A. No. Specifically, there's no -- there's nothing in this report that suggests that the quantity of material that should be removed and, for example, relocated to a disposal site is X number of cubic meters. That volume does -- is not anywhere in this report, no. 01:12:31 01:12:35 01:12:37 01:12:41 01:12:46

Q. Okay. Just so the record is clear, you're not going to offer any opinions as to the volume that should be dredged from the San Diego Shipyard Site? 01:12:49 01:12:51 01:12:54

A. Once again, we had a discussion this morning about what the potential scope of an expert report might be this morning. Or we talked about it this morning about what the scope of an expert report might be that would be produced later based on a review of the DTR and the revised cleanup order, Cleanup and Abatement Order. 01:12:57 01:13:00 01:13:03 01:13:06 01:13:08 01:13:14

That scope has not been determined at this point. So I can't tell you what specifically I'm going to offer expert opinions on related to those two documents right now. 01:13:18 01:13:21 01:13:24 01:13:30

Q. Do you believe you have the expertise to offer opinions as to the volume of sediment that should be dredged from the San Diego Shipyard Site? 01:13:31 01:13:33 01:13:36

A. I believe that I have the expertise to be able to run those calculations if need be. But that is not an area that I -- primary area of my -- of my practice. 01:13:40 01:13:43 01:13:46

Q. I understand that you relied on one of her memos for purposes of your report, though. 01:39:47 01:39:49
A. One of her reports, yes. 01:39:51
Q. Did you ever have a conversation with Ms. Zeeman in connection with the San Diego Shipyard Site? 01:39:54 01:39:56
A. If I had a conversation with -- I would have thought it's Dr. Zeeman. If I had such a conversation, I don't recall it. I don't believe that I did. But I don't -- I don't recollect specifically. 01:39:58 01:40:01 01:40:05 01:40:09
Q. Okay. Let's turn to Exhibit 807, paragraph 3. Let's -- this, I'll represent to you, is a declaration from counsel in connection with your anticipated testimony. Paragraph 3 delineates the areas that you are being offered in this matter as an expert. And I want to ask some questions about that. 01:40:12 01:40:22 01:40:24 01:40:28 01:40:34 01:40:40
According to this declaration, you are being offered as a, quote, "Expert in environmental toxicology and chemistry, ecosystem-based resource management, water quality/water use interactions, sediment quality assessment." And then there seems to be a separate area called "Including contaminated sediment and remediation plans." 01:40:45 01:40:48 01:40:54 01:40:59 01:41:04 01:41:09 01:41:12
Do you see that? 01:41:13
A. I see these words, yes. 01:41:14
Q. Do you agree with the representation in this 01:41:19

declaration that you are an expert in each of those five 01:41:21
areas? 01:41:25

A. Yes. 01:41:28

Q. Now, I notice -- and is that based on -- is 01:41:31
that -- is your conclusion that you're an expert in each 01:41:35
of those areas, is that based on your education or on 01:41:38
your work experience or both or some other thing? 01:41:42

A. Well, it's based on education, knowledge, 01:41:48
experience, and, you know, whatever I've learned in my 01:41:50
career over the last, roughly, 30 years. 01:41:57

Q. Okay. So it sounds like work experience over 01:41:59
30 years. That's one. 01:42:02

A. Mm-hmm. 01:42:03

Q. And your education? 01:42:04

A. Education. 01:42:05

Q. That's two. 01:42:06

A. Yes. 01:42:07

Q. Anything else? 01:42:07

A. Is there anything else that it could possibly be 01:42:12
considered beyond education and work experience? 01:42:15

Q. If the answer is nothing else, then that's 01:42:18
sufficient. I'm just trying to understand what the -- 01:42:20
what you base your -- your expertise on. 01:42:21

A. It may be that I'm not thinking of something 01:42:24
that you're thinking of. But those are the things that I 01:42:26

BY MR. HOWARD: 01:53:51
Q. Mr. MacDonald, looking at Exhibit 807 in the five areas of expertise, is there a point in time when you became or were holding yourself out as an expert in those five areas? 01:53:52 01:53:56 01:54:03 01:54:07
Was there a certain year or event that suddenly allowed you to hold yourself out as an expert in those five areas? 01:54:09 01:54:13 01:54:17
A. I don't think I understand your question. 01:54:20
Q. When did you first become an expert in contaminated sediment and remediation plans? 01:54:25 01:54:28
A. When did I -- 01:54:33
MR. GONZALEZ: Objection. I don't believe that there is either a foundation or facts in evidence indicating that the witness has called himself an expert in contaminated sediment and remediation plans. I believe the focus on the first five that we talked about those. 01:54:35 01:54:37 01:54:41 01:54:43 01:54:47 01:54:51
MR. HOWARD: That's -- that is part of it. 01:54:51
BY MR. HOWARD: 01:54:53
Q. Do you believe you're -- do you believe you're an expert in contaminated sediment and remediation plans? 01:54:52 01:54:53
A. Yes. I mean, we -- yes. 01:54:58
Q. Based on what? 01:55:02
A. We discussed the definition of what an expert is 01:55:04

this morning. 01:55:08
Q. And that is someone who knows more than a 01:55:08
layperson? 01:55:10
A. Yes, correct. And so contaminated sediment, 01:55:11
that is a topic area I have been working in for the last 01:55:15
25 years actively. 01:55:20
And remediation plans is something that I 01:55:23
have -- you know, I just -- I described to you previously 01:55:26
the process that, sort of, is typically done in a 01:55:30
sediment quality assessment that requires this sort of 01:55:34
interaction between the folks that are developing the 01:55:39
remedial action plan and those folks that have been doing 01:55:41
the risk assessment and developing the cleanup goals. 01:55:47
And so that -- that puts me in a place where I 01:55:50
have reviewed a variety of remedial action plans for 01:55:53
sites, commented on them, been able to provide input and 01:55:57
advice related to those remedial action plans. And to 01:56:02
the extent that that exceeds the threshold that we 01:56:06
established this morning, then yes. 01:56:10
Q. And that would be for the last 25 years? 01:56:12
A. I've been working on contaminated sediments for 01:56:15
the last 25 years. I've been -- so I have been 01:56:19
accumulating the experience, knowledge and experience, 01:56:23
required to serve as an expert related to those topics 01:56:28
over that 25-year period, yes. 01:56:33

Q. I -- it really doesn't matter. I'm just trying to understand whether you've done an evaluation of prop wash at the -- at the Shipyard Site. 02:59:20 02:59:25 02:59:29

A. Yeah, I don't see how that would be relevant to what I was trying to accomplish with my report. So I didn't do it. But I don't see that it's relevant. 02:59:31 02:59:33 02:59:35

Q. Okay. And to finish up on the SQOs, would you turn to page 19. 02:59:38 02:59:50

A. Yes. 03:00:05

Q. And Subsection G, where it says, "Cleanup and abatement actions covered by Water Code Section 13304 for sediments that exceed the objectives in Chapter 4 shall comply with Resolution 92-49 entitled 'Policies and Procedures for Investigation and Cleanup and Abatement of Discharges Under Water Code Section 13304.'" 03:00:05 03:00:07 03:00:10 03:00:14 03:00:18 03:00:21

A. I see those words there. 03:00:26

Q. And do you see on the top of the next page on page 20 where it says at the top of the page, "All guidelines when applied for cleanup must comply with 92-49"? 03:00:27 03:00:30 03:00:32 03:00:36

A. I see those words. 03:00:38

Q. Are you familiar with Resolution 92-49? 03:00:39

A. I think you would need to show me Resolution 92-49 for me to become familiar with that. 03:00:44 03:00:45

Q. But as you sit here today, without showing that 03:00:49

document to you, are you familiar with the contents of that document? 03:00:51 03:00:55

A. I could not tell you what's in that document as I'm sitting here today. 03:00:57 03:00:59

Q. Did you apply Resolution 92-49 in any part of your report or as part of your methodology? 03:01:07 03:01:12

A. Without knowing specifically what's in Resolution No. 92-49, it would be impossible for me to tell you that. 03:01:16 03:01:18 03:01:22

Q. Do you recall ever reviewing 92 -- Resolution 92-49 in the course of your practice? 03:01:28 03:01:30

A. I don't have a specific recollection of that. 03:01:35

Q. Have you ever performed an economic feasibility analysis as part of your sediment quality work? 03:01:41 03:01:43

A. What do you mean by "economic feasibility analysis"? 03:01:49 03:01:52

Q. Is that term unfamiliar to you? 03:01:54

A. It's -- it could have various meanings to various people. 03:01:57 03:02:02

Q. Have you undertaken an economic feasibility analysis for any sediment remediation project in terms of the marginal benefit of additional remediation versus the cost of that remediation? 03:02:08 03:02:10 03:02:14 03:02:18

A. Yes. 03:02:21

Q. And where have you undertaken that sort of 03:02:23

economic feasibility analysis? 03:02:25

A. So -- and let me be clear. It would be the Quathiaski Cove case. And this would -- would have been an analysis to determine whether or not it made sense to remediate additional areas based on what that was gonna cost us and what the potential benefits of that -- what that might be. 03:02:27 03:02:30 03:02:34 03:02:39 03:02:44 03:02:47

So I wouldn't say that it was the kind of an analysis that an economist might do, which is a variety of -- I just don't know, you know, how typically that kind of evaluation would be done in, sort of, the context of what you're thinking. 03:02:48 03:02:52 03:02:58 03:03:04 03:03:07

But in the context of what I'm thinking, yes, we have done that to step us make decisions about whether it makes sense to remediate additional areas based on the benefits that we think would accrue as a result of that. 03:03:09 03:03:11 03:03:14 03:03:18

Q. Did that evaluation -- was that evaluation reduced to some written report? 03:03:22 03:03:25

A. No, that was not. That was done based on an evaluation of what the volume would be that we're talking about, what the costs associated with dealing with that volume of material would be, and what the potential benefits of that might be relative to of, well, a variety of benefits that may accrue as a result of that. 03:03:27 03:03:31 03:03:36 03:03:40 03:03:42 03:03:48

That was discussed with the client. And we made 03:03:51

a decision based on those discussions rather than 03:03:53
memorializing that in some kind of a formal document. 03:03:55
Q. I see. So you communicated that to the client 03:03:58
orally? 03:04:00
A. Correct. 03:04:01
Q. And did you prepare any notes or computations or 03:04:02
calculations to support your economic feasibility 03:04:07
analysis in that particular project? 03:04:10
A. Oh, I expect that we had notes and calculations 03:04:12
at the time, yes. 03:04:15
Q. But nothing that was -- nothing that was made 03:04:17
into a -- a formal report? 03:04:21
A. That's correct. 03:04:28
Q. And do those feasibility computations still 03:04:28
exist, or have they been destroyed? 03:04:32
A. I don't know. 03:04:35
Q. Do you recall how long it took you to prepare 03:04:42
that economic feasibility analysis? 03:04:43
A. I don't recall offhand. I'm sorry. That was 03:04:46
several years ago. 03:04:49
Q. Can you give me an idea of roughly the time of 03:04:51
year in which that would have been undertaken? 03:04:54
A. I want to -- I want to say somewhere around 03:04:59
2006. But that's just a guess. 03:05:04
Q. And as part of that evaluation, did you 03:05:09

recommend that certain remediation not be undertaken? 03:05:14

A. In that case, we recommended that additional 03:05:22
remediation be undertaken to address a hotspot that we 03:05:25
located partway through the remediation. 03:05:30

Q. Was the economic feasibility analysis a 03:05:32
site-wide analysis, or was it just a hotspot analysis for 03:05:37
one section of that particular project? 03:05:40

A. It's hard to answer that question. I mean, the 03:05:44
total costs of remediation relate to the whole site. And 03:05:46
so additional costs related to addressing a hotspot also 03:05:50
relate to the entire site, to the total cost of 03:05:55
remediation of that site. So it would be very difficult 03:05:58
to have had that discussion and make a decision without 03:06:03
considering the total cost of the remediation for the 03:06:05
site. 03:06:07

So I would answer that question as saying 03:06:08
it's -- although it was specifically related to 03:06:09
addressing a hotspot area, the economic analysis was -- 03:06:12
it considered all of the costs and benefits related to 03:06:16
the site. 03:06:21

Q. Was that economic feasibility -- feasibility 03:06:24
analysis undertaken before the remediation began, or was 03:06:27
it undertaken during the remediation? 03:06:32

A. We had -- the remediation was in progress at 03:06:34
that time. We had identified an additional hotspot as a 03:06:37

result of some supplemental sampling that we did, 03:06:40
evaluated the nature and areal extent so that we could 03:06:45
delineate the size of that hotspot area. And then that 03:06:50
provided us with basis for having the discussion about 03:06:54
what the cost would be to address that particular hotspot 03:06:58
and what the benefits might be. 03:07:01

Q. Okay. The -- and a couple more questions, and 03:07:03
then we'll take a break. 03:07:07

The portion of your report in Exhibit 800 where 03:07:09
you address chemicals of potential concern, pages 8 03:07:12
through 10, where you are indicating that more -- more 03:07:16
potential chemicals of -- chemicals of potential concern 03:07:24
should be evaluated, let me direct your attention there 03:07:30
and make sure we're on the same -- same page. 03:07:35

Do you see that discussion? 03:07:38

A. I do. 03:07:39

Q. And as I understand your -- your analysis that 03:07:41
you are of the view that seven additional categories of 03:07:46
chemicals should be evaluated. And they're outlined on 03:07:53
page 9 of your report. 03:07:57

And my question, my foundational question, is 03:07:58
what additional evidence do you have that the seven 03:08:03
additional chemicals of potential concern should be 03:08:06
evaluated for purposes of the Shipyard Site? 03:08:10

MR. GONZALEZ: I'll object. Lacks foundation. 03:08:20

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct; that I have read my deposition and have made the necessary corrections, additions or changes to my answers I deem necessary.

Executed on this 7th day of December, 2010.

DONALD MacDONALD

I, ANNE M. ZARKOS, Certified Shorthand Reporter for the State of California, do hereby certify:

That the witness in the foregoing deposition was by me first duly sworn to testify to the truth, the whole truth and nothing but the truth in the foregoing cause; that the deposition was taken by me in machine shorthand and later transcribed into typewriting, under my direction, and that the foregoing contains a true record of the testimony of the witness.

Dated: This 4th day of November, 2010 at San Diego, California.

Anne M. Zarkos

Anne M. Zarkos, RPR, CRR
CSR No. 13095

CERTIFICATE

I, the undersigned, do hereby certify that I have read the foregoing deposition and that, to the best of my knowledge, said deposition is true and accurate (with the exception of the following changes listed below).

PAGE No.	LINE No.	
72	23	both instances of "rate" should be "weight"
77	23	"McFarland" should be "MacFarlane"
84	19-20	"do you" should be "to"
115	7	"at" Should be "like"
160	24	"was part" Should be "was not part"
168	7	"lengths" Should be "legs"
210	21	"classified over 80 percent," should be "classified; over 80 percent correct."
217	22	"control or tested" Should be "control adjusted"
234	16	"four of" should be "for"
244	2	"bioarrumulant of a" should be "bioaccumulative"
125	10	"contaminations are" should be "contaminants are"

Please turn to back of transcript and sign the Penalty of Perjury page.

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD

SAN DIEGO REGION

IN RE THE MATTER OF)
)
TENTATIVE CLEANUP AND ABATEMENT)
ORDER NO. R9-2011-0001)
)
)
)

VIDEOTAPED DEPOSITION OF DONALD MACDONALD

Volume II, Pages 249 - 462

San Diego, California

October 21, 2010

Reported By: Anne M. Zarkos, RPR, CRR,
CSR No. 13095

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Videographer: Abel Sibrel

Also Present: Thomas C. Ginn, Ph.D.
Scott Becker, Ph.D.
Jason M. Conder, Ph.D.

Scott Becker is here today. 09:45:56

Q. Have you worked with those gentlemen before? 09:45:59

A. What do you mean by have I worked with them before? 09:46:02 09:46:05

Q. Have you ever worked on another project, either with or on the other side of the table with these gentlemen? 09:46:05 09:46:08 09:46:10

A. Yes, I have with one or more of them. 09:46:11

Q. Do you have any concerns about their qualifications in their profession? 09:46:17 09:46:20

A. I have not evaluated their -- their qualifications at all. I have no comment. 09:46:22 09:46:24

Q. You have no opinion on their qualifications? 09:46:28

A. I have not evaluated their qualifications in any way. 09:46:30 09:46:33

Q. Do you know -- do you know these gentlemen based on their reputation in the field? 09:46:34 09:46:36

A. I have -- I think I've answered that question already. 09:46:43 09:46:45

Q. I don't think you have. 09:46:47

A. I have not evaluated their qualifications, is what I've said to you. 09:46:48 09:46:52

Q. Have you taught any college courses on sediment quality issues? 09:46:57 09:47:01

A. I don't believe so. By college courses, you 09:47:07

mean courses that are held at a college and given to graduate and undergraduate students. Is that your definition of a college course? 09:47:12 09:47:16 09:47:20

Q. Yes. 09:47:22

A. Okay. Then, no. Definitions matter, as you know. 09:47:23 09:47:25

Q. Why didn't you get a master's or a Ph.D. degree? 09:47:29

A. It wasn't a priority for me. 09:47:38

Q. Why wasn't it a priority? 09:47:40

A. I don't know how -- how do you answer a question like that? I don't have an answer for it. What do you mean, why wasn't it a priority? 09:47:48 09:47:50 09:47:53

Q. I'm just using your terminology. 09:47:55

A. Yeah. I -- I don't have -- I don't have an answer for you. 09:47:59 09:48:00

Q. Did you ever consider getting a graduate degree? 09:48:01

A. Not seriously, no. 09:48:06

Q. Now, help me understand how a person trained in zoology becomes a specialist in sediment remediation issues. How did that -- how did that transformation or how did that take place? 09:48:09 09:48:15 09:48:21 09:48:26

A. It took place as a result of the accumulated experience that I've had over my career working both for government and for -- as an independent consultant. 09:48:30 09:48:32 09:48:37

Q. Do you believe that your college education 09:48:45

equips you on issues of sediment remediation? 09:48:50
A. My college -- my university education, it's not 09:48:54
a college education. It's a university education. 09:48:57
During my time at university, there was little 09:49:03
time -- I spent some time doing sediment work but not 09:49:10
very much. 09:49:14
Q. At the university? 09:49:15
A. At the university, yes. 09:49:16
Q. What did you -- what courses did you take at the 09:49:18
university that in any way related to sediment issues? 09:49:20
A. This would have been work that I did during the 09:49:24
summer while working with -- at the university doing 09:49:25
field work in the collection of various types of sediment 09:49:29
samples and the like for various studies. 09:49:34
Q. Were the -- was the summer work part of a formal 09:49:38
course at the university? 09:49:42
A. No. 09:49:44
Q. Were you working for a professor? 09:49:44
A. Yes. 09:49:47
Q. As a summer job? 09:49:47
A. Yes, that's correct. 09:49:49
Q. Which professor? 09:49:50
A. Janet Stein, for a portion of the time. 09:49:51
Dr. Peter Hochachka for a portion of the time. Some of 09:49:54
my time would have been spent with Dr. Kathleen Cole, as 09:50:01

least in part, wildlife ecology. 09:51:51
Q. What was the title of that course? 09:51:53
A. I can't remember offhand. I'm sorry. 09:51:55
Q. What was -- what type of course was it, 09:51:57
generally? 09:52:00
A. It was an ecology course. I just can't remember 09:52:00
the exact name of it. 09:52:03
Q. Did that course also involve marine ecology? 09:52:05
A. That would have been Tom Carefoot's course on 09:52:09
marine ecology. That would have covered that area more 09:52:13
directly. 09:52:17
Q. Did you take one course in marine ecology? 09:52:18
A. At least one. 09:52:21
Oh, I have to retract one of my earlier answers. 09:52:25
You asked if I gave any college level courses. And I 09:52:29
assisted in teaching a college level course on intertidal 09:52:35
ecology that was given at University of British Columbia. 09:52:38
That was also some time ago. 09:52:46
Q. Was that a seminar or was that a formal course? 09:52:48
A. That was a one-week course. And I can't 09:52:52
remember if it was through the Bamfield Marine Station or 09:53:01
if it was directly through the main campus. 09:53:03
Q. And the title of the course was Intertidal -- 09:53:08
A. Ecology. 09:53:12
Q. And who did you assist teaching that course 09:53:16

with?

A. That was Dr. Jim Ballantyne.

Q. And when did you teach that course?

A. That would have been in the early '80s. I can't tell you exactly the year.

Q. Okay.

Other than the one-week course in the early '80s, have you taught any other college or university level courses in the area of sediments?

A. You recognize that's a different question than what you asked me before.

Q. I understand that.

A. So I have given a number of courses in sediment assessment through the Society of Environmental Toxicology and Chemistry and a variety of other, through U.S. EPA, that would, I believe, qualify as continuing education courses for professionals in the field.

Q. You have taught those or have you been a participant of those?

A. Co-taught.

Q. You co-taught?

A. Yeah.

Q. Did you prepare a book or a formal instruction manual as part of -- part of that instruction?

A. There would have been some documentation that we

prepared. It was not a book. It would have been some 09:54:42
documentation, a series of handouts, overheads, that kind 09:54:45
of thing that would have been prepared to support the 09:54:49
teaching of those courses, yes. 09:54:50

Q. So just so the record's clear, you have not 09:54:52
authored any books in the area of sediment quality 09:54:55
issues. Is that -- is that accurate? 09:54:58

A. Book chapters, I have authored, yes. And I 09:55:04
believe I'm a coauthor on "Ecological Risk Assessment of 09:55:08
Contaminated Sediment," which is a book that was put out 09:55:13
by Environmental Toxicology and Chemistry. 09:55:16

Q. Getting back to finish up the -- our discussion 09:55:23
on the instruction or teaching of college or university 09:55:26
level courses in the area of sediment quality, the 09:55:33
one-week course in 19 -- the 1980s on intertidal ecology. 09:55:37

And were there any other formal courses that you 09:55:45
served as a professor or assistant professor, adjunct 09:55:47
professor, to teach certain courses? 09:55:51

A. Again, was that college level or was that 09:55:53
college courses? 09:55:55

Q. College level -- college courses. Let me 09:55:57
clarify. College courses. 09:56:00

A. Okay. No. I don't believe there was any other 09:56:01
college courses. 09:56:04

Q. But when you -- when I changed the question to 09:56:05

would have signed up and participate -- participated. 09:57:39
And if nonpractitioners had asked about the 09:57:42
course and asked if they -- it was something they would 09:57:48
have been interested in, we would have probably deterred 09:57:50
them from signing up and attending such a course. 09:57:53
Q. What is the longest course that you've taught? 09:57:56
A. I don't know offhand. 09:58:03
Q. Anything longer -- 09:58:05
A. I would say that one-week course on intertidal 09:58:06
ecology would probably be. Most of these courses are a 09:58:09
day or two. 09:58:12
Q. And do any of these courses involve issues of 09:58:13
sediment remediation? 09:58:18
A. Sediment remediation would be one of the topics 09:58:22
addressed typically in these -- in some of these courses. 09:58:25
Not all but some of them. 09:58:28
Q. Would any of these courses involve issues of 09:58:31
sediment remedial design? 09:58:33
A. No, not in the courses that I would have been 09:58:35
teaching. 09:58:38
Q. Do you have any experience in the area of 09:58:40
sediment remedial design? 09:58:42
A. Yes. 09:58:43
Q. And what is -- what is the basis of that 09:58:45
experience? 09:58:47

A. Well, we talked about it quite a bit yesterday, 09:58:48
as you'll recollect, relative to the remedial design for, 09:58:52
for example, Quathiaski Cove, for the Indiana Harbor 09:58:55
site. 09:59:01
Q. The four sites that we talked about yesterday? 09:59:02
A. Yes, that's correct. 09:59:04
Q. Have you taught any courses in the area of 09:59:08
sediment remedial monitoring? 09:59:12
A. Hmm. I can't recollect offhand if that topic 09:59:17
was explicitly identified in one or more of the courses 09:59:25
that we've put on. It's been a little while. And I 09:59:30
don't have in front of me the agendas for each of those 09:59:33
courses. So it's -- I can't say offhand if they did or 09:59:37
did not. 09:59:42
Q. Do you believe that you have a specialization or 09:59:43
expertise in sediment remedial monitoring? 09:59:47
A. Yes. 09:59:50
Q. You do based on what? 09:59:50
A. Based on the wide range of -- or fairly wide 09:59:53
range of monitoring and assessment programs that I've 10:00:00
designed in the past for sediment monitoring, for water 10:00:04
quality monitoring, for monitoring of other components of 10:00:09
the aquatic ecosystems. So yes, I do feel qualified in 10:00:14
that area. 10:00:18
Q. Do you have any opinions on sediment remedial 10:00:19

monitoring with respect to the San Diego shipyard site? 10:00:21
A. Can you provide some more focus on that question? 10:00:26 10:00:32
Q. Based on what you know today, based on the report you prepared, are you intending to offer any opinions to the Regional Board on the area of sediment remedial monitoring? 10:00:33 10:00:35 10:00:38 10:00:41
A. Do you mean related to the 2010 tentative Cleanup and Abatement Order and the DTR? 10:00:43 10:00:46
Q. Based on what you understand today on whatever you've read, are you intending to offer any opinions in the area of sediment remedial monitoring to the Regional Board? 10:00:50 10:00:54 10:00:59 10:01:02
A. I would expect to, considering that that topic -- topic is explicitly addressed in the DTR and the tentative Cleanup and Abatement Order. I would be surprised if part of my expert testimony that I develop in the future does not at least review what is being proposed. And I may have comments related to that, also. 10:01:04 10:01:07 10:01:11 10:01:14 10:01:16 10:01:22
Q. I didn't see any opinions with respect to sediment remedial monitoring in your expert report, Exhibit 800. Are you referring to additional opinions that you may be forming in the future? 10:01:30 10:01:33 10:01:36 10:01:38
A. Yes, that's correct. 10:01:41
Q. And that will be based on what you discussed 10:01:42

yesterday, a future review of the latest DTR and the latest tentative Cleanup and Abatement Order? 10:01:46 10:01:50

A. Yes, that's correct. 10:01:53

Q. But as you sit here today, is it fair to say you don't have any opinions as to the sediment remedial monitoring for the San Diego shipyard site? 10:01:54 10:01:56 10:02:01

A. I think that it's a good idea to have such a program in place, and the details is what I'm going to be looking at. 10:02:04 10:02:07 10:02:10

Q. Tell me what the term "ecosystem based resource" -- "resource management" means? 10:02:15 10:02:17

A. Ecosystem based resource management is an approach to managing ecosystems or the environment that considers humans as part of the ecosystem, rather than something that is apart from the ecosystems that we are studying and trying to manage. 10:02:23 10:02:26 10:02:36 10:02:42 10:02:46

Q. Have you worked for other environmental groups beyond Coastkeeper and EHC in any of your other projects? 10:02:54 10:02:56

A. Yes, I have. 10:03:01

Q. Can you name some of those groups? 10:03:02

A. Sustainable Fisheries Foundation. 10:03:04

Q. Any others? 10:03:07

A. Could you rephrase your question. Actually, just restate your question, if you would. 10:03:17 10:03:19

Q. Did you not understand my question? 10:03:22

other objectives or measures of predictive ability that you have used in prior work other than the 20 percent, 50 percent, and 80 percent overall correct predictability that you've just discussed? 01:35:39 01:35:44 01:35:47 01:35:51
A. Those are the three that I remember off the top of my head. 01:35:53 01:35:55
Q. Okay. Now, do you -- do you agree that the California SQOs were developed by regional sediment experts? 01:35:58 01:36:03 01:36:12
A. I -- I -- I don't know the names of everyone who was involved in the development of those SQOs. So it would be hard for me to give you a categorical answer in that respect. 01:36:19 01:36:20 01:36:26 01:36:30
Q. Would you expect California SQOs to be developed by people other than regional sediment experts? 01:36:31 01:36:34
A. I would not be surprised if there was people involved in a team of experts that were not experts specifically on California. That would not surprise me in the least. 01:36:38 01:36:40 01:36:43 01:36:46
Q. Do you consider yourself to be an expert on California regional sediment quality issues? 01:36:47 01:36:49
A. You know, yesterday we described a definition for expert. You'll recollect that discussion? 01:36:56 01:37:00
Q. I want to go with what your definition of an expert is. 01:37:04 01:37:06

A. Okay. So we -- we covered that yesterday. And 01:37:07
so I would say yes. 01:37:10
Q. Okay. And is that based -- and what is that 01:37:11
based on? 01:37:14
A. The fact that I have conducted this particular 01:37:15
evaluation of data that include information from 01:37:19
San Diego Bay and the shipyard site. 01:37:24
Q. Okay. So the expertise -- 01:37:26
A. Which was located, of course, in California. 01:37:29
Q. So other than the San Diego shipyard site, is 01:37:31
there another project -- I know you worked on the 01:37:34
Montrose NOAA project. Was that another source of your 01:37:36
expertise? 01:37:39
A. That is correct. 01:37:40
Q. Anything other than the San Diego shipyard site 01:37:41
and the NOAA site? 01:37:43
A. I have reviewed other data and information from 01:37:44
California, yes. 01:37:48
Q. Okay. 01:37:50
Now, could you refer to Master Exhibit 6, the 01:37:53
California SQOs. And I don't know where it is in your 01:37:58
stack of material in front of you. I think it's 01:38:02
underneath -- there it is. 01:38:05
Now, would you agree, Mr. MacDonald, that the 01:38:20
SQOs reflect a consensus judgment that an average or mean 01:38:23

A. I don't believe so. 04:54:52
Q. You don't believe so? 04:54:53
A. I don't believe so. I think my involvement in 04:54:55
the case was completed prior to that. 04:54:58
Q. Why was it completed? 04:55:04
A. I produced my report and provided it to my 04:55:08
client. 04:55:13
Q. Who was -- 04:55:18
A. Gave my deposition, and that was, as far as I 04:55:19
know, the last of my involvement in that case. 04:55:23
Q. The client never explained to you why your 04:55:31
involvement in that case ended or concluded? 04:55:33
A. No. 04:55:37
Q. At this point, Mr. MacDonald, obviously, 04:55:54
we're -- over the course of the last two days it's become 04:55:57
clear to -- clear to me that there's an extensive amount 04:56:02
of information that has not been produced to the 04:56:05
designated parties; that there's a substantial amount of 04:56:08
information that either remains up at your office, or has 04:56:14
been produced to your attorneys but not produced to us. 04:56:19
It's also clear to me that you were not 04:56:25
completely prepared for this deposition, in the sense 04:56:28
that key information, in terms of how you prepared your 04:56:31
report, could not be provided and needed additional 04:56:35
analysis and calculation. And because of that, at this 04:56:39

time, all I'm prepared to do is to adjourn the -- this deposition. Not conclude it but adjourn it.

I'm gonna make a demand to counsel that Mr. MacDonald's expert file consistent with the CCP be produced to the designated parties, and that we have additional time to review those documents and ask Mr. MacDonald questions based on the -- the documents and the computations that we have yet to see.

MR. GONZALEZ: For the record, I'm gonna respond entirely and wholly in disagreement with your characterization of Mr. MacDonald's preparation for and attendance at this deposition. I'm not going to respond to your demand.

I will instruct you to instead put that in writing. And we can go through a process of meet and confer and possibly motion practice to compel production or protect documents, if necessary. And I will not at this time acquiescence to making Mr. MacDonald available for further deposition. But again, that is a subject matter that we can discuss off the record and in subsequent proceedings.

MR. HOWARD: And I understand, just so that the record's clear that -- and I'll let other counsel speak for themselves. But they have not had -- yet had an opportunity to ask questions of Mr. MacDonald, in part

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct; that I have read my deposition and have made the necessary corrections, additions or changes to my answers I deem necessary.

Executed on this 7th day of December, 2010.

DONALD MacDONALD

I, ANNE M. ZARKOS, Certified Shorthand Reporter for the State of California, do hereby certify:

That the witness in the foregoing deposition was by me first duly sworn to testify to the truth, the whole truth and nothing but the truth in the foregoing cause; that the deposition was taken by me in machine shorthand and later transcribed into typewriting, under my direction, and that the foregoing contains a true record of the testimony of the witness.

Dated: This 4th day of November, 2010 at San Diego, California.

Anne M. Zarkos

Anne M. Zarkos, RPR, CRR
CSR No. 13095

CERTIFICATE

I, the undersigned, do hereby certify that I have read the foregoing deposition and that, to the best of my knowledge, said deposition is true and accurate (with the exception of the following changes listed below):

PAGE No.	LINE No.	
267	15	"Mira" should be "Meara"
268	20	"Mira" should be "Meara"
269	8	"It's" should be "He's"
270	2, 13	"Haynes" should be "Haines"
273	24	"Mira" should be "Meara"
275	4	"Haynes" should be "Haines"
275	17	"Mira" should be "Meara"
293	19	"1-200" should be "100-200"
311	7	"get a decreased" should be "get decreased"
317	4	"Table 6" should be "Column 6"
318	2	"years--three-three" should be "years, three months, or three"
325	5	"reference a cited" should be "references cited"
326	2	"concentrated" should be "concentration"
359	13	"McDonald" should be "MacDonald"
384	11	"index, no, I do not." should be "index? No, I do not."
396	8	"ask you that" should be "you ask that"

Please turn to back of transcript and sign the Penalty of Perjury page.

EXHIBIT 3

Development of a Sediment Remediation Footprint to Address Risks to Benthic Invertebrates and Fish in the Vicinity of the Shipyards Site in San Diego Bay, California

Prepared for:

Clean Bay Campaign
Environmental Health Coalition
401 Mile of Cars Way, Suite 310
National City, California 91950

Prepared *– October 2009 –* by:

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MACDONALD
ENVIRONMENTAL SCIENCES LTD.

Development of a Sediment Remediation Footprint to Address Risks to Benthic Invertebrates and Fish in the Vicinity of the Shipyards Site in San Diego Bay, California

Prepared for:

Clean Bay Campaign
Environmental Health Coalition
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Prepared – *October 2009* – by:

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Acknowledgments

The author would like to express his appreciation to several individuals who contributed substantially to the preparation of this report. First, data and other information on sediment quality conditions at the Shipyards Site and/or elsewhere in San Diego Bay were provided by Steve Bay (Southern California Coastal Water Research Project), Don MacDonald (National Oceanic and Atmospheric Administration), and Elaine Carlin (Carlin, Young and Associates). Excellent technical reviews of earlier drafts of this report were provided by Steve Bay, Russell Fairey (Moss Landing Marine Laboratories), and Jay Field (National Oceanic and Atmospheric Administration).

This report was prepared using funding provided by the Environmental Health Coalition and San Diego Coastkeeper.

1.0 Introduction and Background

In recognition of the important role that sediments play in the maintenance of a healthy and vital aquatic ecosystem in San Diego Bay, the California State Water Resources Control Board - San Diego Region (i.e., the Regional Board) issued a Tentative Cleanup and Abatement Order (No. R9-2005-0126; i.e., the Order) related to contaminated marine sediment in San Diego Bay within and adjacent to Southwest Marine, Inc. and National Steel and Shipbuilding Company leaseholds, generally located between Sampson Street Extension and the Mouth of Chollas Creek (hereafter referred to as the Shipyards Site). The Order identified persons responsible, provided factual background information, described beneficial use impairments (BUIs), and specified sediment cleanup goals for the site. The Order also provided a number of directives to the persons responsible including:

1. To prepare and implement a remedial action plan;
2. To clean up contaminated sediments;
3. To verify completion of the cleanup; and,
4. To conduct post cleanup monitoring.

Since the Order was issued in 2005, a number of parties have participated in a series of discussions focused on development of a remedial action plan for the Shipyards Site. This document is intended to support revision of the Order by the Regional Board by identifying a remediation footprint for the Shipyards Site that would address impacts on benthic invertebrates and benthic fish utilizing aquatic habitats in the vicinity of the site. The remediation footprint presented in this document is intended to complement the remediation footprint that is being developed by the Participating Parties for addressing risks to human health and aquatic-dependent wildlife. A copy of the authors' Curriculum Vitae is included as Appendix 1 of this report.

2.0 Role of Sediments in Aquatic Ecosystems

The particulate materials that lie below the water in ponds, lakes, streams, rivers, and other aquatic systems are called sediments (ASTM 2009a; 2009b). Sediments represent essential elements of aquatic ecosystems because they support both autotrophic and heterotrophic organisms. Autotrophic (which means self-nourishing) organisms are those that are able to synthesize food from simple inorganic substances (e.g., carbon dioxide, nitrogen, phosphorus) and the sun's energy. Green plants, such as algae, bryophytes (e.g., mosses, liverworts), and aquatic macrophytes (e.g., sedges, reeds, pond weed), are the main autotrophic organisms in freshwater ecosystems. In contrast, heterotrophic (which means other-nourishing) organisms utilize, transform, and decompose the materials that are synthesized by autotrophic organisms (i.e., by consuming or decomposing autotrophic and other heterotrophic organisms). Some of the important heterotrophic organisms that can be present in aquatic ecosystems include bacteria, epibenthic and infaunal invertebrates, fish, amphibians, and reptiles. Birds and mammals can also represent important heterotrophic components of aquatic food webs (i.e., through the consumption of aquatic organisms).

Sediments support the production of food organisms in several ways. Hard-bottom sediments, which are comprised largely of gravels, cobbles, and boulders, provide stable substrates to which periphyton (i.e., the algae that grows on rocks) can attach and grow. Soft sediments, which are common in ponds, lakes, estuaries, and slower-flowing sections of rivers and streams, are comprised largely of sand, silt, and clay. Such sediments provide substrates in which aquatic macrophytes can root and grow. The nutrients that are present in such sediments can also nourish aquatic macrophytes. By providing habitats and nutrients for aquatic plants, sediments support autotrophic production (i.e., the production of green plants) in aquatic systems. Sediments can also support prolific bacterial communities. Bacteria represent important elements of aquatic ecosystems because they decompose organic matter (e.g., the organisms that die and accumulate on the surface of the sediment) and, in so doing, release nutrients to the water column and increase bacterial biomass. Bacteria represent the primary heterotrophic producers in aquatic ecosystems. The role that sediments play in supporting primary productivity (both autotrophic and heterotrophic) is essential because green plants and bacteria represent the foundation of food webs upon which all other aquatic organisms depend (i.e., they are consumed by many other aquatic species).

In addition to their role in supporting primary productivity, sediments also provide essential habitats for many sediment-dwelling invertebrates and benthic fish. Some of these invertebrate species live on the sediments (termed epibenthic species), while others live in the sediments (termed infaunal species). Both epibenthic and infaunal invertebrate species consume plants, bacteria, and other organisms that are associated with the sediments. Invertebrates represent important elements of aquatic ecosystems because they are consumed by a wide range of wildlife species, including fish, birds, and mammals. For example, virtually all fish species consume aquatic invertebrates during all or a portion of their life cycle. In addition, many birds consume aquatic invertebrates during either their aquatic (e.g., sediment-probing birds such as sand pipers) or emergent (e.g., aerial-feeding invertivorous birds swallows) portions of their life cycle. Therefore, sediments are of critical importance to many wildlife species due to the role they play in terms of the production of aquatic invertebrates.

Importantly, sediments can also provide habitats for many wildlife species during portions of their life cycle. For example, juvenile fish often find refuge from predators in sediments and/or in the aquatic vegetation that is supported by the sediments. Therefore, sediments play a variety of essential roles in terms of maintaining the structure (i.e., assemblage of organisms in the system) and function (i.e., the processes that occur in the system) of aquatic ecosystems. Accordingly, it is important to evaluate the effects of contaminated sediment on the major ecological receptor groups that can be adversely affected either directly (i.e., through direct contact with contaminated sediments) or indirectly (i.e., through bioaccumulation and food web transfer) by exposure to sediment-associated COPCs.

3.0 Establishment of Remedial Action Objectives for the San Diego Bay Shipyards Site

Discussions have been ongoing for a protracted period of time regarding management of risks to human health and the environment associated with exposure to sediment-associated contaminants at the Shipyards Site in San Diego Bay, California. While these discussions have provided Participating Parties with an opportunity to share perspectives, they have failed to culminate in a plan for cleaning up contaminated sediments at the site that can be agreed to by all parties. This process has been unsuccessful because participants cannot agree on a number of issues, including:

i. The land and water uses that need to be protected and/or restored at the site;
ii. The level of protection that should be afforded to human health and ecological receptors that are exposed to sediment-associated contaminants at the site;
iii. The data that should be used to evaluate contaminated sediments at the site;
iv. Procedures for interpreting data on sediment quality conditions at the site; and,
v. Preliminary remediation goals (PRGs) that can be used to identify the polygons that should be remediated to achieve risk management goals at the site.

This document is intended to advance future risk management discussions by proposing an approach for evaluating impacts on benthic fish and benthic invertebrates that will support remedial action planning at the site.

3.1 Ecosystem Goals and Objectives

Ecosystem goals are broad narrative statements that define the management goals that have been established for a specific ecosystem. Definition of management goals for the aquatic ecosystem is a fundamental step toward the development of defensible management plans for the area under investigation. Definition of such ecosystem goals requires input from a number of sources to ensure that societal values are adequately represented. Open consultation with the public should be considered a primary source of information for defining these goals. Government agencies, non-government agencies, and other stakeholders should also be consulted during this phase of the process. Importantly, information on the existing and potential uses of the aquatic resources within the basin should be solicited.

In the absence of such consultation with stakeholders, the following ecosystem goals and objectives are proposed for San Diego Bay. Protection and restoration of natural resources should be identified as an important long-term management goal in San Diego Bay. However, this goal is too general to support the development of meaningful planning, research, and management initiatives for the area. To be useful, this candidate ecosystem goal must be further clarified and refined to establish *ecosystem objectives* that are more closely linked with ecosystem science (Harris *et al.* 1987). In turn, the ecosystem objectives support the identification of indicators and metrics that provide direct information for assessing the health and integrity of the ecosystem (See MacDonald and Ingersoll 2002 for a more detailed discussion of the ecosystem-based framework for assessing and managing contaminated sediments). The following ecosystem objectives are proposed for San Diego Bay:

i. Protect and, where necessary, restore benthic conditions that will support a healthy and diverse benthic invertebrate community;
ii. Maintain and, where necessary, restore aquatic environmental conditions that will support a healthy and diverse fish community;

iii. Maintain and, where necessary, restore aquatic, wetland, and terrestrial habitats that will support healthy, diverse, and self-sustaining populations of aquatic-dependent avian species;

iv. Maintain and, where necessary, restore aquatic, wetland, and terrestrial habitats that will support healthy, diverse, and self-sustaining populations of aquatic-dependent mammalian species;

v. Protect any threatened or endangered species that utilize aquatic habitats in the bay;

vi. Reduce the frequency or eliminate fish consumption advisories; and,

vii. Maintain and, where necessary, restore other human uses of San Diego Bay, including primary contact recreation (i.e., swimming) and secondary contact recreation (i.e., boating).

These ecosystem objectives provide a basis for establishing remedial action objectives (RAOs) that are likely to reflect the interests and needs of stakeholders relative to the restoration of natural resource values within San Diego Bay. Remedial actions at the Shipyards Site must be based on such RAOs, if they are to address the needs of all stakeholders and support the long-term ecosystem goals and objectives that have been articulated for San Diego Bay.

3.2 Remedial Action Objectives

Remedial action objectives are statements that express the narrative intent of any remedial actions that are undertaken at a site to mitigate risks to human health and/or ecological receptors. For the Shipyards Site, the RAOs for whole sediment and pore water are intended to address risks to aquatic receptors and human health associated with direct exposure to contaminated sediments. The proposed RAOs for sediment and pore water are:

i. Minimize exposure of aquatic receptors to whole sediments that are sufficiently contaminated to pose moderate risks to the microbial, aquatic plant, benthic invertebrate, and benthic fish communities;

ii. Prevent exposure of aquatic receptors to whole sediments that are sufficiently contaminated to pose high risk to the microbial, aquatic plant, benthic invertebrate, and benthic fish communities;

iii. Minimize human exposure to whole sediments that are sufficiently contaminated to cause an excess lifetime cancer risk of 10^{-5} risk;

iv. Prevent human exposure to whole sediments that are sufficiently contaminated to cause an excess lifetime cancer risk of 10^{-4} risk; and,

v. Prevent human exposure to whole sediments that are sufficiently contaminated to cause a non-cancer hazard index of greater than one.

The RAOs for biological tissues were intended to address risks to fish, aquatic-dependent wildlife, and human health associated with the bioaccumulation of COPCs in the food web. The proposed RAOs for biological tissues include:

i. Reduce the concentrations of COPCs in the tissues of benthic fish to levels that pose no more than moderate risks and, ideally, to levels that pose no more than low risks to fish. For aquatic-dependent wildlife, the proposed RAO is to reduce the concentrations of COPCs in the tissues of prey species, at minimum, to levels that pose no more than moderate risks and, ideally, to levels that pose no more than low risks to sediment-probing birds, carnivorous-wading birds, piscivorus birds, omnivorous mammals, and piscivorus mammals. For humans, the proposed RAO is to minimize or prevent exposure to fish or shellfish tissues that are sufficiently contaminated to cause an excess lifetime cancer risk of 10^{-5} or 10^{-4} risk, respectively (Klasing and Brodberg 2008). Additionally, exposure to fish or shellfish tissues that are sufficiently contaminated to cause a non-cancer hazard index of greater than one should be prevented.

4.0 Chemicals of Potential Concern

Identification of chemicals of potential concern (COPCs) represents an essential element of the remedial investigation process. In general, the COPCs that need to be addressed in a baseline ecological risk assessment (ERA) and/or human health risk assessment (HHRA) are identified by conducting a screening-level ERA and/or HHRA. The results of the ERA and/or HHRA that are conducted subsequently provide a basis for identifying the substances that are causing or substantially contributing to risks to aquatic organisms, aquatic-dependent wildlife, and/or human health. These risk drivers are commonly referred to as contaminants of concern (i.e., COCs; as opposed to COPCs). Application of such a systematic process for identifying COPCs and COCs minimizes the potential that important risk drivers will be missed. In this way, the potential for selecting a remedial alternative that may not effectively mitigate risks to human health and/or ecological receptors can be reduced.

Relative to sediment contamination, COPCs can be classified into two general categories based on their potential effects on ecological receptors, including toxic substances and bioaccumulative substances. for toxic substances that partition into sediments, evaluation of direct effects on sediment-dwelling organisms is likely to represent the primary focus of sediment quality investigations. for bioaccumulative substances, sediment quality assessments are likely to focus on evaluating effects on aquatic-dependent wildlife (i.e., fish, reptiles, birds, mammals) and on human health. Recent discussions among the participating parties on the remedial footprint that could be established for the San Diego Bay Shipyards Site have focused on a limited suite of substances, selected primarily due to their potential to accumulate in the tissues of aquatic organisms, including:

i. Metals (arsenic, cadmium, copper, lead, mercury, and zinc);
ii. Tributyltin (TBT);
iii. Total polychlorinated biphenyls (PCBs; as the sum of the roughly 40 measured congeners); and,

iv. Total high molecular weight polycyclic aromatic hydrocarbons (total HPAHs).

While examination of the underlying data confirms that these substances occur at elevated concentrations in the vicinity of the Shipyards Site, it is unlikely that this suite of COPCs includes all of the potential risk drivers associated with contaminated sediments. More specifically, the list of COPCs should be expanded to include a number of other substances that occur at levels potentially sufficient to cause or substantially contribute to adverse effects on benthic invertebrates, fish, aquatic-dependent wildlife, or human health. Such an expanded list of COPCs should include, at minimum, those substances on the above list and the following substances:

i. Simultaneously extracted metals (SEM; as evaluated using data on acid volatile sulfides; AVS);
ii. Additional metals (chromium, nickel, and selenium);
iii. Additional organotins (monobutyltin, dibutyltin, tetrabutyltin);
iv. Individual PAHs [including 34 parent and alkylated PAHs used in United States Environmental Protection Agency (USEPA) equilibrium-based sediment benchmark-toxic units (ESB-TU) model for non-polar organics];
v. Total low molecular weight PAHs (total LPAH);
vi. Total PAHs; and,
vii. Organochlorine pesticides.

These additional COPCs need to be considered in the evaluation of sediment quality conditions at the Shipyards Site because they have been measured in site sediments and, therefore, need to be evaluated to determine the risks that they pose to benthic invertebrates. While the sum of the measured PCB congeners provides an estimate of total PCB concentrations in sediment and other environmental media, such calculated values tend to underestimate total PCB concentrations. Because the concentrations of each PCB homolog were measured in each sample and the sum of the PCB homologs provides a more accurate estimate of total PCB concentrations, the sum of the homologs should be calculated for each environmental sample and used to evaluate environmental conditions in the vicinity of the Shipyards Site. The PCB congener data are most relevant for evaluating the dioxin-like effects of PCBs.

5.0 Relevant Data for Evaluating Sediment Quality Conditions

There is a wide range of indicators that can be used to evaluate sediment quality conditions at the Shipyards Site in San Diego Bay. Ideally, environmental assessments would include each of the physical, chemical, and biological variables that could, potentially, be affected by anthropogenic activities. However, limitations on human and financial resources preclude this possibility. For this reason, identifying the most relevant indicators for assessing sediment quality conditions is necessary. In recognition of the need to focus data collection programs, MacDonald and Ingersoll (2000) and MacDonald *et al.* (2002a; 2002b) evaluated a variety of candidate indicators and concluded that the following were particularly relevant for assessing sediment quality conditions in aquatic ecosystems.

Receptors of Interest	Indicator of Sediment Quality Conditions
Sediment-dwelling organisms	Chemistry of whole sediments Chemistry of pore water Toxicity of sediments to invertebrates Structure of benthic invertebrate communities
Aquatic-dependent wildlife	Toxicity of sediments to fish Health of fish Status of fish communities Chemistry of whole sediments Chemistry of fish and invertebrate tissues
Human health	Chemistry of whole sediments Chemistry of fish and invertebrate tissues Presence of fish and wildlife consumption advisories

Review of the available documentation (Exponent 2001a; 2001b; 2001c; 2002a; 2002b; 2003) indicates that several types of data have been collected to support the evaluation of sediment quality conditions in the vicinity of the Shipyards site in San Diego Bay including:

i. Whole-sediment chemistry data;
ii. Whole-sediment toxicity data;
iii. Pore-water chemistry data;
iv. Pore-water toxicity data;
v. Benthic macroinvertebrate community structure data;
vi. Invertebrate-tissue chemistry data; and,
vii. Fish-tissue chemistry data.

All of these data types have the potential to provide useful information for evaluating risks to ecological receptors and/or human health associated with direct or indirect exposure to sediment-associated COPCs. However, much of the discussion to date on the remediation footprint has focused on the potential for adverse effects on human health and/or ecological receptors associated with bioaccumulation in the tissues of aquatic organisms. However, it is also important to evaluate the potential effects on benthic invertebrates associated with exposure to contaminated sediments. Accordingly, it is recommended that additional types of data be used to support discussions on the extent of the remedial footprint for the Shipyards Site.

6.0 Procedures for Interpreting Sediment Chemistry Data

Sediment chemistry data provide information that is directly relevant for determining if sediments within an assessment area are contaminated with toxic and/or bioaccumulative substances. However, information on the concentrations of contaminants in whole sediments (i.e., the metrics for sediment chemistry) does not, by itself, provide a basis for determining if the ecosystem goals and objectives are being achieved. For this reason, it is necessary to establish sediment quality targets for sediment chemistry that define the levels of each metric (i.e., the COPCs and mixtures of COPCs) that are likely to support the designated uses of the aquatic ecosystem (i.e., the benthic invertebrate community). These targets can be established by selecting appropriate sediment quality guidelines (SQGs) for each COPC at the site. Such SQGs can be derived using information on contemporary background levels and/or on the concentrations associated with a pre-selected probability of observing adverse biological effects (e.g., MacDonald *et al.* 2000; Field *et al.* 2002).

Effects-based SQGs represent tools that can be used to help establish sediment quality targets that correspond to the specific management goals that have been established for the site under consideration. A variety of numerical SQGs have been developed to support sediment quality assessments in North America. The approaches selected by individual jurisdictions depend on the receptors that are to be considered (e.g., sediment-dwelling organisms, wildlife, or humans), the degree of protection that is to be afforded, the geographic area to which the values are intended to apply (e.g., site-specific, regional, or national), and their intended uses (e.g., screening tools, remediation objectives, identifying toxic and not toxic samples, bioaccumulation assessment).

Recently, CSWRCB (2008) developed numerical SQGs to support evaluations of sediment quality conditions in enclosed bays and estuaries within the state of California. The SQGs for the protection of the benthic invertebrate community in enclosed bays and estuaries are intended to provide a basis for evaluating the risks to sediment-dwelling organisms associated with exposure to a suite of sediment-associated contaminants, including metals (cadmium, copper, lead, mercury, zinc), PAHs (HPAHs, LPAHs) total PCBs, chlordane, DDTs (total DDD, total DDE, total DDT), dieldrin, and trans nonachlor. Two types of SQGs were developed as part of the CSWRCB (2008) Water Quality Control Plan, including chemical score indices (CSIs) and logistic regression models (LRMs). These SQGs were derived using matching sediment chemistry and sediment toxicity data from California bays and estuaries. The SQGs based on P_{MAX} (the maximum probability model, which was derived from the individual chemical model with the highest probability of observing toxicity for a sample; Field *et al.* 2002) have been demonstrated to provide a reliable basis for classifying sediment samples from San Diego Bay as toxic or not toxic, and for evaluating impairment of the benthic invertebrate community in San Diego Bay sediments (i.e., based on Benthic Response Index Scores; Table 2).

7.0 Procedures for Interpreting Sediment Toxicity Data

The objective of a sediment toxicity test is to determine whether contaminated sediments are harmful to benthic organisms (ASTM 2009a; 2009b; USEPA 2000a). Sediment tests can be used to: (1) determine the relationship between toxic effects and bioavailability; (2) investigate interactions among chemicals; (3) compare the sensitivities of different organisms; (4) determine spatial and temporal distribution of contamination; (5) evaluate hazards of dredged material; (6) measure toxicity as part of product licensing or safety testing; (7) rank areas for cleanup; and, (8) estimate the effectiveness of remediation or management practices. Knowledge of specific pathways of interactions among sediments and test organisms is not necessary to conduct the tests.

The results of sediment toxicity tests can be used to assess the bioavailability of contaminants in field-collected sediments. The responses of organisms exposed to field-collected sediments are often compared to the responses of organisms exposed to a negative control material and/or to appropriately-selected reference sediments. The results of toxicity tests on sediments spiked with one or more chemicals can also be used to help establish cause and effect relationships between chemical concentrations and biological responses (ASTM 2009a; 2009b; USEPA 2000a).

The choice of a test organism has a major influence on the relevance, success, and interpretation of a test. As no one organism is best suited for all applications, considering the intended uses of the resultant data is important in the selection of toxicity tests. The following criteria were considered in the selection of the methods and species that were to be described in ASTM (2009a; 2009b) and USEPA (2000b). Ideally, a test organism should:

- i. Have a toxicological database demonstrating relative sensitivity and discrimination to a range of COPCs in sediment;
- ii. Have a database for inter-laboratory comparisons of procedures (for example, round-robin studies);
- iii. Be in contact with sediment (e.g., water column vs. sediment-dwelling organisms);
- iv. Be readily available through culture or from field collection;
- v. Be easily maintained in the laboratory;
- vi. Be easily identified;
- vii. Be ecologically or economically important;
- viii. Have a broad geographical distribution, be indigenous to the site being evaluated (either present or historical), or have a niche similar to organisms of concern at the site (for example, similar feeding guild or behavior to the indigenous organisms);
- ix. Be tolerant of a broad range of sediment physico-chemical characteristics (e.g., grain size); and,
- x. Be compatible with selected exposure methods and endpoints.

The method should also be peer reviewed and confirmed with responses of natural populations of benthic organisms.

A diverse array of whole-sediment and pore-water toxicity tests are available to evaluate contaminated sediments at marine and estuarine sites. It is generally recognized that 10-d whole-sediment toxicity tests with marine and estuarine amphipods represent an essential element of the suite of toxicity tests that should be used to assess marine and estuarine sites. While *Eohaustorius estuarius* and *Rhepoxynius abronius* are the most highly recommended species for conducting such toxicity tests, toxicity testing can be conducted using other amphipod species, considering additional endpoints (i.e., survival, growth, emergence, reburial, and reproduction) and exposure durations (i.e., up to 28-d for *Leptocheirus plumulosus*).

Toxicity testing with other species, evaluating non-lethal endpoints over longer durations of exposure, can provide relevant information for assessing contaminated sediments. For example, 20- to 28-d whole-sediment toxicity tests with polychaetes (e.g., *Neanthes arenaceodentata*; Endpoints: Survival and growth) can provide useful information for assessing risks to benthic invertebrates associated with exposure to contaminated sediments. In addition, 48- to 96-hour sediment-water interface toxicity tests with echinoderm (e.g., *Arbacia punctulata*) or bivalve mollusc larvae (e.g., *Mytilus edulis*; Endpoint: Development) provide tools that provide broader taxonomic coverage and reduce uncertainties associated with the traditional use of these species and life stages (i.e., in pore-water or elutriate exposures).

Certain other toxicity tests may be relevant for assessing marine and estuarine sediments. However, it is now generally agreed that elutriate toxicity tests should not be included in the core suite of tests that are applied at marine and estuarine sites. Elutriate toxicity tests are considered to be more relevant for assessing the effects of open-water disposal of dredged materials than evaluating the toxicity of in-place sediments. Neither solid-phase nor aqueous-phase toxicity tests with the bacterium, *Vibrio fisheri* (i.e., Microtox) are currently recommended for assessing contaminated sediments at marine or estuarine sites, as these tests provide an indication of exposure to contaminants rather than specific measures of effects on benthic organisms.

7.1 Candidate Approaches to Toxicity Designation

At the Shipyards Site, a number of whole-sediment and pore-water toxicity tests have been conducted to evaluate the effects on benthic invertebrates associated with exposure to contaminated sediments. More specifically, 10-d whole-sediment toxicity tests with the amphipod, *Eohaustorius estuarius* (Endpoint: Survival), 48-hr sediment-water interface toxicity tests with the bivalve, *Mytilus galloprovincialis* (Endpoint:

Normal development), and 40-min pore-water toxicity tests with the sea urchin, *Strongylocentrotus purpuratus* (Endpoint: Fertilization) have been conducted on at least 25 sediment samples from the site and five sediment samples from candidate reference areas. Interpretation of the results of these toxicity tests requires a procedure for designating the samples as toxic or not toxic to benthic invertebrates.

A number of approaches can be used to interpret the results of whole-sediment toxicity tests with benthic invertebrates. These approaches can be classified into four general categories, including control comparison approach, minimum significant difference approach, reference envelope approach, and the multiple category approach. Each of these approaches is briefly described below:

i. ***Control Comparison Approach*** - Application of the control comparison approach involves statistical comparison of the responses of test organisms exposed to site sediments to the responses of test organisms exposed to control sediments. Treatments that have responses that are significantly different from those observed in the control treatment(s) are designated as toxic.

ii. ***Minimum Significant Difference Approach*** - Application of the minimum significant difference approach is dependent on the completion of power analyses with data from multiple studies for a specific toxicity test. These results are used to identify the minimum significant difference (MSD or minimum detectable difference; MDD) from the control treatment. Treatments with response levels greater than the MSD are designated as toxic (Thursby *et al.* 1997; Phillips *et al.* 2001).

iii. ***Reference Envelope Approach*** - Application of the reference envelope approach involves collection and testing of sediment samples from a number of reference sites within or nearby the study area. In this context, a reference sediment sample is considered to be a whole-sediment sample obtained near an area of concern used to assess sediment conditions exclusive of the materials of interest (i.e., COPCs; ASTM 2009a; 2009b). The results of the toxicity testing conducted on these samples can be used to develop a reference envelope (i.e., normal range of responses of test organisms exposed to reference sediments, as defined by ASTM 2009a; 2009b; 2009c). Sediment samples with response levels that fall outside the normal range of responses (e.g., survival below the 5th percentile for the reference samples) are designated as toxic.

iv. ***Multiple Category Approach*** - Application of the multiple category approach involves classifying sediment samples into various groups (e.g., not toxic, low toxicity, moderate toxicity, or high toxicity), based on the magnitude of the observed response. The results of statistical comparisons to the negative control results are also used to classify sediment samples into the various categories.

Recently (2007), the Sustainable Fisheries Foundation (SFF) convened an expert's workshop in Victoria, British Columbia (B.C.), on behalf of the Ministry of the Environment (B.C.) to explore the question of how to interpret the results of sediment toxicity tests (SFF 2007). At this workshop, participants agreed that site-wide ecological risk assessments represent the most important applications of whole-sediment toxicity data. More specifically, it was agreed that the results of the toxicity testing program that is implemented at a site should support the development of site-specific toxicity thresholds (i.e., to support development of PRGs and/or clean-up goals). Workshop participants also recognized that interpretation of toxicity test results may necessitate designation of individual sediment samples as toxic or not toxic (e.g., hot spot identification, evaluation of the spatial extent of toxicity). In these cases, workshop participants agreed that the reference envelope approach provides one of the most effective basis for interpreting the results of toxicity tests.

7.2 Criteria for Identifying Reference Sediment Samples/Stations

As indicated above, the reference envelope approach is likely to provide a robust and defensible basis for designating sediment samples from the Shipyards Site as toxic or not toxic relative to reference conditions in the Bay. Therefore, it is recommended that the reference envelope approach be included in the process that will be used to interpret the results of whole-sediment toxicity tests conducted with sediment from the Shipyards Site (as described in Section 7.1).

In general, application of the reference envelope approach necessitates identification of candidate reference sites (i.e., sites that are relatively unimpacted by anthropogenic activities) as part of the overall sampling program design. Understanding the importance of data from reference locations, Exponent (2001a) collected whole-sediment samples at a total of five reference stations. While these data represent an important element of the overall sediment quality assessment program, they may not be sufficient to define reference conditions for the site. Experience at other sites suggests that 10 to 15 sediment samples are needed to adequately characterize variability in the responses of toxicity test organisms associated with exposure to reference sediments. Therefore, data from other sediment quality investigations conducted in San Diego will likely be needed to identify a suitable number of reference sites. The following procedure is recommended for developing reference envelopes for the toxicity test endpoints that have been used to characterize sediment quality conditions at the site. The criteria for sediment chemistry, sediment toxicity, ***and*** benthic invertebrate community structure must be met for a station to be included in the reference pool.

i. ***Criteria for Whole-Sediment Chemistry*** - Whole-sediment chemistry data provide a basis for determining if sediments have been contaminated due to releases of potentially hazardous substances. The following criteria for whole-sediment chemistry are recommended for evaluating candidate reference samples (USEPA 2003; 2005; CSWRCB 2008):

- $P_{MAX} < 0.33$;
- $\sum ESB\text{-}TU_{PAHs} < 0.1$; and,
- $\sum (SEM\text{-}AVS)/f_{oc} < 130$.

Exposure to sediment samples with such chemical characteristics has been shown to have minimal adverse effects on sediment-dwelling organisms (Field *et al.* 2002; USEPA 2003; 2005). At minimum, whole-sediment chemistry data for total metals, SEM, AVS, PAHs, PCBs, and organochlorine pesticides are required to support a conclusion that a candidate reference station has chemical characteristics that would result in minimal exposure of sediment-dwelling organisms to site-related COPCs.

ii. ***Criteria for Whole-Sediment Toxicity*** - Whole-sediment toxicity data should be examined during the reference sample selection process to ensure that unmeasured contaminants or other factors are not influencing benthic invertebrates. The following criteria for whole-sediment toxicity are recommended for evaluating candidate reference samples (CSWRCB 2008):

- Control-adjusted survival of the amphipod, *Leptocheirus plumulosus*, *Eohaustorius estuarius* and/or *Rhepoxynius abronius*, in 10-d whole-sediment toxicity tests is $\geq$ 90%;
- Control-adjusted growth of the polychaete, *Neanthes arenaceodentata,* in 28-d whole-sediment toxicity tests is $\geq$ 90%; and,
- Control-adjusted normal development of larvae of mussels, *Mytilus galloprovincialis,* in 48-h sediment-water interface toxicity tests is $\geq$ 80%.

These criteria correspond to the test acceptability criteria for the negative controls.

At minimum, whole-sediment toxicity data for at least two of these tests are required to support a conclusion that a candidate reference station is not toxic to sediment-dwelling organisms.

iii. ***Criteria for Benthic Invertebrate Community Structure*** - Benthic invertebrate community structure data should also be examined to confirm that unmeasured substances are not adversely affecting benthic invertebrates in candidate reference samples. The following criteria for benthic invertebrate community structure are recommended for evaluating candidate reference samples (CSWRCB 2008):

- Benthic Response Index < 39.96;
- Index of Biotic Integrity = 0;
- Relative Benthic Index (RBI) > 0.27; and,
- Rivers Invertebrate Prediction and Classification System (RIVPACS) > 0.9.

Benthic invertebrate community structure data provide ancillary information for determining if a candidate reference station is likely to have an undisturbed benthic invertebrate community. However, such data are not required to include a station in the reference pool, provided that the criteria for sediment chemistry and toxicity are met.

Sediment samples that meet the above described criteria should be identified as reference samples and included in the reference pool for San Diego Bay.

7.3 Procedures for Applying the Reference Envelope Approach for Interpreting Sediment Toxicity Data

A reference envelope is considered to represent the normal range of toxicological responses for toxicity test organisms exposed to sediment samples that contain background levels of COPCs (i.e., see ASTM definition of reference sediments).

Implementation of the reference envelope approach necessitates determination of the normal range of responses for each toxicity test conducted and endpoint measured in a study. The reference envelope is commonly calculated in a manner such that it encompasses 95% of the variability in the response data. While several procedures can be used to calculate the reference envelope, it is recommended that the lower limit of the reference envelope be calculated as the 5th percentile of the control-adjusted response data for each toxicity test and endpoint. The following procedures are recommended for designating sediment samples as toxic or not toxic using the reference envelope approach:

i. Log-transform the response data for each toxicity test endpoint (assuming the data are log-normally distributed);
ii. Calculate the 5th percentile response level for each toxicity test endpoint. The normal range of reference responses spans the range from the 5th percentile value to the maximum value in the data set; and,
iii. Designate sediment samples with effect values lower than the lower limit of the normal range of control-adjusted responses in reference samples (i.e., lower than the 5th percentile) as toxic for the endpoint under consideration.

As indicated in Section 7.1, the criteria for statistical difference from the control would also need to be met to designate a sediment sample as toxic using the reference envelope approach. It is important to note that application of this approach results in the designation of toxicity on an endpoint-by-endpoint basis. Therefore, a single sample can be designated as toxic for certain endpoints and not toxic for other endpoints. This reflects differences in species sensitivity and differences in mechanisms of toxic action, as expressed in response to exposure to the mixture of contaminants in the sediments.

8.0 Procedures for Interpreting Benthic Invertebrate Community Structure Data

Benthic invertebrate community structure (BICS) is typically evaluated by collecting sediment samples in the field, sieving the samples with a 0.5 mm (or similar) screen, and enumerating the organisms that are retained on the screen. To the extent possible, the benthic invertebrates are identified to genus or species level and the abundance of each species is determined. The raw data are then evaluated in various ways to support their interpretation, with such analyses usually dependent on collection of samples from both reference (presumed unimpacted) and test (possibly impacted) sites.

In California, four key indicators of BICS are commonly used to evaluate sediment quality conditions, including 1) Index of Biotic Integrity (IBI); 2) Relative Benthic Index (RBI); 3) Benthic Response Index (BRI); and 4) River Invertebrate Prediction and Classification System (RIVPAC). CSWRCB (2008) provides detailed descriptions of each of these indicators and describes the procedures used to calculate each index.

9.0 Procedures for Interpreting Tissue Chemistry and Bioaccumulation Data

Contaminated sediments represent important sources of the substances that accumulate in aquatic food webs (Ingersoll *et al.* 1997). Because these contaminants can adversely affect aquatic organisms, aquatic-dependent wildlife, and/or human health, tissue chemistry represents an important indicator in sediment quality assessments (ASTM 2009d; USEPA 2000a). In general, the concentrations of bioaccumulative COPCs in the tissues of sediment-dwelling organisms and fish represent the primary metrics for tissue chemistry. As wildlife species typically consume the entire prey organism, whole-body COPC levels are the most relevant for assessing risks to aquatic-dependent wildlife. In contrast, the levels of COPCs in edible tissue represents the most important metrics for human health assessments. Assessments that are directed at evaluating COPC residues in the tissues of benthic macroinvertebrates and fish should focus on the bioaccumulative COPCs that are known or suspected to occur in sediments at the site under investigation. Typically, the COPCs that are considered in such assessments include: metals, methyl mercury, PAHs, PCBs, organochlorine pesticides, chlorophenols, organotins and/or polychlorinated dibenzo-*p*-dioxins/polychlorinated dibenzofurans. Ingersoll *et al.* (1997) identified three general approaches for conducting bioaccumulation assessments, including:

i. A laboratory approach, which involves exposing organisms to sediment under controlled conditions;
ii. A field approach which involves collecting organisms from a study area; and,
iii. Models to predict bioaccumulation processes.

In the laboratory approach, individuals of a single species are exposed to sediments collected from the study area being assessed under controlled laboratory conditions (ASTM 2009d; USEPA 2000b). After an established period of exposure (usually 28 days), the tissues of the organisms are analyzed for the COPCs. Bioaccumulation has occurred if the final concentrations in tissues exceed concentrations that were present in tissues before the exposure was started. This requires that individuals representative of initial conditions also be analyzed. This approach has been routinely applied in the assessment of contaminated sediments (ASTM 2009d; USEPA 2000b).

In the field approach, concentrations of COPCs in tissues are determined by collecting one or more species exposed to sediments at the study area being assessed. Organisms representing various trophic levels may be collected and analyzed to determine tissue residue levels. These concentrations are compared to those that have been measured in the tissues of organisms collected from appropriately selected reference area(s). Two methods have been used to determine bioaccumulation in the field:

i. Organisms resident at the area are collected *in situ* for analysis; or,

ii. Organisms are transplanted from another location (presumably with a history of little contaminant exposure) to the area of concern then re-collected, and tissues are analyzed after an established period of exposure.

In some cases, semipermeable membrane devices (SPMDs) are deployed in the field for specified time periods to simulate exposures of aquatic organisms to COPCs (Williamson *et al.* 2002).

Models that describe bioaccumulation are relatively well developed for both organic and inorganic contaminants (Thomann 1989; Luoma and Fisher 1997; ASTM 2009d). Toxicokinetic models have a long history, as do simpler models of bioaccumulation processes. Site-specific models predict bioaccumulation on the basis of laboratory-determined characterization of biological processes in the species of interest and field-determined chemical measurements at the area of concern. Some uncertainties remain unresolved in most models and consensus does not exist about the appropriate model to apply for some (if not all) COPCs (Luoma and Fisher 1997).

Equilibrium models are commonly employed in assessments of bioaccumulation and are available for both organic and inorganic COPCs (Di Toro *et al.* 1991; Ankley *et al.* 1996). The models assume that the concentrations of COPCs among all compartments of the environment are controlled by thermodynamics and at least approach equilibrium conditions. If thermodynamic equilibrium exists and if one route of uptake is known or can be predicted, overall bioaccumulation is inferred. Recent applications use an extension of the equilibrium models, termed kinetic or pathway models (ASTM 2009d). These models incorporate geochemical principles and also address uncertainties in the assumptions of equilibrium. Kinetic models assume that routes of bioaccumulation are additive and must be determined independently. Kinetic models and equilibrium models may yield similar results if COPC distributions and concentrations in an environment are at equilibrium (although not always), but can yield different results where environmental compartments are not at equilibrium (e.g., if biological processes control concentrations, speciation, or phase partitioning of COPCs; Ingersoll *et al.* 1997).

Tissue residue guidelines for the protection of aquatic organisms, wildlife species, and/or human health represent candidate sediment quality targets that are used to interpret the results of bioaccumulation assessments. However, a variety of risk-based procedures have also been developed to evaluate the results of such assessments (i.e., by calculating average daily doses of COPCs for specific receptor groups and comparing them to no or lowest observed effect doses). These tools can also be used to back-calculate to the concentrations of COPCs in sediment that will protect human health and ecological receptors.

10.0 Procedures for Identifying Impaired Sediments at the Shipyards Site

Sediment quality assessments are typically conducted to determine if sediments have become contaminated as a result of land or water use activities. When such contamination is indicated, the results of sediment quality assessments need to provide the information required to evaluate the nature, severity, and areal extent of sediment contamination. In turn, this information can be used to identify actual and probable use impairments in the assessment area. As indicated previously, investigators can select a variety of indicators for evaluating sediment quality conditions. Data on such indicators can provide useful information for assessing effects on aquatic life, wildlife, or human health.

While individual indicators of sediment quality each have an inherent level of uncertainty associated with their application, the uncertainty associated with an overall assessment of sediment quality conditions can be reduced by integrating information from each of these individual indicators. For example, sediment chemistry, sediment toxicity, and benthic invertebrate community structure data can be used together in a sediment quality triad assessment to establish a weight-of-evidence linking contaminated sediments to adverse effects on sediment-dwelling organisms. Integration of multiple tools using a weight-of-evidence approach has the potential to substantially reduce uncertainty associated with risk assessments of contaminated sediment and, thereby, improve management decisions (Long and Chapman 1985; Chapman 1992; Canfield *et al.* 1996; Ingersoll *et al.* 1997; Wenning and Ingersoll 2002).

Formulation of a scientifically-defensible remedial action plan (RAP) for the Shipyards Site necessitates the development and implementation of a systematic process for designating individual sediment samples as impaired or not impaired. Such a process should consider the potential for adverse effects on four general classes of receptor groups, including benthic invertebrate community, benthic fish community, aquatic-dependent wildlife, and humans that utilize aquatic resources within San Diego Bay. The following sections of this document describe the procedures that are recommended for evaluating sediment quality conditions in the vicinity of the Shipyards Site relative to the potential for impairment of the benthic invertebrate and benthic fish communities.

10.1 Procedures for Identifying Impairment to the Benthic Invertebrate Community

As indicated previously, there are a number of procedures that could be used to evaluate risks to benthic invertebrates at the Shipyards Site in San Diego Bay. All of these procedures can be used to evaluate sediment quality conditions on a sample-by-sample basis. This is important because risks to locally-important populations of benthic invertebrates (i.e., those contained within individual polygons) should be evaluated to ensure that any remedial measures identified will effectively address contamination within sediment hot spots at the site. The procedure that is proposed to advance discussions on the remedial footprint at the Shipyards Site relies on up to five data types, including:

i. Whole-sediment chemistry;
ii. Pore-water chemistry;
iii. Whole-sediment toxicity;
iv. Pore-water toxicity; and,
v. Benthic invertebrate community structure (BICS).

Based on a review of the tools that are currently available, data on the three legs of the sediment quality triad were used to evaluate risks to benthic invertebrates at the site. That is, chemistry, toxicity, and BICS were evaluated and integrated, as available, to determine if exposure to contaminated sediments is likely to be impairing the benthic invertebrate community in the vicinity of the Shipyards Site.

For the chemistry leg of the sediment quality triad, whole-sediment chemistry and pore-water chemistry data were considered together to determine if the concentrations of COPCs that have been measured at a station are sufficient to adversely affect sediment-dwelling organisms. In accordance with the guidance offered by the CSWRCB (2008), exposure of benthic invertebrates to sediment-associated COPCs was classified into four categories using the P_{MAX} (the maximum probability model, which was derived from the individual chemical model with the highest probability of observing toxicity for a sample; Field *et al.* 2002), that was calculated for each sediment sample (Table 1), as follows:

i. Minimal Exposure - $P_{MAX} < 0.33$;
ii. Low Exposure - P_{MAX} 0.33 to 0.49;
iii. Moderate Exposure - P_{MAX} 0.50 to 0.66; or,
iv. High Exposure - $P_{MAX} > 0.66$.

These categories are consistent with those recommended by CSWRCB (2008). While CSWRCB (2008) also recommended application of a chemical score index (CSI), application of the P_{MAX} model alone provides a reliable basis for classifying sediment samples in terms of their potential toxicity to benthic organisms (Table 2). Pore-water chemistry data were also considered in the evaluation of benthic invertebrate exposure to sediment-associated COPCs. More specifically, sediment samples were classified into four exposure categories based on the maximum multiple of the California Toxics Rule (CTR) water quality criteria (WQC) that was calculated for each COPC in pore water (Table 1), as follows:

i. Minimal Exposure - Maximum Multiple of CTR WQC < 1.0;
ii. Low Exposure - Maximum Multiple of CTR WQC 1.0 to < 5.0;
iii. Moderate Exposure - Maximum Multiple of CTR WQC 5.0 to 10.0; or,
iv. High Exposure - Maximum Multiple of CTR WQC > 10.0.

Water quality criteria represent the concentrations of COPCs that are intended to protect 95% of aquatic species against adverse effects associated with exposure to water. The above exposure categories represent multiples of the WQC that may not be directly correlated with adverse effects on aquatic organisms. Nevertheless, examination of the underlying toxicity data for many chemicals indicates that adverse effects are likely to occur on certain species at COPC concentrations more than five times the WQC.

For each station, the higher of the exposure categories determined using the whole-sediment chemistry or the pore-water chemistry data was selected to represent exposure of benthic invertebrates to sediment-associated COPCs (Table 1). Table 2 presents the results of an evaluation of the predictive ability of the P_{MAX}-based exposure categories for San Diego Bay. These results show that the probability of observing sediment toxicity or benthic community impairment is generally low at P_{MAX} values < 0.49. Average control-adjusted amphipod survival is lower (86%) and the frequency of toxicity is higher (64%) at P_{MAX} values between 0.50 and 0.66. The lowest average control-adjusted amphipod survival (77%) and highest frequency of toxicity (84%) were observed for sediment samples from the Bay with P_{MAX} values $\geq$ 0.67. Therefore, sediment samples from San Diego Bay with P_{MAX} values of $\geq$ 0.50 are likely to be toxic to benthic invertebrates.

For the toxicity leg of the sediment quality triad, the results of three toxicity tests were considered to determine if exposure to whole-sediment or pore-water samples from the Shipyards Site would adversely affect benthic invertebrates. The three toxicity tests include:

i. 10-d whole-sediment toxicity tests with the amphipod, *Eohaustorius estuarius* (Endpoint: Survival);
ii. 48-hr sediment-water interface toxicity tests with the bivalve, *Mytilus galloprovincialis* (Endpoint: Normal development); and,
iii. 40-min pore-water toxicity tests with the sea urchin, *Strongylocentrotus purpuratus* (Endpoint: Fertilization).

One of these tests provides information on the lethal effects on benthic invertebrates exposed to whole sediment (i.e., the 10-d lethality test with amphipods). The other two tests provide information on sub-lethal effects on benthic organisms exposed to contaminants at the sediment-water interface or in pore water. While the results of these toxicity tests are likely to provide relevant information for evaluating impairments to the benthic invertebrate community, the assessment would be improved if the results of longer-term toxicity tests were also available (e.g., 28-d survival and growth of the polychaete, *Neanthes arenaceodentata* and/or survival, growth, and reproduction of the amphipod, *Leptocheirus plumulosus*).

Interpretation of the results of these toxicity tests necessitates the identification of critical response values (i.e., toxicity thresholds). Procedures for designating sediment samples as toxic or not toxic using the reference envelope approach were described earlier in this document. However, consensus reference envelopes for the three toxicity tests that were used to evaluate sediment samples from the Shipyards Site have not yet been established because the participating parties have not been able to reach agreement on a group of samples for defining reference conditions and because the reference area criteria described in this document have not been applied. For this reason, an alternate approach was used to interpret the results of the toxicity tests, as follows (Table 3; CSWRCB 2008):

Level of Toxicity	Amphipod Survival	Mussel Normal	Sea Urchin Fertilization
Not Toxic	90 - 100%	80 - 100%	80 - 100%
Low Toxicity	82 - 89%	77 - 79%	70 - < 80%
Moderate Toxicity	59 - 81%	42 - 76%	60 - < 70%
High Toxicity	< 59%	< 42%	< 60%

These response categories were generally established using the guidance provided by the CSWRCB (2008). The procedure for interpreting the results of the sea urchin toxicity tests was selected because it is generally consistent with the results of power analyses conducted for the 48-hr sea urchin fertilization and embryo development toxicity test (Carr and Biedenbach 1999). That is, it is reasonable to classify samples with sea urchin fertilization rates ≥ 80% as not toxic. The other three categories that were established represent 10% increments in the magnitude-of-toxicity beyond the toxicity threshold (i.e., 80%). For each station, the toxicity categories determined for each toxicity test were compared (Table 3) and the highest toxicity category was selected to represent the maximum toxicity at a station. This procedure for integrating toxicity test results was selected because each of the three toxicity tests provides unique information on the toxicity of contaminated sediments to benthic invertebrates (adverse effects on survival, reproduction and/or early development have the potential to impair the benthic community). In addition, the absence of data on the toxicity of site sediments to benthic invertebrates in longer-term exposures increases uncertainty in the level of protection afforded benthic invertebrates when not toxic conditions are identified using the results of the selected toxicity tests. Selection of the highest toxicity category for each station reduces the potential for underestimating whole-sediment and/or pore-water toxicity.

For the BICS leg of the sediment quality triad, data on several multi-metric indices were integrated to determine if benthic invertebrate communities were likely impaired in the vicinity of the Shipyards Site. More specifically, results for the IBI, the RBI, and the BRI were compiled for each sediment sample and used to determine a response category for each index (i.e., reference, low disturbance, moderate disturbance, or high disturbance; Table 4). For each of these metrics, disturbance of the benthic invertebrate community was evaluated using the score that was determined from the raw data [S. Bay, Personal communication, Southern California Coastal Water Research Project (SCCWRP), 110-3535 Harbor Boulevard, Costa Mesa, California 92626], as follows:

Disturbance Category	BRI Score	IBI Score	RBI Score	RIVPACS Score
Reference Conditions	< 39.96	0	> 0.27	> 0.9 - < 1.1
Low Disturbance	39.96 - 49.14	1	0.17 - 0.27	0.75 - 0.9 *or* 1.10 - 1.25
Moderate Disturbance	49.15 - 73.26	2	0.09 - 0.16	0.33 - 0.74 *or* > 1.25
High Disturbance	> 73.26	3 or 4	< 0.09	< 0.33

The RIVPACS was not used in this assessment because SCCWRP did not calculate scores for this index. The highest of the benthic index response categories for up to three indices was used to classify individual samples relative to disturbance to the benthic invertebrate community (Table 4). This approach was used because each index has the potential to provide unique information on the status of the benthic invertebrate communities.

The three legs of the sediment quality triad were integrated to develop a final determination of risk for each station, using the contingency table developed by

CSWRCB (2008; Table 5). Using this procedure, sediment samples were placed into one of four categories, including (Table 6).

Risk to Benthic Invertebrates	Overall Evaluation of Station (Table 6)
Low Risk	Unimpacted; Likely Unimpacted
Moderate Risk	Possibly Impacted
High Risk	Likely Impacted; Clearly Impacted
Uncertain Risk; More data required	Inconclusive

The results of the integrated risk evaluation for the benthic invertebrate community are presented in Figure 1. In this figure, the area represented by each station is identified by the station number (i.e., using the Thiessen polygons that were established by the responsible parties). The high risk sites should be considered to be the highest priority for implementing remedial measures that reduce or eliminate exposure of benthic invertebrates to sediment associated contaminants. The low risk sites should be considered to have conditions sufficient to support a viable benthic invertebrate community. Additional information should be collected to determine if remedial actions are required at sites that were classified as posing moderate or uncertain risks to benthic invertebrates (Figure 1). In some cases, multiple samples were collected at a station and the resultant risk classifications do not agree. In those cases, risks to the benthic invertebrate community were considered to be inconclusive and more data should be collected to confirm or reject the need for remedial action.

The foregoing evaluation of risks to the benthic community is based on analysis of the available sediment quality data for the Shipyards Site using generally-accepted approaches and procedures for conducting such assessments. However, it is acknowledged that other procedures could have been applied to these data. For example, the available sediment chemistry data could have been evaluated using alternate sediment quality guidelines and/or other chemical mixture models. As the P_{MAX} model was shown to provide a reliable basis for classifying sediment samples from San Diego Bay as toxic and not toxic to benthic invertebrates, application of the P_{MAX} model was considered to be reasonable. Alternate procedures for evaluating sediment chemistry should also be subject to this type of reliability assessment prior to their application at the Shipyards Site. Similarly, sediment samples could be designated as toxic and not toxic using a variety of procedures (see Section 7.1). The approach used in this evaluation was based on the guidance provided by the CSWRCB (2008) and is considered to be reliable for California bays and estuaries. Nevertheless, the reference envelope would provide a more site-specific basis for assessing sediment toxicity and should be considered by the responsible authority. Finally, alternate approaches could have been used to interpret benthic invertebrate community structure data and to integrate multiple lines-of-evidence. However, the procedures used in this evaluation are based on interpretations of a robust data set for the State of California by highly qualified sediment quality practitioners (CSWRCB 2008). Therefore, the procedures used in this evaluation are considered to be reliable.

10.2 Procedures for Identifying Impairment to the Benthic Fish Community

A variety of approaches have been used to evaluate risks to the benthic fish community associated with exposure to sediment-associated COPCs. These approaches typically rely on one or more of the following data types:

i. Near-bottom water chemistry;
ii. Whole-sediment chemistry;
iii. Pore-water chemistry;
iv. Whole-sediment toxicity;
v. Pore-water toxicity;
vi. Prey-tissue chemistry;
vii. Fish-tissue chemistry;
viii. Benthic fish community structure and abundance; and/or,
ix. Various fish health metrics (e.g., incidence of lesions and tumors).

While each of these lines-of-evidence can provide important information for evaluating risks to fish associated with exposure to contaminated sediments, application of approaches reliant on such data is challenging for the Shipyards Site because certain types of information are not readily available. For example, near-bottom water chemistry data, whole-sediment toxicity data, pore-water toxicity data, tissue chemistry data for benthic fish with small home ranges, benthic fish community structure and abundance data, and fish health data were not located for the Shipyards Site. In addition, it is challenging to evaluate risks to fish by modeling total daily doses of COPCs for fish, primarily because relevant toxicity reference values (TRVs) are generally unavailable. Finally, uncertainties associated with exposure estimation and effects assessment can influence the use of whole-sediment chemistry and pore-water chemistry data for evaluating risks to benthic fish.

In this evaluation, the concentrations of selected bioaccumulative COPCs in the tissues of benthic fish (i.e., gobies) were estimated for each of the Thiessen polygons that were generated from the site. More specifically, fish tissue concentrations were estimated using the measured concentrations of total PCBs (sum of homologs; Table 7), TBT (Table 8), and mercury (Table 9) in sediment samples from the site, the average bioaccumulation factors/sediment-biota bioaccumulation factor (BAFs/BSAFs) that were determined for sand bass at the Shipyards Site (Zeeman 2004; i.e., 1.61 for total PCBs, 0.22 for TBT, and 0.54 for mercury, on a dry weight to dry weight basis; excluding data for reference sites, measured levels of total organic carbon in sediment samples, and estimated concentrations of lipid in goby tissues; i.e., 4%, which was the minimum level reported for naked gobies; Lederhouse *et al.* 2007). Table 10 presents a summary of the evaluation of impairment to the benthic fish community when considering all of the three COPCs together. The equations used to estimate the concentrations of bioaccumulative COPCs in benthic fish tissues are presented below:

For PCBs and TBT:

[Fish Tissue (DW)] = [Sediment (DW)] x f-lipid/f_{oc} x BSAF

For Mercury:

[Fish Tissue (DW)] = [Sediment (DW)] x BAF

Conditions sufficient to impair the benthic fish community were considered to exist if the predicted concentrations of one or more bioaccumulative COPCs in the tissues of benthic fish exceeded the following toxicity thresholds:

i. Total PCBs - 1.95 mg/kg DW (geometric mean of the no observed effect level and lowest observed effect level; for reproduction; Orn *et al.* 1998; Table 7);
ii. TBT - 2.0 mg/kg DW (lowest observed effect concentration for growth of yolk-sac fry; Meador *et al.* 2002; Table 8); and,
iii. Mercury - 13.5 mg/kg DW(no observed effect concentration for mortality or abnormalities; McKim *et al.* 1976; Table 9).

These results were used to categorize sediment samples into two groups based on the risks that they posed to the benthic fish community as follows:

i. Low Risk: Benthic Fish Community Likely Unimpacted (all COPCs < TRVs); or,
ii. High Risk; Benthic Fish Community Likely Impacted (one or more COPCs $\geq$ TRVs).

These results were then used to generate a map of the site that showed how each of the Thiessen polygons were designated relative to the impacts of contaminated sediments on the benthic fish community in the vicinity of the Shipyards Site (Figure 2).

These toxicity thresholds were established based on the results of reviews of the scientific literature on the effects of tissue-associated COPCs on various fish species. As fish exhibit variable sensitivities to bioaccumulative COPCs, these toxicity thresholds could over-estimate or under-estimate toxicity to gobies. As adverse effects on fish have been observed at concentrations well below each of the selective toxicity thresholds, it is not unlikely that this evaluation under-estimates toxicity to gobies in the vicinity the Shipyards Site.

11.0 Proposed Remediation Footprint

The Participating Parties in the mediation process have been developing a remediation footprint for the Shipyards Sites based on evaluations of the potential for adverse effects on human health and/or aquatic-dependent wildlife associated with dietary exposure to bioaccumulative COPCs. While this information is useful for initiating the remedial alternative evaluation process, it is insufficient to support the development of an RAP for the site. Importantly, effects on benthic invertebrates and fish must be considered in the development of remedial alternatives for the Shipyards Site. To assist the participating parties in further developing the remediation footprint, the Thiessen polygons that would need to be remediated to mitigate effects on benthic invertebrates and/or benthic fish have been identified using the procedures described in Section 9.

The results of the evaluation of impacts on the benthic invertebrate community associated with exposure to contaminated sediments in the vicinity of the Shipyards Site in San Diego Bay are shown in Figure 1. In this figure, each Thiessen polygon was assigned a color based on the probability that impacts have occurred on the benthic invertebrate community, as follows:

i. High Risk to Benthic Community - Red;
ii. Moderate Risk Benthic Community - Yellow;
iii. Low Risk to Benthic Community - Green; or,
iv. Uncertain Risk to Benthic Community - White.

The results of the evaluation of impacts on the benthic fish community associated with exposure to contaminated sediments in the vicinity of the Shipyards Site in San Diego Bay are shown in Figure 2. In this figure, each Thiessen polygon was assigned a color based on the probability that impacts have occurred on the benthic fish community, as follows:

i. High Risk to Benthic Fish Community - Red; or,
ii. Tolerable Risk to Benthic Fish Community - Green.

Figure 3 integrates the results of the benthic invertebrate and benthic fish assessments. In this figure, each Thiessen polygon was assigned a color based on the probability that impacts have occurred on the benthic invertebrate community or the benthic fish community (i.e., the higher of the two risk classifications for fish or invertebrates was selected for each polygon), as follows:

i. High Risk to Benthic Invertebrate or Fish Communities - Red;
ii. Moderate Risk to Benthic Invertebrate or Fish Communities - Yellow;
iii. Low/Tolerable Risk to Benthic Invertebrate or Fish Communities - Green; or,
iv. Uncertain Risk to Benthic Invertebrate or Fish Communities - White.

Integration of these results with the remediation footprint developed to address risks to human health and/or aquatic-dependent wildlife will provide a robust basis for identifying a remediation footprint consistent with the RAOs identified previously. Such a remediation footprint is more likely to be acceptable to the public than the proposal that is currently being considered by the responsible parties. In addition, development and implementation of a RAP that encompassed this remediation footprint would minimize the potential for leaving COPCs in place that would result in residual injury to natural resources at the site. The Natural Resource Damage Assessment (NRDA) process provides a framework for evaluating and quantifying such natural resource injuries.

12.0 Summary and Conclusions

This report was prepared to provide an independent review of the available sediment quality data for the Shipyards Site in San Diego Bay, California. The results of this evaluation show that exposure to sediment poses moderate to high risks to benthic invertebrates throughout much of the Shipyards Site (Figure 1). Low risks to benthic invertebrates were apparent for only two of the sampling stations at the site. Uncertain risks were identified at another seven sampling stations. Additional data should be collected to enhance understanding of risks to benthic invertebrates at those stations where moderate or uncertain risks were identified. High risks to benthic fish were identified at 27 of the stations sampled in the vicinity of the Shipyards Site (Figure 2).

As part of this evaluation, remedial action objectives (RAOs) were articulated for the Shipyards Site. Such RAOs provide narrative objectives for the site that guide the interpretation of various risk assessments relative to the need for, and spatial extent of, management actions to address risks to human health and ecological receptors. Establishment of such RAOs is essential for the effective management of the Shipyards Site. The remedial footprint presented in Figure 3 identifies the polygons that require remediation to address risks to benthic invertebrates and/or fish. These areas should be considered to be the highest priority for the implementation of remedial measures. By way of comparison, the stations that were classified by the California Regional Water Quality Control Board-San Diego Region as likely adversely impacted, possibly adversely impacted, and unlikely adversely impacted relative to the benthic invertebrate community are identified in Figure 4 (CSRWQCB-SDR 2008).

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Tables

Table 1. Evaluation of whole-sediment chemistry and pore-water chemistry data for the Shipyards Site.

Station	Whole-Sediment Chemistry (WSC)		Pore-Water Chemistry (PWC)		Maximum Exposure Level for WSC and PWC
	P_{MAX}	Exposure Level	Maximum Multiple of CTR WQC	Exposure Level	
NA01	0.6923	High	5 (Cu)	Moderate	High
NA01	0.7222	High	5 (Cu)	Moderate	High
NA01	0.8649	High	5 (Cu)	Moderate	High
NA02	0.6564	Moderate	ND	ND	Moderate
NA02	0.6495	Moderate	ND	ND	Moderate
NA03	0.7065	High	ND	ND	High
NA04	0.7087	High	ND	ND	High
NA04	0.7794	High	ND	ND	High
NA05	0.6165	Moderate	ND	ND	Moderate
NA06	0.7878	High	11 (Cu)	High	High
NA06	0.7373	High	11 (Cu)	High	High
NA06	0.7781	High	11 (Cu)	High	High
NA07	0.7196	High	ND	ND	High
NA08	0.7266	High	ND	ND	High
NA09	0.7215	High	ND	ND	High
NA09	0.8394	High	ND	ND	High
NA10	0.6002	Moderate	ND	ND	Moderate
NA11	0.6423	Moderate	ND	ND	Moderate
NA12	0.6177	Moderate	ND	ND	Moderate
NA13	0.6842	High	5 (Cu)	Moderate	High
NA13	0.7072	High	5 (Cu)	Moderate	High
NA13	0.6622	High	5 (Cu)	Moderate	High
NA14	0.6083	Moderate	ND	ND	Moderate
NA15	0.7079	High	ND	ND	High
NA16	0.7122	High	7 (Cu)	Moderate	High
NA16	0.8756	High	7 (Cu)	Moderate	High
NA16	0.7139	High	7 (Cu)	Moderate	High
NA17	0.8641	High	7 (Cu)	Moderate	High
NA17	0.7912	High	7 (Cu)	Moderate	High
NA17R	0.8187	High	ND	ND	High
NA18	0.7517	High	ND	ND	High

Table 1. Evaluation of whole-sediment chemistry and pore-water chemistry data for the Shipyards Site.

Station	Whole-Sediment Chemistry (WSC)		Pore-Water Chemistry (PWC)		Maximum Exposure Level for WSC and PWC
	P_{MAX}	Exposure Level	Maximum Multiple of CTR WQC	Exposure Level	
NA19	0.7835	High	ND	ND	High
NA19	0.8762	High	ND	ND	High
NA20	0.5963	Moderate	ND	ND	Moderate
NA20	0.6915	High	ND	ND	High
NA21	0.6732	High	ND	ND	High
NA21	0.9265	High	ND	ND	High
NA22	0.7092	High	ND	ND	High
NA23R	0.7949	High	ND	ND	High
NA23R	0.7739	High	ND	ND	High
NA24	0.6915	High	ND	ND	High
NA24	0.5251	Moderate	ND	ND	Moderate
NA25	0.4984	Moderate	ND	ND	Moderate
NA25	0.2507	Minimal	ND	ND	Minimal
NA26	0.5215	Moderate	ND	ND	Moderate
NA26	0.3632	Low	ND	ND	Low
NA27	0.8028	High	ND	ND	High
NA28	0.7592	High	ND	ND	High
NA29	0.5665	Moderate	ND	ND	Moderate
NA29	0.534	Moderate	ND	ND	Moderate
NA30	0.5757	Moderate	ND	ND	Moderate
NA30	0.4199	Low	ND	ND	Low
NA31	0.4597	Low	ND	ND	Low
NA31	0.0531	Minimal	ND	ND	Minimal
SW01	0.7437	High	17 (TPCBs)	High	High
SW01	0.8037	High	17 (TPCBs)	High	High
SW02	0.8534	High	533 (TPCB; outlier)	High	High
SW02	0.7307	High	533 (TPCB; outlier)	High	High
SW02	0.8924	High	533 (TPCB; outlier)	High	High
SW03	0.6606	High	ND	ND	High
SW04	0.9764	High	20 (TPCBs)	High	High
SW04	0.8465	High	20 (TPCBs)	High	High

Table 1. Evaluation of whole-sediment chemistry and pore-water chemistry data for the Shipyards Site.

Station	Whole-Sediment Chemistry (WSC)		Pore-Water Chemistry (PWC)		Maximum Exposure Level for WSC and PWC
	P_{MAX}	Exposure Level	Maximum Multiple of CTR WQC	Exposure Level	
SW04	0.9528	High	20 (TPCBs)	High	High
SW05	0.7582	High	ND	ND	High
SW06	0.6891	High	ND	ND	High
SW07	0.571	Moderate	ND	ND	Moderate
SW08	0.9014	High	17 (TPCBs)	High	High
SW08	0.9299	High	17 (TPCBs)	High	High
SW08	0.8784	High	17 (TPCBs)	High	High
SW09	0.9134	High	ND	ND	High
SW10	0.7436	High	ND	ND	High
SW10	0.5374	Moderate	ND	ND	Moderate
SW11	0.6495	Moderate	ND	ND	Moderate
SW12	0.5665	Moderate	5 (Cu)	Moderate	Moderate
SW12	0.4984	Moderate	5 (Cu)	Moderate	Moderate
SW12	0.5251	Moderate	5 (Cu)	Moderate	Moderate
SW13	0.873	High	ND	ND	High
SW14	0.7051	High	ND	ND	High
SW15	0.6969	High	ND	ND	High
SW16	0.7723	High	ND	ND	High
SW17	0.7128	High	ND	ND	High
SW17	0.8033	High	ND	ND	High
SW17	0.8131	High	ND	ND	High
SW18	0.6883	High	ND	ND	High
SW19	0.6954	High	ND	ND	High
SW20	0.7558	High	ND	ND	High
SW20	0.7739	High	ND	ND	High
SW20	0.7752	High	ND	ND	High
SW21	0.7602	High	ND	ND	High
SW22	0.7373	High	ND	ND	High
SW23	0.7481	High	ND	ND	High
SW24	0.7424	High	22 (TPCBs)	High	High
SW24	0.8508	High	22 (TPCBs)	High	High

Table 1. Evaluation of whole-sediment chemistry and pore-water chemistry data for the Shipyards Site.

Station	Whole-Sediment Chemistry (WSC)		Pore-Water Chemistry (PWC)		Maximum Exposure Level for WSC and PWC
	P_{MAX}	Exposure Level	Maximum Multiple of CTR WQC	Exposure Level	
SW24	0.7309	High	22 (TPCBs)	High	High
SW24	0.7067	High	22 (TPCBs)	High	High
SW25	0.7469	High	9 (Cu)	Moderate	High
SW25	0.5442	Moderate	9 (Cu)	Moderate	Moderate
SW25	0.7156	High	9 (Cu)	Moderate	High
SW26	0.5694	Moderate	ND	ND	Moderate
SW27	0.6638	High	ND	ND	High
SW27	0.7282	High	ND	ND	High
SW28	0.7256	High	10 (TPCBs)	Moderate	High
SW28	0.8384	High	10 (TPCBs)	Moderate	High
SW28	0.7351	High	10 (TPCBs)	Moderate	High
SW29	0.5665	Moderate	ND	ND	Moderate
SW29	0.6434	Moderate	ND	ND	Moderate
SW30	0.6915	High	ND	ND	High
SW30	0.7065	High	ND	ND	High
SW31	0.398	Low	ND	ND	Low
SW32	0.5004	Moderate	ND	ND	Moderate
SW32	0.5652	Moderate	ND	ND	Moderate
SW33	0.4236	Low	ND	ND	Low
SW33	0.5726	Moderate	ND	ND	Moderate
SW34	0.4308	Low	ND	ND	Low
SW34	0.7204	High	ND	ND	High
SW36	0.7447	High	ND	ND	High
SW36	0.7025	High	ND	ND	High

CTR = California Toxics Rule; WQC = Water Quality Criteria; ND = no data; Cu = copper; TPCBs = total polychlorinated biphenyls.

Table 2. Predictive ability of sediment quality guidelines in San Diego Bay, California.

P_{MAX} Range[1]	n	Average Amphipod Survival (%)	Frequency of Toxicity[2]	Average BRI Score[3]	Frequency of M or H Benthic Community Impairment (BRI Category of 3 or 4)[4]	Frequency of Possibly, Likely, or Clearly Impact Ratings[5]
< 0.33	6	94%	16.7% (1 of 6)	33.46	0% (0 of 6)	0% (0 of 6)
0.33 - 0.49	38	93%	28.9% (11 of 38)	38.5	8.3% (3 of 36)	5.2% (2 of 38)
0.50 - 0.66	59	86%	64.4% (38 of 59)	46.2	27.6% (16 of 58)	62.7% (37 of 59)
0.67 - 1.0	62	77%	83.9% (52 of 62)	50.5	44.3% (27 of 61)	82.3% (51 of 62)

n = number of samples; M = moderate; H = high; SQO = sediment quality objective.

[1] These ranges of P_{MAX} values correspond to minimal, low, moderate, and high exposure levels, respectively.

[2] Toxicity was identified based on statistically significant differences between treatment and control for 10-d amphipod survival.

[3] BRI = benthic response index; Note BRIs of 39.96-49.14 are considered to indicate low disturbance to benthic communities, while BRIs $\geq$ 49.15 are indicative of moderate to high disturbance levels.

[4] BRI Category of 3 and 4 are associated with moderate and high levels of benthic disturbance.

[5] Based on SQOs classification system.

Table 3. Evaluation of whole-sediment (WS), sediment-water interface (SWI), and pore-water (PW) toxicity data for the Shipyards Site.

Station	10-day Amphipod WS Toxity Test		48- hour Mussel SWI Toxicity Test		40-minute Sea Urchin PW Toxicity Test		Maximum Toxicity Based on WS, SWI, or PW Toxicity
	Control-Adjusted Survival (%)	Toxicity	Control-Adjusted Normal Development (%)	Toxicity	Control-Adjusted Fertilization (%)	Toxicity	
NA01	80	Moderate	61	Moderate	85.6	Not Toxic	Moderate
NA03	84	Low	117	Not Toxic	84	Not Toxic	Low
NA04	80	Moderate	105	Not Toxic	88	Not Toxic	Moderate
NA05	89	Low	118	Not Toxic	95	Not Toxic	Low
NA06	78	Moderate	84	Not Toxic	103	Not Toxic	Moderate
NA07	75	Moderate	100	Not Toxic	101	Not Toxic	Moderate
NA09	88	Low	2	High	99	Not Toxic	High
NA11	70	Moderate	92	Not Toxic	100	Not Toxic	Moderate
NA12	82	Low	19	High	89	Not Toxic	High
NA15	97	Not Toxic	116	Not Toxic	88	Not Toxic	Not Toxic
NA16	90	Not Toxic	5	High	83	Not Toxic	High
NA17	95	Not Toxic	98	Not Toxic	88	Not Toxic	Not Toxic
NA19	89	Low	2	High	71	Low	High
NA20	90	Not Toxic	92	Not Toxic	78	Low	Low
NA22	95	Not Toxic	3	High	110	Not Toxic	High
SW02	88	Low	96	Not Toxic	102	Not Toxic	Low
SW03	92	Not Toxic	100	Not Toxic	102	Not Toxic	Not Toxic
SW04	94	Not Toxic	72	Moderate	108	Not Toxic	Moderate
SW08	91	Not Toxic	106	Not Toxic	102	Not Toxic	Not Toxic
SW09	88	Low	96	Not Toxic	99	Not Toxic	Low
SW11	77	Moderate	103	Not Toxic	89	Not Toxic	Moderate
SW13	92	Not Toxic	32	High	98	Not Toxic	High
SW15	92	Not Toxic	10	High	102	Not Toxic	High
SW17	95	Not Toxic	19	High	95	Not Toxic	High
SW18	74	Moderate	79	Low	82	Not Toxic	Moderate
SW21	91	Not Toxic	76	Moderate	101	Not Toxic	Moderate
SW22	90	Not Toxic	2	High	104	Not Toxic	High
SW23	91	Not Toxic	20	High	107	Not Toxic	High
SW25	86	Low	12	High	102	Not Toxic	High
SW27	73	Moderate	27	High	90	Not Toxic	High

Table 4. Evaluation of benthic invertebrate community structure (BICS) data for the Shipyards Site.

Station	Benthic Response Index (BRI)		Index of Biotic Integrity (IBI)		Relative Benthic Index (RBI)		Maximum Benthic LOE Score[1]	Level of Disturbance based on BICS
	BRI Score	BRI Category	IBI Score	IBI Category	RBI Score	RBI Category		
NA03	48.44	2	1	2	0.17	2	2	Low
NA04	43.24	2	1	2	0.15	3	3	Moderate
NA05	46.97	2	1	2	0.12	3	3	Moderate
NA06	44.75	2	1	2	0.16	2	2	Low
NA09	44.69	2	1	2	0.14	3	3	Moderate
NA11	50.8	3	1	2	0.11	3	3	Moderate
NA12	43.59	2	1	2	0.16	2	2	Low
NA15	53.6	3	1	2	0.07	4	4	High
NA16	46.25	2	1	2	0.18	2	2	Low
NA17	43.29	2	1	2	0.18	2	2	Low
NA19	41.02	2	1	2	0.14	3	3	Moderate
NA20	49.63	3	1	2	0.08	4	4	High
NA22	49.97	3	1	2	0.09	3	3	Moderate
SW03	39.36	1	1	2	0.12	3	3	Moderate
SW04	53.66	3	1	2	0.11	3	3	Moderate
SW08	51.76	3	1	2	0.17	2	3	Moderate
SW09	43.94	2	1	2	0.17	2	2	Low
SW11	40.62	2	1	2	0.22	2	2	Low
SW13	44.29	2	1	2	0.18	2	2	Low
SW15	40.37	2	1	2	0.21	2	2	Low
SW17	39.81	1	0	1	0.13	3	3	Moderate
SW18	40.45	2	1	2	0.17	2	2	Low
SW21	43.44	2	1	2	0.14	3	3	Moderate
SW22	44.18	2	1	2	0.13	3	3	Moderate
SW23	46.66	2	1	2	0.15	3	3	Moderate
SW25	48.71	2	1	2	0.17	2	2	Low
SW27	43.57	2	1	2	0.19	2	2	Low

[1]Benthic Line-of-Evidence (LOE) Score is a median of BRI Category, RBI Category, and IBI Category.

Benthic LOE Score: 1 corresponds with reference conditions; 2 indicates low disturbance; 3 indicates moderate disturbance; 4 indicates high disturbance.

Table 5. Contingency table used to classify risks to benthic invertebrates at each sampling station, based on multiple lines-of-evidence (LOE).

Combination	Chemistry LOE	Toxicity LOE	Benthic Community LOE	Station Assessment
1	Minimal	Nontoxic	Reference	Unimpacted
2	Minimal	Low	Reference	Unimpacted
3	Minimal	Moderate	Reference	Unimpacted
4	Minimal	High	Reference	Inconclusive
5	Minimal	Nontoxic	Low	Unimpacted
6	Minimal	Low	Low	Likely unimpacted
7	Minimal	Moderate	Low	Likely unimpacted
8	Minimal	High	Low	Possibly impacted
9	Minimal	Nontoxic	Moderate	Likely unimpacted
10	Minimal	Low	Moderate	Likely unimpacted
11	Minimal	Moderate	Moderate	Possibly impacted
12	Minimal	High	Moderate	Likely impacted
13	Minimal	Nontoxic	High	Likely unimpacted
14	Minimal	Low	High	Inconclusive
15	Minimal	Moderate	High	Possibly impacted
16	Minimal	High	High	Likely impacted
17	Low	Nontoxic	Reference	Unimpacted
18	Low	Low	Reference	Unimpacted
19	Low	Moderate	Reference	Likely unimpacted
20	Low	High	Reference	Possibly impacted
21	Low	Nontoxic	Low	Unimpacted
22	Low	Low	Low	Likely unimpacted
23	Low	Moderate	Low	Possibly impacted
24	Low	High	Low	Possibly impacted
25	Low	Nontoxic	Moderate	Likely unimpacted
26	Low	Low	Moderate	Possibly impacted
27	Low	Moderate	Moderate	Likely impacted
28	Low	High	Moderate	Likely impacted
29	Low	Nontoxic	High	Likely unimpacted
30	Low	Low	High	Possibly impacted
31	Low	Moderate	High	Likely impacted
32	Low	High	High	Likely impacted
33	Moderate	Nontoxic	Reference	Unimpacted
34	Moderate	Low	Reference	Likely unimpacted
35	Moderate	Moderate	Reference	Likely unimpacted
36	Moderate	High	Reference	Possibly impacted
37	Moderate	Nontoxic	Low	Unimpacted
38	Moderate	Low	Low	Possibly impacted
39	Moderate	Moderate	Low	Possibly impacted
40	Moderate	High	Low	Possibly impacted
41	Moderate	Nontoxic	Moderate	Possibly impacted
42	Moderate	Low	Moderate	Likely impacted
43	Moderate	Moderate	Moderate	Likely impacted
44	Moderate	High	Moderate	Likely impacted
45	Moderate	Nontoxic	High	Possibly impacted

Table 5. Contingency table used to classify risks to benthic invertebrates at each sampling station, based on multiple lines-of-evidence (LOE).

Combination	Chemistry LOE	Toxicity LOE	Benthic Community LOE	Station Assessment
46	Moderate	Low	High	Likely impacted
47	Moderate	Moderate	High	Likely impacted
48	Moderate	High	High	Likely impacted
49	High	Nontoxic	Reference	Likely unimpacted
50	High	Low	Reference	Likely unimpacted
51	High	Moderate	Reference	Inconclusive
52	High	High	Reference	Likely impacted
53	High	Nontoxic	Low	Likely unimpacted
54	High	Low	Low	Possibly impacted
55	High	Moderate	Low	Likely impacted
56	High	High	Low	Likely impacted
57	High	Nontoxic	Moderate	Likely impacted
58	High	Low	Moderate	Likely impacted
59	High	Moderate	Moderate	Clearly impacted
60	High	High	Moderate	Clearly impacted
61	High	Nontoxic	High	Likely impacted
62	High	Low	High	Likely impacted
63	High	Moderate	High	Clearly impacted
64	High	High	High	Clearly impacted

Table 6. Integration of multiple lines-of-evidence for evaluating impairment to the benthic invertebrate community in the vicinity of the Shipyards Site.

Station[1]	Indicator of Impairment to Benthic Community			Overall Evaluation of Station [2,3]	Risk Classification
	WSC/PWC Exposure (from Table 1)	WS/PW Toxicity (from Table 3)	BICS Disturbance (from Table 4)		
NA01	High	Moderate	NDR	Clearly Impacted	High
NA01	High	Moderate	NDR	Clearly Impacted	High
NA01	High	Moderate	NDR	Clearly Impacted	High
NA02	Moderate	NDR	NDR	Likely Impacted	High
NA02	Moderate	NDR	NDR	Likely Impacted	High
NA03	High	Low	Low	Possibly Impacted	Moderate
NA04	High	Moderate	Moderate	Clearly Impacted	High
NA04	High	Moderate	Moderate	Clearly Impacted	High
NA05	Moderate	Low	Moderate	Possibly Impacted	Moderate
NA06	High	Moderate	Low	Likely Impacted	High
NA06	High	Moderate	Low	Likely Impacted	High
NA06	High	Moderate	Low	Likely Impacted	High
NA07	High	Moderate	NDR	Clearly Impacted	High
NA08	High	NDR	NDR	Clearly Impacted	High
NA09	High	High	Moderate	Clearly Impacted	High
NA09	High	High	Moderate	Clearly Impacted	High
NA10	Moderate	NDR	NDR	Likely Impacted	High
NA11	Moderate	Moderate	Moderate	Likely Impacted	High
NA12	Moderate	High	Low	Possibly Impacted	Moderate
NA13	High	NDR	NDR	Clearly Impacted	High
NA13	High	NDR	NDR	Clearly Impacted	High
NA13	High	NDR	NDR	Clearly Impacted	High
NA14	Moderate	NDR	NDR	Likely Impacted	High
NA15	High	Not Toxic	High	Likely Impacted	High
NA16	High	High	Low	Likely Impacted	High
NA16	High	High	Low	Likely Impacted	High
NA16	High	High	Low	Likely Impacted	High
NA17	High	Not Toxic	Low	Likely Unimpacted	Low
NA17	High	Not Toxic	Low	Likely Unimpacted	Low
NA17R	High	NDR	NDR	Clearly Impacted	High
NA18	High	NDR	NDR	Clearly Impacted	High
NA19	High	High	Moderate	Clearly Impacted	High
NA19	High	High	Moderate	Clearly Impacted	High
NA20	Moderate	Low	High	Likely Impacted	High
NA20	High	Low	High	Likely Impacted	High
NA21	High	NDR	NDR	Clearly Impacted	High
NA21	High	NDR	NDR	Clearly Impacted	High
NA22	High	High	Moderate	Clearly Impacted	High
NA23R	High	NDR	NDR	Clearly Impacted	High
NA23R	High	NDR	NDR	Clearly Impacted	High
NA24	High	NDR	NDR	Clearly Impacted	High
NA24	Moderate	NDR	NDR	Likely Impacted	High
NA25	Moderate	NDR	NDR	Likely Impacted	High

Table 6. Integration of multiple lines-of-evidence for evaluating impairment to the benthic invertebrate community in the vicinity of the Shipyards Site.

Station[1]	Indicator of Impairment to Benthic Community			Overall Evaluation of Station [2,3]	Risk Classification
	WSC/PWC Exposure (from Table 1)	WS/PW Toxicity (from Table 3)	BICS Disturbance (from Table 4)		
NA25	Minimal	NDR	NDR	Unimpacted	Low
NA26	Moderate	NDR	NDR	Likely Impacted	High
NA26	Low	NDR	NDR	Likely Unimpacted	Low
NA27	High	NDR	NDR	Clearly Impacted	High
NA28	High	NDR	NDR	Clearly Impacted	High
NA29	Moderate	NDR	NDR	Likely Impacted	High
NA29	Moderate	NDR	NDR	Likely Impacted	High
NA30	Moderate	NDR	NDR	Likely Impacted	High
NA30	Low	NDR	NDR	Likely Unimpacted	Low
NA31	Low	NDR	NDR	Likely Unimpacted	Low
NA31	Minimal	NDR	NDR	Unimpacted	Low
SW01	High	NDR	NDR	Clearly Impacted	High
SW01	High	NDR	NDR	Clearly Impacted	High
SW02	High	Low	NDR	Possibly Impacted	Moderate
SW02	High	Low	NDR	Possibly Impacted	Moderate
SW02	High	Low	NDR	Possibly Impacted	Moderate
SW03	High	Not Toxic	Moderate	Likely Impacted	High
SW04	High	Moderate	Moderate	Clearly Impacted	High
SW04	High	Moderate	Moderate	Clearly Impacted	High
SW04	High	Moderate	Moderate	Clearly Impacted	High
SW05	High	NDR	NDR	Clearly Impacted	High
SW06	High	NDR	NDR	Clearly Impacted	High
SW07	Moderate	NDR	NDR	Likely Impacted	High
SW08	High	Not Toxic	Moderate	Likely Impacted	High
SW08	High	Not Toxic	Moderate	Likely Impacted	High
SW08	High	Not Toxic	Moderate	Likely Impacted	High
SW09	High	Low	Low	Possibly Impacted	Moderate
SW10	High	NDR	NDR	Clearly Impacted	High
SW10	Moderate	NDR	NDR	Likely Impacted	High
SW11	Moderate	Moderate	Low	Possibly Impacted	Moderate
SW12	Moderate	NDR	NDR	Likely Impacted	High
SW12	Moderate	NDR	NDR	Likely Impacted	High
SW12	Moderate	NDR	NDR	Likely Impacted	High
SW13	High	High	Low	Likely Impacted	High
SW14	High	NDR	NDR	Clearly Impacted	High
SW15	High	High	Low	Likely Impacted	High
SW16	High	NDR	NDR	Clearly Impacted	High
SW17	High	High	Moderate	Clearly Impacted	High
SW17	High	High	Moderate	Clearly Impacted	High
SW17	High	High	Moderate	Clearly Impacted	High
SW18	High	Moderate	Low	Likely Impacted	High
SW19	High	NDR	NDR	Clearly Impacted	High
SW20	High	NDR	NDR	Clearly Impacted	High

Table 6. Integration of multiple lines-of-evidence for evaluating impairment to the benthic invertebrate community in the vicinity of the Shipyards Site.

Station[1]	Indicator of Impairment to Benthic Community: WSC/PWC Exposure (from Table 1)	WS/PW Toxicity (from Table 3)	BICS Disturbance (from Table 4)	Overall Evaluation of Station [2,3]	Risk Classification
SW20	High	NDR	NDR	Clearly Impacted	High
SW20	High	NDR	NDR	Clearly Impacted	High
SW21	High	Moderate	Moderate	Clearly Impacted	High
SW22	High	High	Moderate	Clearly Impacted	High
SW23	High	High	Moderate	Clearly Impacted	High
SW24	High	NDR	NDR	Clearly Impacted	High
SW24	High	NDR	NDR	Clearly Impacted	High
SW24	High	NDR	NDR	Clearly Impacted	High
SW24	High	NDR	NDR	Clearly Impacted	High
SW25	High	High	Low	Likely Impacted	High
SW25	Moderate	High	Low	Possibly Impacted	Moderate
SW25	High	High	Low	Likely Impacted	High
SW26	Moderate	NDR	NDR	Likely Impacted	High
SW27	High	High	Low	Likely Impacted	High
SW27	High	High	Low	Likely Impacted	High
SW28	High	NDR	NDR	Clearly Impacted	High
SW28	High	NDR	NDR	Clearly Impacted	High
SW28	High	NDR	NDR	Clearly Impacted	High
SW29	Moderate	NDR	NDR	Likely Impacted	High
SW29	Moderate	NDR	NDR	Likely Impacted	High
SW30	High	NDR	NDR	Clearly Impacted	High
SW30	High	NDR	NDR	Clearly Impacted	High
SW31	Low	NDR	NDR	Likely Unimpacted	Low
SW32	Moderate	NDR	NDR	Likely Impacted	High
SW32	Moderate	NDR	NDR	Likely Impacted	High
SW33	Low	NDR	NDR	Likely Unimpacted	Low
SW33	Moderate	NDR	NDR	Likely Impacted	High
SW34	Low	NDR	NDR	Likely Unimpacted	Low
SW34	High	NDR	NDR	Clearly Impacted	High
SW36	High	NDR	NDR	Clearly Impacted	High
SW36	High	NDR	NDR	Clearly Impacted	High

WSC = whole-sediment chemistry; PWC = pore water Chemistry; BICS - benthic invertebrate community structure.
NDR = no data reported.

[1] Multiple results for same stations represent comparisons of impairment using selected pmax values reported in Table 1.

[2] For samples for which data on one or more LOE was not available the missing LOEs were considered to be equal to the classification for the lowest LOE for that sample.

[3] Overall evaluation of station was conducted using the matrix presented in Table 5.

Table 7. Estimated concentrations of total polychlorinated biphenyls (PCBs) in the tissues of benthic fish in the vicinity of the Shipyards Site.

Station	[PCB] in Sediment (mg/kg DW)[1]	Fraction Lipid in Goby Tissue (F-Lipid)	Fraction TOC in Sediment (f_{oc})	BSAF	Estimated [PCB] in Goby-WB (mg/kg DW)	Toxicity Threshold (mg/kg DW)[2]	Impairment to Fish Expected (Y or N)
NA01	1.01	0.04	0.027	1.61	2.44	1.95	Y
NA02	0.25	0.04	0.009	1.61	1.82	1.95	N
NA03	0.52	0.04	0.023	1.61	1.44	1.95	N
NA04	1.39	0.04	0.026	1.61	3.45	1.95	Y
NA05	0.25	0.04	0.016	1.61	1.02	1.95	N
NA06	1.06	0.04	0.017	1.61	4.09	1.95	Y
NA07	0.71	0.04	0.020	1.61	2.27	1.95	Y
NA08	0.43	0.04	0.022	1.61	1.28	1.95	N
NA09	2.99	0.04	0.026	1.61	7.27	1.95	Y
NA10	0.23	0.04	0.012	1.61	1.24	1.95	N
NA11	0.27	0.04	0.017	1.61	1.02	1.95	N
NA12	0.22	0.04	0.015	1.61	0.95	1.95	N
NA13	0.17	0.04	0.009	1.61	1.24	1.95	N
NA15	0.48	0.04	0.020	1.61	1.57	1.95	N
NA16	0.84	0.04	0.023	1.61	2.41	1.95	Y
NA17	0.62	0.04	0.021	1.61	1.91	1.95	N
NA17R	0.54	0.04	0.011	1.61	3.14	1.95	Y
NA18	0.49	0.04	0.020	1.61	1.56	1.95	N
NA19	1.01	0.04	0.015	1.61	4.42	1.95	Y
NA20	0.30	0.04	0.014	1.61	1.33	1.95	N
NA21	0.41	0.04	0.014	1.61	1.86	1.95	N
NA22	0.25	0.04	0.016	1.61	0.98	1.95	N
NA23R	0.47	0.04	0.025	1.61	1.19	1.95	N
NA24	0.18	0.04	0.014	1.61	0.87	1.95	N
NA25	0.04	0.04	0.004	1.61	0.59	1.95	N
NA26	0.07	0.04	0.004	1.61	1.15	1.95	N
NA27	0.29	0.04	0.020	1.61	0.94	1.95	N
NA28	0.26	0.04	0.019	1.61	0.88	1.95	N
NA29	0.13	0.04	0.006	1.61	1.41	1.95	N
NA30	0.09	0.04	0.007	1.61	0.77	1.95	N

Table 7. Estimated concentrations of total polychlorinated biphenyls (PCBs) in the tissues of benthic fish in the vicinity of the Shipyards Site.

Station	[PCB] in Sediment (mg/kg DW)[1]	Fraction Lipid in Goby Tissue (F-Lipid)	Fraction TOC in Sediment (f_{oc})	BSAF	Estimated [PCB] in Goby-WB (mg/kg DW)	Toxicity Threshold (mg/kg DW)[2]	Impairment to Fish Expected (Y or N)
NA31	0.03	0.04	0.003	1.61	0.65	1.95	N
SW01	1.40	0.04	0.014	1.61	6.24	1.95	Y
SW02	4.30	0.04	0.041	1.61	6.68	1.95	Y
SW03	0.58	0.04	0.031	1.61	1.21	1.95	N
SW04	9.76	0.04	0.019	1.61	32.95	1.95	Y
SW05	1.80	0.04	0.015	1.61	7.46	1.95	Y
SW06	0.58	0.04	0.018	1.61	2.04	1.95	Y
SW07	0.23	0.04	0.017	1.61	0.87	1.95	N
SW08	5.59	0.04	0.022	1.61	16.13	1.95	Y
SW09	1.06	0.04	0.019	1.61	3.51	1.95	Y
SW10	0.42	0.04	0.007	1.61	3.98	1.95	Y
SW11	0.28	0.04	0.018	1.61	0.99	1.95	N
SW12	0.18	0.04	0.010	1.61	1.23	1.95	N
SW13	0.71	0.04	0.023	1.61	1.97	1.95	Y
SW14	0.57	0.04	0.021	1.61	1.73	1.95	N
SW15	0.54	0.04	0.023	1.61	1.51	1.95	N
SW16	0.61	0.04	0.022	1.61	1.77	1.95	N
SW17	0.93	0.04	0.017	1.61	3.59	1.95	Y
SW18	0.66	0.04	0.022	1.61	1.95	1.95	Y
SW19	0.05	0.04	0.005	1.61	0.55	1.95	N
SW20	3.43	0.04	0.012	1.61	19.06	1.95	Y
SW21	3.61	0.04	0.021	1.61	11.08	1.95	Y
SW22	1.38	0.04	0.025	1.61	3.62	1.95	Y
SW23	1.54	0.04	0.025	1.61	3.93	1.95	Y
SW24	2.22	0.04	0.017	1.61	8.41	1.95	Y
SW25	0.42	0.04	0.016	1.61	1.65	1.95	N
SW27	0.28	0.04	0.010	1.61	1.73	1.95	N
SW28	1.90	0.04	0.023	1.61	5.44	1.95	Y
SW29	0.48	0.04	0.006	1.61	5.06	1.95	Y
SW30	0.24	0.04	0.019	1.61	0.81	1.95	N

Table 7. Estimated concentrations of total polychlorinated biphenyls (PCBs) in the tissues of benthic fish in the vicinity of the Shipyards Site.

Station	[PCB] in Sediment (mg/kg DW)[1]	Fraction Lipid in Goby Tissue (F-Lipid)	Fraction TOC in Sediment (f_{oc})	BSAF	Estimated [PCB] in Goby-WB (mg/kg DW)	Toxicity Threshold (mg/kg DW)[2]	Impairment to Fish Expected (Y or N)
SW31	0.05	0.04	0.005	1.61	0.70	1.95	N
SW32	0.12	0.04	0.012	1.61	0.64	1.95	N
SW33	0.08	0.04	0.014	1.61	0.36	1.95	N
SW34	0.11	0.04	0.010	1.61	0.70	1.95	N
SW36	0.69	0.04	0.019	1.61	2.33	1.95	Y

DW = dry weight; TOC = total organic carbon; f_{oc} = fraction organic carbon; BSAF = sediment-biota bioaccumulation factor; WB = whole body; Y = yes; N = no.

[1] Total PCB concentration is calculated as the sum of all homologs.

[2] Orn *et al.* (1998).

Table 8. Estimated concentrations of tributyltin (TBT) in the tissues of benthic fish in the vicinity of the Shipyards Site.

Station	[TBT] in Sediment (mg/kg DW)	Fraction Lipid in Goby Tissue (F-Lipid)	Fraction TOC in Sediment (f_{oc})	BSAF	Estimated [TBT] in Goby-WB (mg/kg DW)	Toxicity Threshold (mg/kg DW)[1]	Impairment to Fish Expected (Y or N)
NA01	0.097	0.04	0.027	0.22	0.032	2.0	N
NA02	0.028	0.04	0.009	0.22	0.028	2.0	N
NA03	0.180	0.04	0.023	0.22	0.068	2.0	N
NA04	0.187	0.04	0.026	0.22	0.063	2.0	N
NA05	0.110	0.04	0.016	0.22	0.060	2.0	N
NA06	0.215	0.04	0.017	0.22	0.113	2.0	N
NA07	0.111	0.04	0.020	0.22	0.048	2.0	N
NA08	0.110	0.04	0.022	0.22	0.044	2.0	N
NA09	0.118	0.04	0.026	0.22	0.039	2.0	N
NA10	0.091	0.04	0.012	0.22	0.068	2.0	N
NA11	0.038	0.04	0.017	0.22	0.020	2.0	N
NA12	0.080	0.04	0.015	0.22	0.048	2.0	N
NA13	0.048	0.04	0.009	0.22	0.048	2.0	N
NA15	0.670	0.04	0.020	0.22	0.302	2.0	N
NA16	0.082	0.04	0.023	0.22	0.032	2.0	N
NA17	1.350	0.04	0.021	0.22	0.564	2.0	N
NA17R	0.547	0.04	0.011	0.22	0.439	2.0	N
NA18	0.210	0.04	0.020	0.22	0.091	2.0	N
NA19	0.905	0.04	0.015	0.22	0.540	2.0	N
NA20	0.176	0.04	0.014	0.22	0.108	2.0	N
NA21	0.131	0.04	0.014	0.22	0.082	2.0	N
NA22	0.120	0.04	0.016	0.22	0.064	2.0	N
NA23R	0.268	0.04	0.025	0.22	0.093	2.0	N
NA24	0.032	0.04	0.014	0.22	0.021	2.0	N
NA25	0.009	0.04	0.004	0.22	0.019	2.0	N
NA26	0.010	0.04	0.004	0.22	0.024	2.0	N
NA27	0.100	0.04	0.020	0.22	0.044	2.0	N
NA28	0.090	0.04	0.019	0.22	0.042	2.0	N
NA29	0.030	0.04	0.006	0.22	0.046	2.0	N
NA30	0.013	0.04	0.007	0.22	0.016	2.0	N
NA31	0.007	0.04	0.003	0.22	0.019	2.0	N

Table 8. Estimated concentrations of tributyltin (TBT) in the tissues of benthic fish in the vicinity of the Shipyards Site.

Station	[TBT] in Sediment (mg/kg DW)	Fraction Lipid in Goby Tissue (F-Lipid)	Fraction TOC in Sediment (f_{oc})	BSAF	Estimated [TBT] in Goby-WB (mg/kg DW)	Toxicity Threshold (mg/kg DW)[1]	Impairment to Fish Expected (Y or N)
SW01	0.181	0.04	0.014	0.22	0.111	2.0	N
SW02	0.101	0.04	0.041	0.22	0.021	2.0	N
SW03	0.053	0.04	0.031	0.22	0.015	2.0	N
SW04	3.350	0.04	0.019	0.22	1.545	2.0	N
SW05	0.170	0.04	0.015	0.22	0.097	2.0	N
SW06	0.100	0.04	0.018	0.22	0.048	2.0	N
SW07	0.044	0.04	0.017	0.22	0.022	2.0	N
SW08	3.249	0.04	0.022	0.22	1.281	2.0	N
SW09	0.910	0.04	0.019	0.22	0.413	2.0	N
SW10	0.159	0.04	0.007	0.22	0.207	2.0	N
SW11	0.140	0.04	0.018	0.22	0.068	2.0	N
SW12	0.033	0.04	0.010	0.22	0.031	2.0	N
SW13	0.790	0.04	0.023	0.22	0.298	2.0	N
SW14	0.450	0.04	0.021	0.22	0.186	2.0	N
SW15	0.170	0.04	0.023	0.22	0.065	2.0	N
SW16	1.100	0.04	0.022	0.22	0.432	2.0	N
SW17	0.504	0.04	0.017	0.22	0.266	2.0	N
SW18	0.130	0.04	0.022	0.22	0.052	2.0	N
SW19	0.010	0.04	0.005	0.22	0.016	2.0	N
SW20	0.194	0.04	0.012	0.22	0.147	2.0	N
SW21	0.170	0.04	0.021	0.22	0.071	2.0	N
SW22	0.190	0.04	0.025	0.22	0.068	2.0	N
SW23	0.210	0.04	0.025	0.22	0.073	2.0	N
SW24	0.092	0.04	0.017	0.22	0.047	2.0	N
SW25	0.185	0.04	0.016	0.22	0.100	2.0	N
SW27	0.756	0.04	0.010	0.22	0.637	2.0	N
SW28	0.106	0.04	0.023	0.22	0.041	2.0	N
SW29	0.093	0.04	0.006	0.22	0.134	2.0	N
SW30	0.058	0.04	0.019	0.22	0.027	2.0	N
SW31	0.032	0.04	0.005	0.22	0.058	2.0	N
SW32	0.014	0.04	0.012	0.22	0.011	2.0	N

Table 8. Estimated concentrations of tributyltin (TBT) in the tissues of benthic fish in the vicinity of the Shipyards Site.

Station	[TBT] in Sediment (mg/kg DW)	Fraction Lipid in Goby Tissue (F-Lipid)	Fraction TOC in Sediment (f_{oc})	BSAF	Estimated [TBT] in Goby-WB (mg/kg DW)	Toxicity Threshold (mg/kg DW)[1]	Impairment to Fish Expected (Y or N)
SW33	0.011	0.04	0.014	0.22	0.007	2.0	N
SW34	0.031	0.04	0.010	0.22	0.026	2.0	N
SW36	0.523	0.04	0.019	0.22	0.240	2.0	N

DW = dry weight; TOC = total organic carbon; f_{oc} = fraction organic carbon; BSAF = sediment-biota bioaccumulation factor; WB = whole body; Y = yes; N = no.

[1]Meador *et al.* (2002).

Table 9. Estimated concentrations of mercury (Hg) in the tissues of benthic fish in the vicinity of the Shipyards Site.

Station	[Hg] in Sediment (mg/kg DW)	BAF	Estimated [Hg] in Goby-WB (mg/kg DW)	Toxicity Threshold (mg/kg DW)[1]	Impairment to Fish Expected (Y or N)
NA01	1.71	0.543	0.93	13.5	N
NA02	0.58	0.543	0.31	13.5	N
NA03	1.05	0.543	0.57	13.5	N
NA04	2.08	0.543	1.13	13.5	N
NA05	0.61	0.543	0.33	13.5	N
NA06	1.87	0.543	1.01	13.5	N
NA07	1.43	0.543	0.77	13.5	N
NA08	0.82	0.543	0.45	13.5	N
NA09	3.29	0.543	1.78	13.5	N
NA10	0.58	0.543	0.31	13.5	N
NA11	0.85	0.543	0.46	13.5	N
NA12	0.62	0.543	0.34	13.5	N
NA13	0.42	0.543	0.23	13.5	N
NA14	0.55	0.543	0.30	13.5	N
NA15	0.98	0.543	0.53	13.5	N
NA16	2.17	0.543	1.18	13.5	N
NA17	0.87	0.543	0.47	13.5	N
NA17R	0.44	0.543	0.24	13.5	N
NA18	0.79	0.543	0.43	13.5	N
NA19	0.82	0.543	0.45	13.5	N
NA20	0.55	0.543	0.30	13.5	N
NA21	1.03	0.543	0.56	13.5	N
NA22	0.38	0.543	0.21	13.5	N
NA23R	1.19	0.543	0.64	13.5	N
NA24	0.59	0.543	0.32	13.5	N
NA25	0.15	0.543	0.08	13.5	N
NA26	0.23	0.543	0.13	13.5	N
NA27	1.18	0.543	0.64	13.5	N
NA28	0.88	0.543	0.48	13.5	N
NA29	0.27	0.543	0.15	13.5	N
NA30	0.34	0.543	0.18	13.5	N
NA31	0.12	0.543	0.07	13.5	N
SW01	1.00	0.543	0.55	13.5	N
SW02	2.54	0.543	1.38	13.5	N
SW03	1.19	0.543	0.65	13.5	N
SW04	3.01	0.543	1.63	13.5	N
SW05	0.96	0.543	0.52	13.5	N
SW06	0.75	0.543	0.41	13.5	N
SW07	0.52	0.543	0.28	13.5	N
SW08	2.81	0.543	1.52	13.5	N
SW09	0.96	0.543	0.52	13.5	N
SW10	0.30	0.543	0.16	13.5	N
SW11	0.75	0.543	0.41	13.5	N

Table 9. Estimated concentrations of mercury (Hg) in the tissues of benthic fish in the vicinity of the Shipyards Site.

Station	[Hg] in Sediment (mg/kg DW)	BAF	Estimated [Hg] in Goby-WB (mg/kg DW)	Toxicity Threshold (mg/kg DW)[1]	Impairment to Fish Expected (Y or N)
SW12	0.39	0.543	0.21	13.5	N
SW13	0.86	0.543	0.47	13.5	N
SW14	1.03	0.543	0.56	13.5	N
SW15	0.90	0.543	0.49	13.5	N
SW16	0.95	0.543	0.52	13.5	N
SW17	0.88	0.543	0.48	13.5	N
SW18	0.75	0.543	0.41	13.5	N
SW19	0.67	0.543	0.36	13.5	N
SW20	0.68	0.543	0.37	13.5	N
SW21	1.44	0.543	0.78	13.5	N
SW22	1.13	0.543	0.61	13.5	N
SW23	1.02	0.543	0.55	13.5	N
SW24	1.67	0.543	0.91	13.5	N
SW25	0.64	0.543	0.35	13.5	N
SW26	0.43	0.543	0.23	13.5	N
SW27	0.61	0.543	0.33	13.5	N
SW28	1.43	0.543	0.77	13.5	N
SW29	0.35	0.543	0.19	13.5	N
SW30	0.67	0.543	0.36	13.5	N
SW31	0.12	0.543	0.06	13.5	N
SW32	0.33	0.543	0.18	13.5	N
SW33	0.41	0.543	0.22	13.5	N
SW34	0.52	0.543	0.28	13.5	N
SW36	0.72	0.543	0.39	13.5	N

DW = dry weight; TOC = total organic carbon; BAF = bioaccumulation factor; WB = whole body;
Y = yes; N = no.

[1]McKim *et al.* (1976)

Table 10. Summary of evaluation of impairment to the benthic fish community in the vicinity of the Shipyards Site.

Station	Impairment to Fish Expected			Concentrations of One or More COPC Indicate Likely Impairment to Fish (Y or N)
	Total PCBs	TBT	Hg	
NA01	Y	N	N	Y
NA02	N	N	N	N
NA03	N	N	N	N
NA04	Y	N	N	Y
NA05	N	N	N	N
NA06	Y	N	N	Y
NA07	Y	N	N	Y
NA08	N	N	N	N
NA09	Y	N	N	Y
NA10	N	N	N	N
NA11	N	N	N	N
NA12	N	N	N	N
NA13	N	N	N	N
NA14	ND	ND	N	N
NA15	N	N	N	N
NA16	Y	N	N	Y
NA17	N	N	N	N
NA17R	Y	N	N	Y
NA18	N	N	N	N
NA19	Y	N	N	Y
NA20	N	N	N	N
NA21	N	N	N	N
NA22	N	N	N	N
NA23R	N	N	N	N
NA24	N	N	N	N
NA25	N	N	N	N
NA26	N	N	N	N
NA27	N	N	N	N
NA28	N	N	N	N
NA29	N	N	N	N
NA30	N	N	N	N
NA31	N	N	N	N
SW01	Y	N	N	Y
SW02	Y	N	N	Y
SW03	N	N	N	N
SW04	Y	N	N	Y
SW05	Y	N	N	Y
SW06	Y	N	N	Y
SW07	N	N	N	N
SW08	Y	N	N	Y
SW09	Y	N	N	Y
SW10	Y	N	N	Y
SW11	N	N	N	N

Table 10. Summary of evaluation of impairment to the benthic fish community in the vicinity of the Shipyards Site.

Station	Impairment to Fish Expected			Concentrations of One or More COPC Indicate Likely Impairment to Fish (Y or N)
	Total PCBs	TBT	Hg	
SW12	N	N	N	N
SW13	Y	N	N	Y
SW14	N	N	N	N
SW15	N	N	N	N
SW16	N	N	N	N
SW17	Y	N	N	Y
SW18	Y	N	N	Y
SW19	N	N	N	N
SW20	Y	N	N	Y
SW21	Y	N	N	Y
SW22	Y	N	N	Y
SW23	Y	N	N	Y
SW24	Y	N	N	Y
SW25	N	N	N	N
SW26	ND	ND	N	N
SW27	N	N	N	N
SW28	Y	N	N	Y
SW29	Y	N	N	Y
SW30	N	N	N	N
SW31	N	N	N	N
SW32	N	N	N	N
SW33	N	N	N	N
SW34	N	N	N	N
SW36	Y	N	N	Y

PCBs = polychlorinated biphenyls; TBT = tributyltin; Hg = mercury; Y = yes; N = no; ND = no data.
COPC = chemical of potential concern.

Figures

Figure 1. Risks to the benthic invertebrate community associated with exposure to contaminated sediments in the vicinity of the Shipyards Site, San Diego Bay.

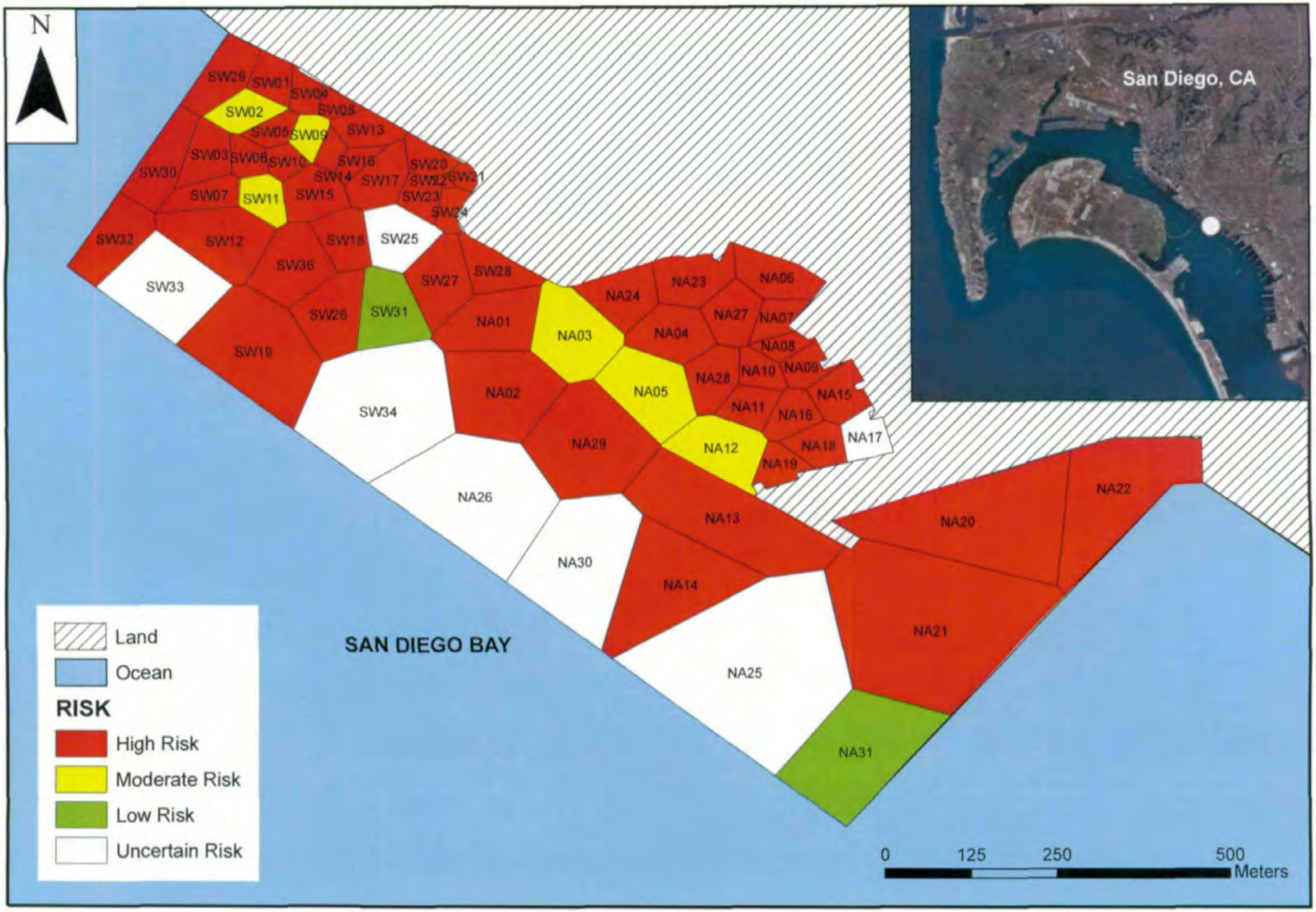
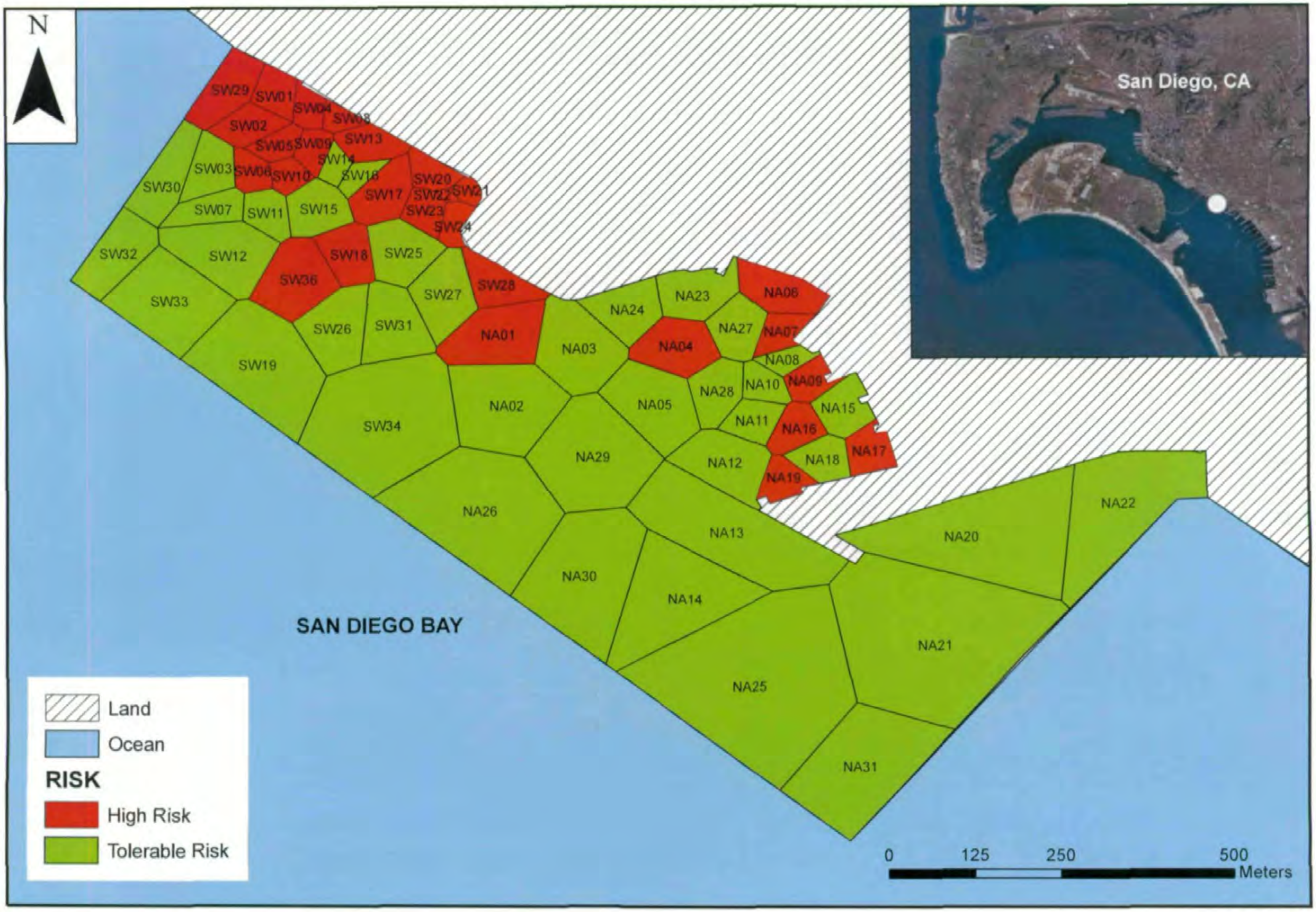
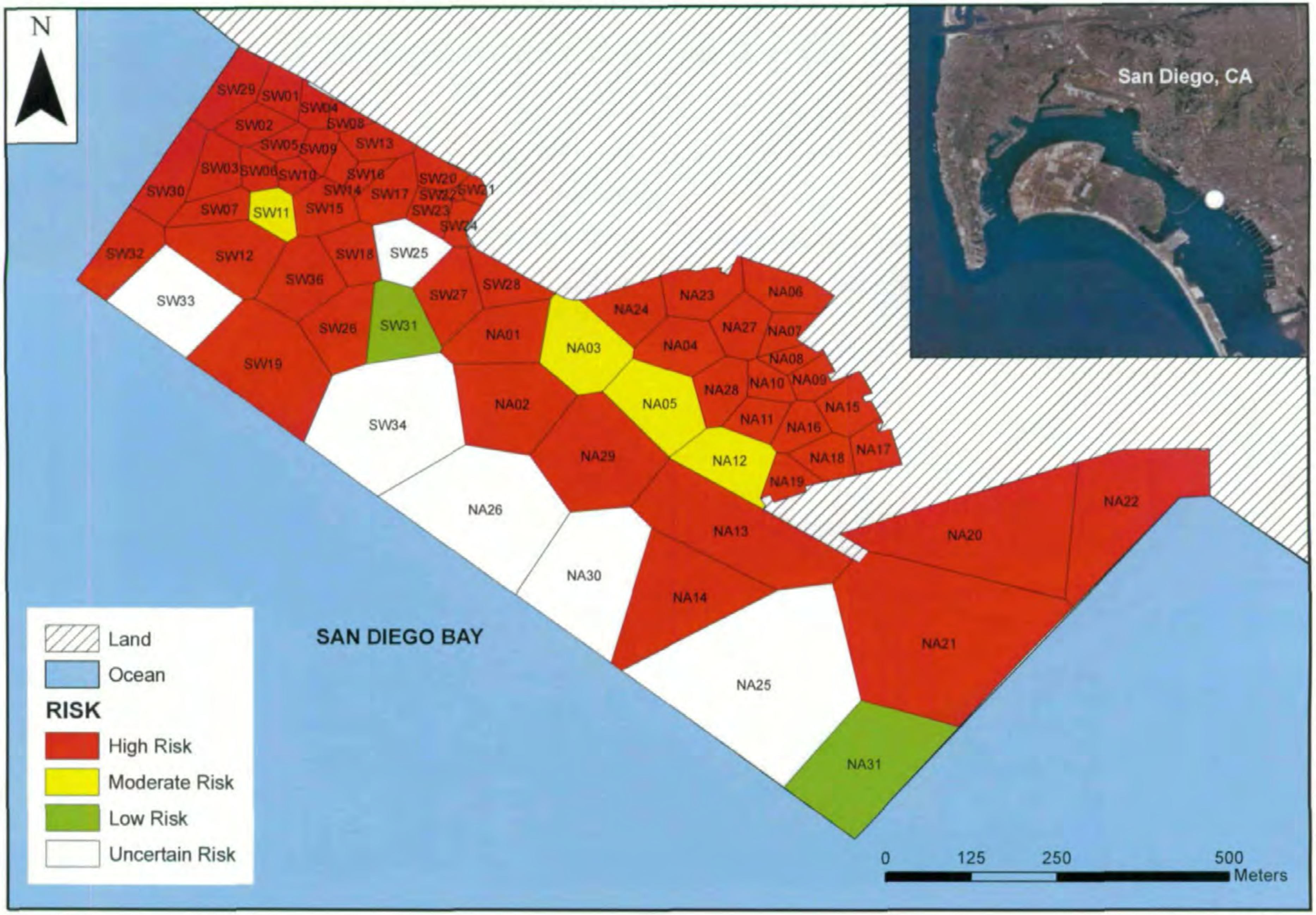


Figure 2. Risks to the benthic fish community associated with exposure to contaminated sediments in the vicinity of the Shipyards Site, San Diego Bay.



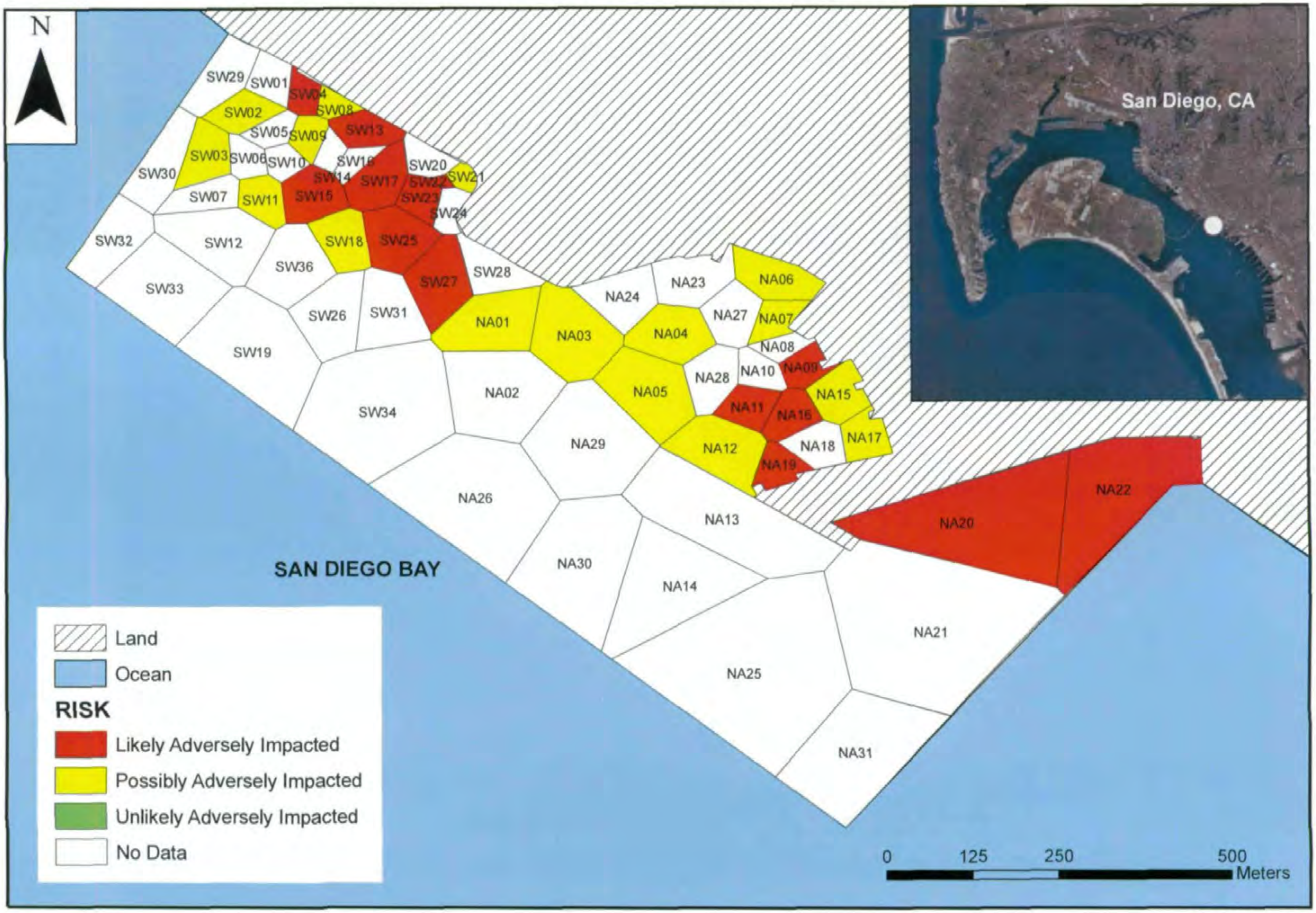
SAR378458

Figure 3. Risks to the benthic invertebrate or benthic fish communities associated with exposure to contaminated sediments in the vicinity of the Shipyards Site, San Diego Bay.



SAR378459

Figure 4. Classification of Shipyards Site stations by the CSRWQCB-SDR (2008).



SAR378460

Appendix 1

DONALD D. MACDONALD

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EDUCATION:

Bachelor of Science, Zoology
(Fisheries Biology; Environmental Physiology, Comparative Biochemistry)
University of British Columbia, 1982

SPECIALIZATION:

Principal of MacDonald Environmental Sciences Limited, which was established to provide scientific consulting services in the fields of fisheries and aquatic resource management, stream ecology, environmental quality guidelines and policy development, environmental risk and hazard assessment, and information and technology transfer.

Specialist environmental toxicology and chemistry, ecosystem-based resource management, water quality/water use interactions, and sediment quality assessment.

PROFESSIONAL MEMBERSHIPS:

American Fisheries Society
President Western Division; Past-President, Canadian Aquatic Resources Section; Nominations Committee; Chair, Wetlands Conservation Committee; Newsletter Committee; Membership Committee.
Aquaculture Association of Canada
Association of Professional Biologists of British Columbia
Canadian Association on Water Pollution Research and Control
International Association on Water Pollution Research and Control
Society of Environmental Toxicology and Chemistry

OTHER PROFESSIONAL ACTIVITIES:

1986-1988	Newsletter Editor, North Pacific International Chapter, American Fisheries Society
1987-1989	Chair, Membership Committee, North Pacific International Chapter, American Fisheries Society
1992-1994	Chair, Wetlands Conservation Committee, Canadian Aquatic Resources Section, American Fisheries Society
1990-1994	Vice-President, President-Elect, President, and Past-President, Canadian Aquatic Resources Section, American Fisheries Society
1995-Present	Canadian Director and Chair, Board of Directors, Sustainable Fisheries Foundation
1997-2001	Vice-President, President-Elect, President, and Past-President, Western Division, American Fisheries Society
2000-2001	Member, Membership Committee, American Fisheries Society
2003-2006	Award of Excellence Committee, American Fisheries Society
2005-2006	Member, Science Advisory Board for Contaminated Sites in British Columbia
2006-Present	Board or Directors, Mid-Island Science, Technology & Innovation Council (MISTIC)

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PROFESSIONAL CERTIFICATIONS:

Fisheries Professional-Certified (American Fisheries Society)
Registered Professional Biologist (Association of Professional Biologists of British Columbia)

EXPERIENCE:

AQUATIC BIOLOGIST - February 1989 to Present

MacDonald Environmental Sciences Limited, #24 - 4800 Island Highway North, Nanaimo, B.C. V9T 1W6 Independent consulting on environmental impact assessment, natural resource damage assessment, ecological risk assessment, fisheries and aquatic resource management, environmental quality, stream ecology, computer data management, and information and technology transfer. Projects include the development of water quality guidelines, sediment quality guidelines, tissue residue guidelines, environmental quality monitoring programs, fisheries co-management programs, ecosystem-based management, ecological risk assessments, natural resource damage assessments, and the assessment of environmental quality.

WATER QUALITY OBJECTIVES OFFICER - September 1984 to February 1989

Water Quality Branch, Inland Waters, Environment Canada, 502 - 1001 West Pender Street, Vancouver, B.C. V6E 2M9 Compilation, management and statistical analysis of existing and new information generated to support the formulation of water quality objectives in waters of significant federal interest; generation of water quality criteria information through toxicological, water quality, and other studies; design and implementation of monitoring programs to assess compliance with water quality objectives; preparation of reports and other publications on information developed to formulate water quality objectives; organization of workshops and information exchange sessions on water quality guidelines and objectives; provision of information and advice to technical committees established to resolve the International Joint Commission reference on the Flathead River. Supervisor: Dr. D. Valiela, Head Water Quality Objectives Division

TECHNICAL PLANNING COORDINATOR - November 1983 to September 1984

Water Quality Branch, Inland Waters, Environment Canada. 502 - 1001 West Pender Street, Vancouver, B.C. V6E 2M9 Planning and development of regional water quality programs, including long- and short-term logistics and budgetary requirements and inter-project coordination; planning, organization, expedition, and supervision of special field studies and sampling projects for water quality analysis; pollution surveillance and sediment sampling; planning and implementation on national water quality monitoring programs to assess national trends and conditions. Supervisor: Dr. W.E. Erlebach, Chief Water Quality Branch

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PUBLICATIONS AND TECHNICAL REPORTS:

Journal/Book Publications

Clark, M.J.R., D.D. MacDonald, P.H. Whitfield, and M.P. Wong. 2009. Designing monitoring programs for water quality based on experience in Canada. Part II - Monitoring Tools - Problem Characterization and Data Quality Objectives. In Review.

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EXHIBIT 4

Review and Evaluation of Tentative Clean-Up and Abatement Order (No. R9-2011-001) for the Shipyard Sediment Site, San Diego Bay, San Diego, California

March 11, 2011

Prepared on Behalf of:

San Diego Coastkeeper
2825 Dewey Road, Suite 200
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Expert Report of:

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List of Acronyms

AET	-	apparent effects threshold
BAP	-	benzo(a)pyrene
BMP	-	best management practice
COC	-	chemical of concern
DO	-	dissolved oxygen
DTR	-	Draft Technical Report
DW	-	dry weight
ERM	-	effects range median
HPAHs	-	high molecular weight polynuclear aromatic hydrocarbons
LAETs	-	lowest apparent effects threshold
LDEQ	-	Louisiana Department of Environmental Quality
LOE	-	line-of-evidence
MESL	-	MacDonald Environmental Sciences Ltd.
ND	-	no data
NOAA	-	National Oceanic and Atmospheric Administration
PCBs	-	polychlorinated biphenyls
Pmax	-	maximum probability model.
QAPP	-	Quality Assurance Project Plan
RAO	-	remedial action objective
S	-	survival
SAP	-	Sampling and Analysis Plan
SCSA	-	sediment confirmation sampling area
SFF	-	Sustainable Fisheries Foundation
SMU	-	sediment management unit
SQGQ	-	sediment quality guideline quotient
SQG	-	sediment quality guideline
SQT	-	sediment quality triad
SS-MEQ	-	site-specific median effects quotient
SWAC	-	Surface-Area Weighted Average Concentration
TBT	-	tributyltin
TCAO	-	Tentative Clean-Up and Abatement Order
TMDL	-	total maximum daily load
TRV	-	tissue residue value
UCL	-	upper confidence limit
USDOJ	-	United States Department of Justice
USEPA	-	United States Environmental Protection Agency
USFWS	-	United States Fish and Wildlife Service
WQC	-	water quality criteria

Expert Report of Donald D. MacDonald Regarding the Tentative Clean-Up and Abatement Order (No. R9-2011-0001) for the Shipyard Sediment Site, San Diego Bay, San Diego, CA

A. Qualifications

1. I, Donald Douglas MacDonald, am the principal of MacDonald Environmental Sciences Ltd. (MESL) and Canadian Director of the Sustainable Fisheries Foundation (SFF). The Canadian offices of both organizations are located in Nanaimo, British Columbia, Canada.

2. I am a Registered Professional Biologist, a member of the British Columbia College of Applied Biology, and a Certified Fisheries Practitioner.

3. I am an expert in the field of ecological risk assessment, natural resource damage assessment, and ecosystem-based management. I specialize in designing and conducting investigations to evaluate the effects of contaminated sediment on ecological receptors, including benthic invertebrates, fish, and aquatic-dependent wildlife. I also specialize in the design and implementation of environmental quality monitoring programs.

4. I received my Bachelor of Science in Zoology in 1981 from the University of British Columbia, which is located in Vancouver, British Columbia.

5. Between 1982 and 1989, I was employed by a federal government agency (Environment Canada) as a Technical Planning Coordinator and as a Physical Scientist.

6. MESL was incorporated in 1989 and I have worked as an independent consultant over the past 21 years. Over that period, I have provided specialized consulting services to a wide range of clients in Canada, the United States, and elsewhere, including federal, state, provincial, and tribal government agencies, academic institutions, non-governmental organizations, and industry.

7. Over my professional career, I have authored over 300 primary journal articles, book chapters, and technical reports on a wide range of topics related to environmental assessment and management. In addition, I have edited several books that were published by various scientific organizations.

8. I have designed, conducted, and/or provided technical oversight on numerous ecological risk assessments and/or natural resources damage assessments at sediment-contaminated sites in North America. The tasks that were completed at several of these sites are briefly described to illustrate relevant experience in contaminated site assessment and remediation. My experience in the design and implementation of environmental monitoring programs is also briefly described.

    a. The Calcasieu Estuary site is located in the vicinity of Lake Charles, LA. At this site, I have conducted a baseline ecological risk assessment (2000-2002), developed preliminary remediation goals (i.e., clean-up goals) and evaluated post-remedial risks (2003), conducted a natural resource damage assessment (2005), evaluated the effects of the Citgo oil spill (2006), estimated ecological service losses in Bayou d'Inde (2009 - 2010), and provided advice on post-remediation monitoring (2010). To support these projects, I designed and implemented two sediment and biota sampling programs to provide the data and information needed to evaluate risks and/or injury to benthic invertebrates, fish, birds and mammals associated with exposure to metals, polycyclic aromatic hydrocarbons, polychlorinated biphenyls, polychlorinated dibenzo-*p*-dioxins and polychlorinated dibenzofuran, and other contaminants. Clients included United States Environmental Protection Agency (USEPA), National Oceanic and Atmospheric Administration (NOAA), United States Fish and Wildlife Service (USFWS), and Louisiana Department of Environmental Quality (LDEQ).

b. The Tri-State Mining District is located in the Spring and Neosho river basins of Kansas, Missouri, and Oklahoma. At this site, I prepared the sampling and analysis plan to support evaluation of the effects on benthic invertebrates associated with exposure to contaminated sediments. The resultant data were used to develop concentration-response models and toxicity thresholds for selected chemicals of potential concern and contaminant mixtures. I used these data, including the toxicity thresholds, to evaluate risks to benthic invertebrates utilizing habitats throughout the study area. I have also developed sediment injury thresholds to support a natural resource damage assessment of the site (2006-2011). Clients included USEPA and USFWS.

c. The Upper Columbia River is located between the Canada-U.S. border and Grand Coulee Dam in Washington State. At this site, I developed numerical sediment quality standards to support sediment management initiatives in the study area (2002). I have also provided USEPA with oversight support on the remedial investigation that was being conducted by the Discharger (2005-2010). This work included development of a problem formulation document, establishing expectations for data collection, reviewing and evaluating of sampling and analysis plans, providing oversight of laboratory toxicity testing programs, and reviewing environmental data and information. I have also supported the Natural Resources Trustees by contributing to the Natural Resource Damage Assessment Plan, reviewing settlement offers, and interpreting matching sediment chemistry and toxicity data from the site (2010-2011). Clients included USEPA, USFWS, Washington Department of Ecology, and the Confederated Tribes of the Colville Reservation.

d. The Indiana Harbor site is located in the vicinity of Gary, Indiana. Activities at the Indiana Harbor site have included reviewing and evaluating historical data and information, conducting a natural resource damage assessment, developing remedial action objectives, deriving preliminary remedial goals (i.e., clean-up goals), reviewing remedial alternatives, and predicting post-remedial risks to ecological receptors (1998-2007). Clients included United States Department of Justice and USFWS.

e. The Quathiaski Cove is located on Quadra Island, British Columbia. At this site, I have designed and implemented environmental sampling programs, evaluated the nature and extent of contamination, assessed risks to ecological receptors, developed numerical clean-up goals, reviewed and evaluated remedial alternatives, provided oversight during remediation, evaluated confirmation monitoring data, oversaw site restoration, prepared applications for certificates of compliance (2005-2011). The client was Weston Foods Canada.

f. I have also conducted investigations to assess risks and/or natural resource injury at the Passaic River-Newark Bay Complex (NJ), Hudson River site (NY), Bloomington PCB site (IN), Piles Creek site (NJ), Cornell-Dubilier site, NJ, Vermont Asbestos site (VT), Anniston PCB site (AL), Sauget site (IL), Crofton site (BC), Portland Harbor site (OR), and others. Furthermore, I have designed and/or implemented environmental monitoring programs (i.e., for water, sediment, and/or biota) for the Fraser River and Estuary (BC), Columbia River (BC), Flathead River (BC), Similkameen River (BC), Thompson River (BC), Kootenay River (BC), Strait of Juan de Fuca (BC), Slave River (NWT), Liard River (NWT), Peel River (NWT), Presque Isle Bay (PA), Delaware River (PA, DE), and Tampa Bay (FL).

9. An accurate copy of my Curriculum Vitae is included as Appendix 1 of this expert report.

10. In 2009, I authored "Development of a Sediment Remediation Footprint to Address Risks to Benthic Invertebrates and Fish in the Vicinity of the Shipyards Sediment Site in San Diego Bay, California." This report provided an alternative approach to identifying a remediation footprint that would address impacts on benthic invertebrates and benthic fish utilizing aquatic habitats in the vicinity of the Shipyard Sediment Site. The remediation footprint presented in that document was intended to

complement the remediation footprint that was being developed for addressing risks to human health and aquatic-dependent wildlife.

11. This expert report contains my expert opinions, which I hold to a reasonable degree of scientific certainty. My opinions are based on application of professional judgment, training, experience, knowledge of facts or data related to my fields of expertise, as well as consultation with a qualified expert on Total Maximum Daily Loads (Barry W. Sulkin, M.S.), as applied to the review of the Tentative Clean-Up and Abatement Order and Draft Technical Report that were issued by the San Diego Water Board in 2010. These facts and data are typically and reasonably relied upon by experts in my field.

B. Summary of Expert Opinion

In my expert opinion, the remedial actions required under the Tentative Clean-Up and Abatement Order (No. R9-2011-0001; hereafter referred to as the "TCAO") and Draft Technical Report for Tentative Clean-Up and Abatement Order (No. R9-2011-0001; hereafter referred to as the "DTR") for the Shipyard Sediment Site, San Diego Bay, San Diego, California will likely result in improvements in sediment quality conditions at the site. However, there are a number of issues that must be addressed to ensure that the clean-up results in pollutant concentrations that do not unreasonably affect San Diego Bay beneficial uses. These issues include:

1. The Proposed Remedial Footprint does not include all of the polygons that meet the requirements for clean-up according to the methodology described in the DTR. Therefore, the Proposed Remedial Footprint should be expanded to include all of the polygons that meet the selection criteria.

2. Limitations on the establishment and implementation of the Alternative Clean-Up Levels make it difficult to determine if San Diego Bay beneficial uses will be unreasonably affected by the post-remedial contamination levels. To assure that beneficial uses are protected, Remediation Monitoring and Post-Remedial Monitoring must be improved to ensure that the Alternative Clean-Up Levels are achieved at the Shipyard Sediment Site following remediation.

3. The requirements for Remediation Monitoring, as specified in Section B.1.1 of the TCAO and in Section 34.1 of the DTR, do not mandate development and implementation of a Remediation Monitoring plan that will provide the data and information needed to assess compliance with water quality standards, 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. Therefore, the Remediation Monitoring requirements must be revised to address each of these issues.

4. The requirements for Post Remedial Monitoring, as specified in Section D of the TCAO and in Section 34.2 of the DTR, do not mandate development and implementation of a Post Remedial Monitoring plan that will provide the data and information needed to determine if the pollutant concentrations remaining in the sediments will not unreasonably affect San Diego Bay beneficial uses. In other words, the current Post Remedial Monitoring requirements do not require collection of the data and information needed to evaluate the effectiveness of remedial measures and to identify the need for further remediation to achieve clean-up goals at the Shipyard Sediment Site. Therefore, the Post Remedial Monitoring results cannot be used to objectively evaluate the effectiveness of the remedial measures or to assess the need for further remediation to achieve the clean-up goals at the Shipyard Sediment Site.

5. The Trigger Exceedance Investigation and Characterization process, described in Section D.4 of the TCAO and DTR, will not provide a basis for compelling the persons responsible for discharging contaminants of concern to conduct further remediation to achieve clean-up goals at the Shipyard Sediment Site.

C. Expert Opinion #1: Proposed Remedial Footprint

The Proposed Remedial Footprint does not include all of the polygons that meet the requirements for clean-up according to the methodology described in the DTR. Therefore, the Proposed Remedial Footprint should be expanded to include all of the polygons that meet the selection criteria.

C.1 Description of Methodology Used

The Proposed Remedial Footprint—the portion of the site that is targeted for remediation—is described in Section 33 and shown in Attachment 2, 3, and 4 of the TCAO. Section 33 of the DTR describes the process that was used to identify the polygons that were included in the Proposed Remedial Footprint. Briefly, this process involved the following steps:

- A number of polygons, termed Thiessen Polygons, were created using information on the locations of the stations where sediments were sampled by the Dischargers. *See* Exponent (2003) for details on the creation of Thiessen Polygons. Each Thiessen Polygon is intended to define the area of influence around its sampling point, so that any location inside the polygon is closer to its sampling point than it is to any of the other sampling points;

- After dividing the site into polygons, the Proposed Remedial Footprint was established by evaluating the available data for each station. According to the TCAO, the Proposed Remedial Footprint was established by identifying all of the polygons that had sediment pollutant levels likely to adversely affect the health of the benthic community and by ranking each polygon based on the level of contamination by the five primary chemicals of concern (COCs);

- Polygons with contaminant concentrations sufficient to adversely affect the health of the benthic community were identified in two ways. For those stations for which sediment quality triad data were available—sediment chemistry, sediment toxicity, and benthic invertebrate community structure—any polygon that was identified as "Likely" impaired was included in the Proposed Remedial Footprint, while "Possibly" impaired polygons were further evaluated to determine their priority for inclusion. *See* Table 18-14 of the DTR for more information on the weight-of-evidence framework that was used in the aquatic life impairment assessment. For non-Triad stations, sediment chemistry data alone were used to identify polygons for inclusion in the Proposed Remedial Footprint. More specifically, all non-triad stations exceeding the 60% lowest apparent effect threshold (LAET) values for the five primary COCs[1] or a site-specific median effects quotient (SS-MEQ) value of 0.9 were designated for remediation. The SS-MEQ was calculated by averaging the quotients derived for the five primary COCs. This was determined by dividing the measured concentration of the COC by the median concentrations of that COC in six triad samples, three of which were designated as likely impaired and three of which were designated as possibly impaired;

- The concentrations of the five primary COCs were also used to calculate a Composite Surface-Area Weighted Average Concentration (SWAC) Ranking Value for each polygon. In this approach, Composite SWAC Ranking Values were calculated for each polygon by dividing the concentration of each COC by the pre-remedial SWAC for that COC and summing the quotients that were calculated for the five primary COCs. This index of contamination was used to identify the most contaminated polygons that should be removed on a "worst first" basis. Such polygons were included in the Proposed Remedial Footprint on a priority basis. The polygons included in the Proposed Remedial Footprint had Composite SWAC Ranking Values ranging from 5.5[2] to 46.6.

- Finally, a number of polygons were excluded from the Proposed Remedial Footprint based on other considerations, including the results of triad evaluation or technical infeasibility. Station NA22 was excluded from the Proposed Remedial Footprint because a total maximum daily load (TMDL) is being developed for the mouth of Chollas Creek.

Using this procedure, 23 polygons were included in the Proposed Remedial Footprint. These polygons have composite SWAC Ranking Values greater than or equal to 5.5 and/or SS-MEQ greater than or equal to 0.9.

C.2 Evaluation of the Methodology Used

The methods used to identify polygons for inclusion in the Proposed Remedial Footprint are described in the TCAO and in the DTR. Evaluation of these methods indicates that there are a number of limitations of

[1] Copper of 552 mg/kg, mercury of 2.67 mg/kg, high molecular weight polynuclear aromatic hydrocarbons (HPAH) of 15.3 mg/kg, polychlorinated biphenyls, of 3.27 mg/kg, and tributyltin (TBT) of .11 mg/kg; *See* DTR Table 32-19

[2] While DTR Table 33-1 lists the lowest Composite SWAC Ranking Value as 5.5, Appendix Tables A33-1 and A33-2 list the lowest Composite SWAC Ranking Value as 5.4.

the underlying data and of the selection criteria that substantially influence the selection of polygons for inclusion in the Proposed Remedial Footprint including:

C.2.1 The sampling density is insufficient to accurately characterize the nature and extent of contamination at this type of site.

According to the TCAO and DTR, sediment samples were collected at only one location within each Thiessen Polygon. Yet, examination of the underlying sediment chemistry data indicates that there is substantial variability in contaminant concentrations across the site. More specifically, the concentrations of COCs typically varied by two orders of magnitude or more among sampling stations. *See* Table A33-3 of the DTR for more information on the variability of COC concentrations. Substantial variability was also evident for adjacent polygons. For example, the pre-remedy average surface sediment concentration of PAHs was 23.41 mg/kg DW at SW10.[3] In the adjacent polygons, PAH concentrations ranged from 7.0 to 15.0 mg/kg DW.

To address concerns regarding spatial variability in sediment chemistry, investigators frequently design sediment sampling programs to provide a high density of samples in the vicinity of point source discharges of contaminants. At Quathiaski Cove in British Columbia, for example, I collected sediment chemistry data at 82 stations to characterize a five-acre water lot at a shipyard site resulting in a sampling density of 17 stations per acre (MacDonald *et al.* 2008). By comparison, sediment chemistry data for 66 sampling locations were used to characterize about 148 acres at the Shipyard Sediment Site in San Diego Bay—a sampling density of 0.44 stations per acre. In some cases, such as NA21 and NA25, data from a single sediment sampling location was used to characterize over 11 acres of benthic habitat. Hence, sediment sampling conducted at the Shipyard Sediment Site was inadequate to accurately characterize the nature and extent of sediment contamination. The uncertainty in the nature and extent of contamination means that there is uncertainty in the protectiveness of the Proposed Remedial Footprint.

C.2.2 The Composite SWAC Ranking Value provides a consistent, but incomplete, basis for ranking polygons for inclusion in the Proposed Remedial Footprint.

As indicated above, the Composite SWAC Ranking Value was calculated using data on the pre-remedy average surface sediment concentrations of the five primary COCs for each polygon and on the SWACs of these COCs for the entire site. Accordingly, this index of contamination provides information on the magnitude of contamination at each location relative to the average concentration of the five primary COCs at the site. However, it is important to understand that this index does not provide a basis for evaluating the potential for adverse effects on human health or the environment. In addition, the index does not consider the concentrations of other contaminants that could be elevated in sediments from the site. Specifically, lead, zinc, low molecular weight (L) PAHs all exceed toxicity thresholds in surficial sediments at one or more sampling stations. *See* DTR Table A33-3.

[3] *See* DTR Table A33-3, column "Fairey 13 total PAH - half detection limit"

C.2.3 The Composite SWAC Ranking Value was not applied consistently to identify polygons for inclusion in the Proposed Remedial Footprint.

According to the DTR, the lowest composite SWAC Ranking Value for stations included in the Proposed Remedial Footprint was 5.5. However, a total of 15 stations with Composite SWAC Ranking Values higher than 5.5 were not included in the Proposed Remedial Footprint. *See* Tables A33-1 and A33-2 of the DTR.

Table 33-6 of the DTR provides the rationale for excluding five of the fifteen polygons with Composite SWAC Ranking Values greater than 5.5 from the Proposed Remedial Footprint. However, the rationale provided in Table 33-6 is not always correct. For example, the rationale for excluding NA07 indicates that the concentrations of all COCs are below 60% LAET values. Yet, Table A33-3 indicates that high molecular weight (H) PAH levels in surficial sediments were 15.85 mg/kg DW at NA07, which exceeds the 60% LAET value of 15.3 mg/kg DW for HPAH. *See* Table 32-19. In addition, the rationale provided in Table 33-6 indicates that sediments from NA07 had low toxicity and low benthic impacts, but no benthic invertebrate community structure data were included for NA07 in the triad database that was provided by the San Diego Regional Board.

Furthermore, Table 33-6 fails to provide an explanation for excluding ten polygons with Composite SWAC Ranking Values greater than 5.5 from the Proposed Remedial Footprint. Therefore, the rationale provided in Table 33-6 of the DTR for excluding stations with Composite SWAC Ranking Values greater than 5.5 is arbitrary and does not justify the exclusions.

C.2.4 There is insufficient evidence to demonstrate that the SS-MEQ threshold (0.9) provides a reliable basis for identifying polygons that are "Likely" impacted and hence, should be included in the Proposed Remedial Footprint. Without clear and convincing evidence in the record demonstrating that 0.9 is an appropriate threshold, it is not possible to demonstrate that the polygons included in the Proposed Remedial Footprint are sufficient to protect existing and reasonably foreseeable beneficial uses of San Diego Bay.

According to the information provided in Section 33.1.3 of the DTR, non-Triad stations with SS-MEQ values greater than 0.9 were predicted to be "Likely" impacted and included in the Proposed Remedial Footprint. However, the technical basis for selecting 0.9 as the threshold for "Likely" impacted sediment samples is not described in Section 32.5.2 of the DTR. Rather, the text indicates that a threshold of 0.9 had 73% overall reliability.[4] While the results of the reliability evaluation are presented in Table 32-21, the underlying data are not provided. Therefore, it is not possible to determine if alternate thresholds for SS-MEQ would have higher or lower reliability. Therefore, it is uncertain if the selected SS-MEQ threshold provides the most reliable tool for identifying non-Triad stations that are "Likely" impacted.

In addition, Table 33-2 of the DTR indicates that supporting calculations for SS-MEQ values are presented in Appendix 33, yet no such calculations are provided in Tables A33-1 to A33-8. Failure to provide the calculations of SS-MEQ values for each polygon prevents reviewers from determining if stations with SS-MEQ values greater than 0.9 have been excluded from the Proposed Remedial Footprint.

C.2.5 There is insufficient evidence to demonstrate that the 60% LAET values provide a reliable basis for identifying polygons that are "Likely" impacted and, hence, should be included in the Proposed Remedial Footprint.

Importantly, the 60% LAET values presented in Table 32-19 are substantially higher than the sediment quality guidelines that were used in the Triad assessment presented in the DTR and those that have been routinely used to evaluate sediment quality conditions at marine and estuarine sites throughout the United States (Table 1).

[4] DTR Table 32-21 reports this value as 70%.

TABLE 1. COMPARISON OF 60% LAET VALUES TO EFFECTS RANGE MEDIAN (ERM) VALUES

Priority COC	60% LAET Value	ERM Value[1]
Copper	552 mg/kg DW	270 mg/kg DW
Mercury	2.67 mg/kg DW	0.71 mg/kg DW
HPAH	15.3 mg/kg DW	9.6 mg/kg DW
TPCB	3.27 mg/kg DW	0.18 mg/kg DW
TBT	1.1 mg/kg DW	0.06 mg/kg OC[2]

[1]From Long *et al.* (1995)
[2]From Meador *et al.* (2002): Reported as 6000 ng/g OC, which was converted to 0.06 mg/kg assuming an organic carbon content of 1%

According to the information provided in Section 32.5.2 of the DTR, additional sampling was conducted in 2009 to provide the data needed to determine if the 60% LAET and SS-MEQ thresholds could reliably predict the likelihood of sediment quality impacts to the benthic community at the Shipyard Sediment Site. Sediment samples were collected at five stations located outside the Proposed Remedial Footprint and submitted for chemical analysis, toxicity testing, and benthic invertebrate community analysis. Based on comparisons of the measured concentrations of COCs to the 60% LAET and to the SS-MEQ threshold (0.9), it was predicted that none of the samples would be "Likely" impacted. All five samples were classified as "Unlikely" impacted or "Possibly" impacted based on examination of the sediment chemistry, sediment toxicity, and benthic community. Hence, it was concluded that the 60% LAET and the SS-MEQ threshold provided reliable predictors of likely benthic impairment at the Shipyard Sediment Site.

This conclusion is invalid for the following reasons:

- A scientifically-defensible evaluation of the reliability of the 60% LAET values and SS-MEQ threshold requires data on chemical composition, toxicity, and benthic community structure for substantially more than five sediment samples. Such evaluations of reliability or predictive ability are typically conducted with matching sediment chemistry and toxicity data on at least 50 sediment samples. For example, at the Tri-State Mining District and Calcasieu Estuary sites, 70 to 100 sediment samples were used to evaluate reliability of the toxicity thresholds (MacDonald et al. 2002; 2009; 2010).

- The samples that were collected to support the reliability assessment had maximum concentrations of the five primary COCs that were substantially lower than the 60% LAET values, as follows:

TABLE 2. COMPARISON OF 60% LAET VALUES TO THE MAXIMUM CONCENTRATIONS OF COCS MEASURED DURING THE SUPPLEMENTAL SAMPLING PROGRAM

Priority COC	60% LAET Value	Maximum Concentration
Copper	552 mg/kg DW	258 mg/kg DW
Mercury	2.67 mg/kg DW	1.18 mg/kg DW
HPAH	15.3 mg/kg DW	8.1 mg/kg DW
TPCB	3.27 mg/kg DW	0.83 mg/kg DW
TBT	1.11 mg/kg DW	0.15 mg/kg DW

Therefore, much lower values than the 60% LAET would also have provided a reliable basis for classifying these sediment samples as not "Likely" impacted. That is, the data that were collected did not provide a basis for determining if the 60% LAET values represented thresholds for adverse effects on benthic organisms or if adverse effects would be observed at lower levels:

- The samples that were collected to support the reliability assessment had SS-MEQ values that were substantially below the threshold that was used to identify "Likely" impacted samples; they ranged from 0.38 to 0.69 (calculated from data presented in Table 32-20 of the DTR) compared to the threshold of 0.9. Therefore, lower values than the selected SS-MEQ threshold would also have provided a reliable basis for classifying these sediment samples as not "Likely" impacted;

- The available data did not provide a basis for determining if the selected 60% LAETs or the SS-MEQ threshold provided reliable bases for classifying sediment samples as "Likely" impacted because the thresholds were never exceeded in these five sediment samples; and

- The procedures that were used to classify sediment samples as "Likely" impacted may not provide a sensitive basis for identifying sediment samples that are toxic to benthic invertebrates or associated with impairment of the benthic invertebrate community.

C.2.6 The procedures that were used to designate sediment samples from the Shipyard Sediment Site as "Likely" impacted are not protective.

These procedures are not protective for the following reasons.

- Sediment samples from the Shipyard Sediment Site were designated as moderately or highly toxic if: *(1)* the survival of amphipods exposed to a sediment sample was statistically significantly different from the control treatment **and** *(2)* control-adjusted survival was lower than the lower prediction limit for the reference sediment samples (72.9% survival; as presented in Table 18.7 of the DTR). Table 6 presents the data that were used in the DTR to establish the lower prediction limits for reference sediment samples.

- This approach to defining the normal range of amphipod responses is not consistent with the practices that are currently recommended by the Science Advisory Group on Sediment Quality Assessment. *See* Sustainable Fisheries Foundation (2007). Current guidance for determining reference conditions includes screening the toxicity test results and including samples in the reference envelope only if response rates are within the range specified for an acceptable negative control treatment: control-adjusted survival of 80 to 100% for amphipods. *See* American Society for Testing and Materials (2010). This screening step is applied to ensure that candidate reference samples with response rates that are influenced by the presence of unmeasured contaminants are not included in the reference pool. By applying this criterion, sediment samples with less than about 82% (see Table 7 for details on the recalculation of the reference envelope for the amphipod toxicity test) control-adjusted survival would be designated as toxic at the Shipyard Sediment Site. This is generally consistent with the guidance established by the California State Water Resources Control Board in its draft "Water quality control plan for enclosed bays and estuaries (CSWRCB 2008)." This limitation of the toxicity designation procedures also applies to the other toxicity test endpoints.

C.2.7 The rationale for excluding polygon NA22 from the Proposed Remedial Footprint is inappropriate. This area was included in the geographic scope of the Shipyard Sediment Site and, therefore, should be included on the list of the candidate Remedial Footprint stations.

According to Section 33.1.1 of the DTR, Station NA22 was "Likely" impaired based on moderate sediment chemistry, moderate toxicity, and moderate benthic community impairment. These results indicate that NA22 should be remediated because COCs in sediments are likely adversely affecting benthic invertebrates within this polygon. The conjecture about the potential effects of propeller testing on the benthic community is inconsistent with the methodology outlined in the DTR and should have no bearing on the results of the evaluation of this station. Importantly, the suggestion that the TMDL process will provide a more effective basis for making a decision on NA22 is invalid for the following reasons:

- The Mouth of Chollas, Switzer, Paleta Creeks TMDL ("Creek Mouth TMDL") will not address the existing contamination in polygon NA22. TMDLs are forward-looking policies intended to reduce the loading of contaminants to receiving water bodies, not to remove existing contamination. That is, the TMDL process will not provide a vehicle for remediating contaminated sediment within the NA22 polygon. A new and separate remediation process would need to be initiated after completion of the Creek Mouth TMDL to address existing contaminated sediment in NA22, if it is not remediated under the TCAO.

- The Creek Mouth TMDL does not address the same list of contaminants as the TCAO for the Sediment Shipyard Site. That is, the TMDL is focused on chlordane, PAHs, PCBs, and DDTs. Metals and TBT are not being addressed under the TMDL.

- The Creek Mouth TMDL will help to prevent the recontamination of the Shipyard Site, particularly polygon NA22.

- NA22 polygon is not included in post-remedial monitoring so it will not be possible to determine whether or not the TMDL achieves the same clean-up goals as those achieved under the TCAO for the Sediment Shipyard Site.

C.2.8 The rationale provided in Table 33-6 of the DTR for excluding certain polygons from the Remedial Footprint is not sufficient.

The rationale provided for excluding several polygons from the Proposed Remedial Footprint is flawed in several ways:

- The polygon SW03 was excluded from the Proposed Remedial Footprint, even though sediments within this polygon had elevated levels of cadmium. Cadmium levels in SW03 were not considered in the development of the Proposed Remedial Footprint because it was categorized as a secondary contaminant of concern at the Shipyard Sediment Site. This rationale is not reasonable because any substance that is identified as a risk driver—as cadmium was for SW03—should necessarily be considered in the development of clean-up goals.

- Technical infeasibility was identified as a rationale for excluding NA07, NA08, NA23, and NA27 from the Remedial Footprint. However, the evaluations of the technical feasibility of dredging within all or a portion of these polygons, as presented in Section 33.1.4 of the DTR, only include conclusory statements about technical infeasibility. These conclusions are not supported by evidence in the record, such as engineering assessments, that would render these conclusions scientifically valid.

- No rationale was provided for excluding NA01, NA04, NA06, NA16, NA16, NA21, SW25, or SW 29 from the Remedial Footprint.

C.2.9 The DTR failed to explicitly consider the potential effects on fish with small home ranges associated with exposure to contaminated sediments during the development of the Proposed Remedial Footprint.

This represents a major limitation of the Proposed Remedial Footprint because fish with small home ranges are known to utilize benthic habitats at the site and the concentrations of PCBs in sediments are sufficient to adversely affect the reproduction of fish at various locations. As a result, adverse effects on the health of benthic fish could occur at the site following remediation if the polygons with elevated levels of PCBs in sediments are not included in the Proposed Remedial Footprint. The polygons with concentrations of PCBs in sediments sufficient to adversely affect fish reproduction include NA01, NA04, NA07, NA16, SW06, SW18, and SW29 (see Table 1 of this document for more information on the hazard quotients that were calculated for these polygons). According to the DTR, the work that was done at the site on fish with large home ranges was inconclusive[5] and, hence, was not used in the development of the Proposed Remedial Footprint.

C.3 Conclusions Regarding the Proposed Remedial Footprint

The TCAO and the DTR describe the process that was used to develop the Proposed Remedial Footprint for the Sediment Shipyard Site. This process was designed to enable the Dischargers to meet Alternative Clean-Up Levels for the Shipyard Sediment Site and generally involved:

- Identifying and including in the Proposed Remedial Footprint all of the polygons where contaminated sediments were likely to adversely affect the health of the benthic community; and,

- Ranking the remaining polygons based on the concentrations of the five priority contaminants and selecting the most highly contaminated of these polygons—on a "worst first" basis—for inclusion in the Proposed Remedial Footprint, such that the predicted post-remedial SWACs for all five primary COCs would meet the Alternative Clean-Up Goals for aquatic-dependent wildlife and human health.

Based on the results of the evaluation of the methods that were presented in the TCAO and the DTR, I draw the following conclusions on the Proposed Remedial Footprint:

C.3.1. Developing the Proposed Remedial Footprint using Thiessen Polygons constructed to identify the area represented by each sediment sampling location is a scientifically valid method that has been used in other sediment remediation projects. However, the polygons developed at the Shipyard Sediment Site using this method are unusually large (i.e., up to 12 acres), which generates uncertainty in remedial decisions made for large areas based on limited sampling.

C.3.2 Evaluating risks to human health and aquatic-dependent wildlife using SWACs of contaminants in sediment is a scientifically valid approach that has been used in other sediment remediation projects. However, SWACs do not provide a basis for accurately assessing the impacts on benthic invertebrates or benthic fish. Other tools are needed to evaluate risks to these ecological receptors.

5 DTR Appendix 15, section A15.2.3

C.3.3 Evaluating risks to benthic invertebrates using a sediment quality triad (SQT) approach is a scientifically valid approach that has been used in other sediment remediation projects. However, effective application of this approach requires appropriate interpretation of sediment chemistry, sediment toxicity, and benthic invertebrate community structure data. The procedures described in the DTR for interpreting such data are not always consistent with the best current guidance.

C.3.4 Virtually all of the SQT stations evaluated had concentrations of contaminants that indicated that benthic invertebrates receive moderate to high exposure to contaminants at the Shipyard Sediment Site. This finding is in agreement with other interpretations of the sediment chemistry data, including my prior analysis in 2009 (MacDonald 2009).

C.3.5 The sediment toxicity data collected at the Shipyard Sediment Site have not been interpreted using methods that are consistent with the current guidance by the Science Advisory Group on Sediment Quality Assessment. *See* MacDonald *et al.* (2009 for more information). While reference conditions were defined for each toxicity test endpoint, the calculations of the 95% prediction limits were unduly influenced by inclusion of data for reference sediment samples that had unacceptably low amphipod survival, bivalve normal development, and/or sea urchin fertilization. For the bivalve toxicity test endpoint, insufficient data were compiled to support calculation of a valid reference envelope. This problem could be effectively addressed by adopting the procedures for determining level of toxicity established by the California State Water Resources Control Board (CSWRCB 2008). Table 6 and 7 provide comparisons of the reference envelope developed for use in the DTR to a reference envelope that was developed using procedures that are more scientifically defensible.

C.3.6 For polygons for which sediment chemistry data only were available, the DTR switched assessment methods from the SQGQ1 to SS-MEQ to assess impacts on the benthic invertebrate community, even though SQGQ1 method is preferable (i.e., the SQGQ1 method is effects-based and could be consistently applied at the site). While calculation of SS-MEQ values provides a consistent index of contamination in sediment samples from the Shipyard Sediment Site, SS-MEQ does not provide an effects-based tool for predicting adverse effects on the benthic community. In the context of this review, an effects-based tool is an indicator of contamination that is based on relationships between sediment chemistry and sediment toxicity. Such effects-based tools (e.g., SQGQ1) provide a basis for understanding the probability and/or magnitude of toxicity to benthic invertebrates (or other receptors) at specific levels of contaminations. The SQGQ1, the frequency of exceedance of SQGs, and the upper prediction limit for reference samples provide much more relevant tools for predicting adverse effects on the benthic community. *See* Finding 18 of the DTR; MacDonald (2009). Assuming toxicity to benthic invertebrates is classified using the criteria established by the California State Water Resources Control Board (CSWRCB 2008), 21 of the 29 (i.e., 72%) sediment samples, with moderate or high line-of-evidence (LOE) rankings for sediment chemistry were moderately or highly toxic to benthic invertebrates. *See* Table18-6 of the DTR. Further, all of the sediment samples with low LOE rankings for sediment chemistry were not toxic or had low toxicity to benthic invertebrates, resulting in an overall reliability of 73%. *See* Table18-6 of the DTR. With this level of reliability of the selected sediment chemistry metrics for the Triad samples, there is no rational reason to develop a different tool for evaluating the non-Triad sediment samples, particularly when SS-MEQ is not based on effects on benthic invertebrates (i.e., the SS-MEQ is not more reliable than the SQGQ1 method in terms of correctly classifying sediment samples as toxic or not toxic).

C.3.7 The Composite SWAC Ranking Value that was developed to identify the most contaminated polygons that would be included first in the Proposed Remedial Footprint was not applied consistently in the TCAO or the DTR. The Proposed Remedial Footprint includes 23 polygons with SWAC ranking values greater than or equal to 5.5, but left out 15 polygons with Composite SWAC Ranking Values greater than 5.5.

C.3.8 The Proposed Remedial Footprint excludes polygons, like NA07, with concentrations of contaminants in sediment that likely pose higher risks to human health and aquatic-dependent wildlife than some of the polygons included in the Proposed Remedial Footprint.

C.3.9 The Proposed Remedial Footprint excludes polygons with concentrations of contaminants in sediment that likely pose high risks to benthic fish.

C.3.10 The Proposed Remedial Footprint excludes polygons or portions of polygons, like NA20, NA21, and NA22, which are being considered in the Mouth of Chollas Creek TMDL assessment process. The DTR explains that these polygons or portions of these polygons were removed from the Proposed Remedial Footprint because they "fall within an area that is being evaluated as part of the TMDLs for Toxic Pollutants in Sediment at the Mouth of Chollas Creek TMDL and is not considered part of the Shipyard Sediment Site for the purposes of the TCAO." This decision was based on the assertion that "the additional samples from the TMDL will allow a better assessment of the causes of potential impairment in the mouth of the Chollas Creek area." While additional data could support a more in-depth assessment of this area, the conclusion that the TMDL process will address sediment contamination in these polygons is incorrect because the TMDL process will not provide a vehicle for remediating contaminated sediment.

C.3.11 The DTR explains why the Proposed Remedial Footprint excludes seven polygons—NA07, NA08, NA23, NA27, SW03, SW06, and SW19—that would otherwise be included in the Proposed Remedial Footprint. *See* Table 33-6 of the DTR. However, the explanation for excluding these polygons is not scientifically valid and is, in some cases, based on erroneous conclusions regarding contaminant concentrations or potential for impacts to the benthic community. For example, the DTR excluded NA07 and NA23 from the Proposed Remedial Footprint based on conclusions that dredging these polygons "had technical feasibility problems." Specifically, the DTR concluded that dredging both polygons would "undermine the slope." In order to be scientifically valid, these conclusions of technical infeasibility must be supported by detailed engineering studies of the existing slope and the impacts that various dredging techniques would have on the slope. The DTR provides no information about the existing sediment slope and includes no engineering studies to support its conclusion that dredging these polygons is technically infeasible. For this reason, the technical infeasibility conclusion for these polygons is not scientifically defensible.

In summary, the process for developing the Proposed Remedial Footprint is conceptually sound and is consistent with the approach used at other sites in the United States to guide remedial activities. However, there are a number of inconsistencies in the application of the procedures that need to be corrected to ensure that the Proposed Remedial Footprint will meet the goals articulated in the TCAO and DTR. In addition, the results of an independent evaluation of the available data and information that I performed in 2009 indicate that additional polygons should be included in the sediment remedial footprint for the Shipyard Sediment Site (MacDonald 2009). Table 5 presents the results of an evaluation for seven polygons that should be added to the Remedial Footprint to address inconsistencies in the procedures applied in the DTR and to address risks to fish utilizing habitats within the study area.

The results of this analysis indicate that the following polygons pose unacceptable risks to fish and would likely or possibly adversely affect the benthic community: NA01, NA04, NA07, NA16, SW06, SW18, and SW29. In addition, polygon NA22 should be included in the Remedial Footprint because it meets the criteria established in the DTR and it is not valid to exclude it based on its consideration in the TMDL process for the Mouth of Chollas Creek. Hence, these eight polygons, at minimum, should also be included in the Remedial Footprint for the Shipyard Sediment Site.

D. Expert Opinion #2: Alternative Clean-Up Levels

Limitations on the establishment and implementation of the Alternative Clean-Up Levels make it difficult to determine if San Diego Bay beneficial uses will be unreasonably affected by the post-remedial contamination levels. To assure that beneficial uses are protected, Remediation Monitoring and Post Remedial Monitoring must be improved to ensure that the Shipyard Sediment Site is remediated to the Alternative Clean-Up Levels.

D.1 Overview of Methods Used to Establish Alternative Clean-Up Levels

The methods that were used to develop the Alternative Clean-Up Levels for the Shipyard Sediment Site are described in Section 32 of the TCAO and Finding 32 of the DTR. The Alternative Clean-Up Levels for aquatic life is a narrative statement that indicates that all areas determined to have sediment pollution levels likely to adversely affect the health of the benthic community are to be remediated. The procedures for identifying the polygons with sediment pollution levels likely to adversely affect the health of the benthic community are described in Findings 15, 16, 17, and 18 of the DTR. In contrast, numerical Alternative Clean-Up Levels for human health and aquatic-dependent wildlife were established for the five primary COCs at the Shipyard Sediment Site: copper, mercury, HPAH, PCBs, and TBT. The DTR claims that these Alternative Clean-Up Levels, which represent surface-area weighted averaged concentrations (SWACs) of the five primary COCs, were established at the lowest levels that were considered to be technologically and economically achievable at the Shipyard Sediment Site. The DTR also claims that the Alternative Clean-Up Levels are protective of human health and aquatic-dependent wildlife.

D.2 Uncertainties Associated with the Alternative Clean-Up Levels

The appropriateness and protectiveness of the Alternative Clean-Up Levels described in Section 32 of the TCAO and Finding 32 of the DTR are uncertain for several reasons, including:

D.2.1 The Alternative Clean-Up Levels are substantially higher than background levels of the primary COCs in San Diego Bay.

Clean-Up Levels that correspond with background conditions in San Diego Bay would provide the highest, practically achievable, level of protection to ecological receptors utilizing habitats in the vicinity of the Shipyard Sediment Site. In recognition of the importance of establishing background conditions in San Diego Bay, the San Diego Water Board selected a group of reference stations located within relatively cleaner areas of San Diego Bay considered to be unaffected by the Shipyard Sediment Site. While there has been substantial debate regarding which stations should be included in the reference pool, it is certain that clean-up to the background sediment chemistry levels identified in Table 1 of the TCAO would provide ecological receptors with a higher level of protection than would clean-up to the Alternative Clean-Up Levels presented in Table 2 of the TCAO. The Alternative Clean-Up Levels are 19 to 500% higher than the background sediment chemistry levels.

D.2.2 Neither the TCAO nor the DTR explicitly identify numerical Alternative Clean-Up Levels for the protection of aquatic life.

Table 2 of the TCAO and Section 32 of the DTR present the numerical Alternative Clean-Up Levels for aquatic-dependent wildlife and human health. More specifically, these tables present the numerical Alternative Clean-Up Levels for copper, mercury, HPAHs, PCBs, and TBT in sediment.

In contrast, the Alternative Clean-Up Levels for aquatic organisms is a narrative statement that directs the Dischargers to "remediate all areas determined to have sediment pollutant levels likely to adversely affect the health of the benthic community." Application of this narrative statement requires evaluation of multiple lines-of-evidence that are focused on assessing effects on benthic invertebrates. No information was presented in the TCAO or the DTR on how the potential for adverse effects on fish were explicitly considered in development of the Alternative Clean-Up Levels. Although the DTR does address fish bile data and fish histopathology, the results of those analyses were not incorporated into the Alternative Clean-Up Levels. The DTR should have considered effects on fish other than the inconclusive data that were collected on the bile and histopathology of fish with large home ranges. Without evidence in the record demonstrating that potential for adverse effects on fish were considered, I conclude that the Alternative Clean-Up Levels were developed without considering the potential for adverse impacts on fish. Therefore, the Alternative Clean-Up Levels do not ensure that fish are protected. Because fish are key receptors in San Diego Bay, effects on fish need to be addressed during development of the Proposed Remedial Footprint.

D.2.3 The Alternative Clean-Up Levels fail to include numerical limits to protect benthic invertebrates.

The DTR employs a procedure for evaluating risks to aquatic life associated with exposure to contaminated sediments that relies on sediment chemistry, sediment toxicity, and benthic invertebrate community data. While reliance on multiple lines-of-evidence is generally recommended for assessing contaminated sediments, the procedures that were used to interpret individual lines-of-evidence do not correctly identify all of the sediment samples that would adversely affect benthic invertebrate communities. Specific examples of limitations in the data interpretation procedures include:

- The metric for evaluating sediment chemistry data in the non-Triad samples is not effects-based. The DTR fails to explain why the 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. This disconnect between the evaluations of the Triad and non-Triad sediment samples adds to the uncertainty in the identification of "Likely" impacted samples.

- The criteria that were established for interpreting amphipod toxicity data rely upon establishment of a 95% lower prediction limit for the reference pool to classify sediment samples into risk categories. Yet, several samples were included in the reference pool that did not meet criteria for negative control samples, which is that at least 80% survival is required for an acceptable negative control sample. This same criterion is routinely applied to identify reference sediment samples (Sustainable Fisheries Foundation 2007; MacDonald et al. 2009). Inclusion of samples that had amphipod survival lower than 80% in the reference pool results in calculation of a 95% lower prediction limit—72.9%—that is too low. See Table 18-7 of the DTR. As a result, sediment samples are identified as toxic only if survival is less that 72.9%. Application of the biological criteria for identifying acceptable reference sediment samples would have resulted in a threshold of about 82% control-adjusted survival for amphipods. The following polygons would have been identified as toxic to amphipods using a more appropriate procedure for establishing reference conditions: NA01, NA04, NA06, NA07, SW11, SW18, and SW27.

- Only four samples were included in the reference pool for the bivalve development toxicity test. This does not represent a robust data set and its use results in calculation of a 95% lower prediction limit of 37.4% normal. See Table 18-7 of the DTR. This number is substantially lower than the result for any of the samples included in the reference pool, where percent normal development ranged from 66 to 101%. Therefore, the procedure that was used to identify toxic samples relative to bivalve development is invalid.

- The data that were used to establish the reference envelope for the sea urchin fertilization test included samples that have fertilization rates below test acceptability criteria (70% for negative controls). This results in the calculation of a 95% lower prediction limit of 41.9%, which is inappropriately low. Hence many of the samples from the site could be misclassified as not toxic using this threshold.

Because the procedures used to interpret individual lines-of-evidence are not protective, it is likely that determinations of risks to benthic invertebrates associated with exposure to sediment from the Shipyard Sediment Site will not provide an adequate basis for protecting benthic invertebrate communities. Hence, the Alternative Clean-Up Levels are unlikely to provide an adequate level of protection to the benthic community and are likely to be only minimally protective of benthic invertebrates.

D.2.4 The Alternative Clean-Up Levels fail to include numerical limits to protect fish.

This is a serious limitation of the Alternative Clean-Up Levels because many of the contaminants present at the Shipyard Sediment Site have the potential to accumulate in the tissues of benthic fish and adversely affect their survival, growth, or reproduction. My analysis of data from the Shipyard Sediment Site indicates that benthic fish are at risk throughout portions of the site and at least seven polygons were not included in the Proposed Remedial Footprint that had unacceptable risks to fish (MacDonald 2009). This finding demonstrates that risks to fish are not effectively addressed by the Alternative Clean-Up Levels.

D.2.5. The shortcomings of the Alternative Clean-Up Levels lead to uncertainty in the protectiveness of the remediation. This problem can be addressed, at least in part, by setting stringent Remediation and Post Remedial Monitoring requirements.

Short of going back to the drawing board and developing new Alternative Clean-Up Levels, the best way to address uncertainties in the protectiveness of the Alternative Clean-Up Levels is to strengthen the Remediation Monitoring and Post Remedial Monitoring requirements. Without stringent Remediation and Post Remedial Monitoring to ensure that the Alternative Clean-Up Levels are actually achieved throughout the entire Shipyard Sediment Site, it is highly likely that existing and/or future beneficial uses in San Diego Bay may be unreasonably affected.

D.2.6 The TCAO provides no evidence that "clean-up of the remedial footprint will restore any injury, destruction, or loss of natural resources."

While Section 32 of the TCAO concludes that the proposed remedial action will restore any natural resources that may have been injured by releases of hazardous substances at the Shipyard Sediment Site, neither the TCAO nor the DTR includes any evidence to support this assertion. Importantly, the San Diego Regional Water Quality Control Board has not conducted a natural resource damage assessment at the Shipyard Sediment Site and, hence, has no basis for making this assertion. More importantly, the San Diego Regional Board does not have authority for conducting natural resource damage assessments. Rather, the Natural Resources Trustees have authority to conduct natural resource damage assessments and to draw conclusions regarding injury to natural resources and the effectiveness of remedial actions in terms of restoring natural resource values. Therefore, all statements regarding the injury to natural resources, natural resource service losses, and associated damages must be removed from the TCAO and the DTR.

D.3 Conclusions Regarding the Alternative Clean-Up Levels

Collectively, these limitations on the establishment and implementation of the Alternative Clean-Up Levels mean that these Alternative Clean-Up Levels cannot ensure that beneficial uses will not be unreasonably affected at the Shipyard Sediment Site. The results of the foregoing evaluation indicate that the clean-up within the Proposed Remedial Footprint will likely leave harmful levels of contaminants in place throughout portions of the Shipyard Sediment Site because the clean-up will be minimally protective of benthic invertebrates and fish. Therefore, I conclude that:

D.3.1 It is essential that the Remediation Monitoring program provide a reliable basis for documenting that water quality standards have been violated outside the construction area during remedial activities.

D.3.2 It is essential that the Remediation Monitoring program that is conducted during the remedial activities provide a reliable basis for documenting that the target clean-up levels for sediment have been reached within the remedial footprint and that remedial activities have not further contaminated areas located outside the remedial footprint.

D.3.3 It is essential that the Post Remedial monitoring program provide data and information of sufficient quality and quantity to determine if the Alternative Clean-Up Levels have been met at the Shipyard Sediment Site following implementation of remedial measures.

D.3.4 It is essential that the San Diego Regional Board be prepared to require additional remediation if the Alternative Clean-Up Levels have not been met following completion of the remedial activities at the site.

D.3.5 Regardless of the assertions made in the TCAO regarding the effectiveness of the clean-up for restoring any injury, destruction, or loss of natural resources, the Natural Resources Trustees may conduct a natural resource damage assessment to evaluate injuries to natural resources, to estimate the ecological service losses and other service losses associated with such injuries, and to calculate any damages to the public associated with natural resource service losses. Such damages would cover damages that have accrued between 1981 (the year that CERCLA was enacted) and the time that the remedial activities are completed. In addition, residual damages to natural resources will also be evaluated if the remedial measures are not sufficient to restore injured natural resources. Residual damages would be lower if a more protective clean-up was implemented at the Shipyard Sediment Site.

E. Expert Opinion #3: Remediation Monitoring

The requirements for Remediation Monitoring, as specified in Section B.1.1 of the TCAO and in Section 34.1 of the DTR, do not mandate development and implementation of a Remediation Monitoring Plan that will provide the data and information needed to assess compliance with water quality standards, 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. Therefore, the Remediation Monitoring requirements must be revised to address each of these issues.

E.1 Overview of Remediation Monitoring Requirements

A Remediation Monitoring program is an environmental monitoring program that is implemented while remedial activities are being conducted. In this case, Remediation Monitoring is the monitoring that will be conducted during dredging of sediments at the Shipyard Sediment Site. Remediation Monitoring is an essential element of any sediment remediation because it provides the data and information needed: ***(1)*** to confirm, while the work is being done, whether or not the sediment is being appropriately remediated so that the levels of contaminants in sediment following dredging meet the clean-up goals; and, ***(2)*** to determine if sediment and/or pore water disturbed during dredging are impacting water quality, causing violations of water quality standards, or are traveling to areas not slated for remediation.

Based on the information presented in Section B1 of the TCAO, the Dischargers must develop a Remediation Monitoring Plan consisting of water quality monitoring, sediment monitoring, and disposal monitoring consistent with Section 34.1 of the DTR. The water quality monitoring must be sufficient to demonstrate that implementation of the selected remedial activities does not result in violations of water quality standards outside the construction area. The sediment monitoring must be sufficient to confirm that the selected remedial activities have achieved target clean-up levels within the remedial footprint specified in Directive A.2. The disposal monitoring must be sufficient to adequately characterize the dredged sediments in order to identify appropriate disposal options.

E.2 Deficiencies of the Remediation Monitoring Requirements—Water Quality

Section B.1.1 of the TCAO and Section 34.1 of the DTR indicate that water quality monitoring must be conducted to demonstrate that implementation of the selected remedial activities do not result in violations of water quality standards outside the construction area and to confirm that the selected remedial activities have achieved target clean-up goals within the remedial footprint. The water quality component of the

Remediation Monitoring program specified in the TCAO and the DTR is inadequate for the following reasons:

E.2.1 The DTR allows water quality impacts to be assessed through modeling and turbidity measurements alone, but water quality impacts can be adequately assessed only by comparing results of real-time monitoring of turbidity and dissolved oxygen and sampling of contaminants of concern to the water quality standards included in the San Diego RWQCB Basin Plan and/or state water quality standards.

The DTR requires water quality monitoring during remediation to assess compliance with "water quality monitoring goals." The DTR's water quality monitoring approach presents several problems. First, the DTR fails to explicitly define "water quality monitoring goals." Although the DTR states that the goal of water quality monitoring "is to demonstrate that remedy implementation does not result in violations of water quality standards outside the construction area," the DTR fails to explicitly state the water quality standards. To address this problem, the DTR should explicitly include the numeric water quality standards that must be achieved during remediation.

Second, the DTR gives the Dischargers discretion to measure compliance with ambiguous water quality monitoring goals through two separate measures. The first method involves developing a model of turbidity and synoptic water quality measures prior to remedy implementation to determine if monitored turbidity would likely result in unacceptable water quality. Under this method, turbidity would be used as the only indicator of water quality conditions. The second method involves real-time monitoring of turbidity and dissolved oxygen at locations 250 feet from the dredge zone, 500 feet from the dredged zone, and at ambient locations.

Modeling with turbidity measurements alone is not an appropriate method to accurately gauge water quality impacts as they are occurring because such information cannot demonstrate compliance with numeric water quality standards for dissolved oxygen or other contaminants of concern which may be released during dredging. To assess compliance with numeric water quality standards during remediation, the Dischargers must conduct real-time monitoring of turbidity and dissolved oxygen, and collect surface water samples for analysis of all primary and secondary contaminants of concern. The information collected must be compared to numeric water quality standards established in the San Diego RWQCB Basin Plan—and listed in the DTR—to determine whether the Dischargers are complying with applicable water quality standards during remediation.

E.2.2 The DTR allows Dischargers to take all water quality samples from up-current locations, which would mask true water quality impacts.

The water quality monitoring program specifies that Dischargers must collect four water samples on each of two arcs outside the construction area, with one arc located at 250 feet and the other arc located at 500 feet from the construction area. However, the DTR is silent as to where along the arcs the samples need to be collected. This means that Dischargers are free to collect all the samples from up-current locations. Collecting samples only from up-current locations will mask the true water quality impacts that are experienced down-current form the dredging. To address this problem, the DTR must require that sampling locations be determined according to the impact of tidal flow on the plume from the construction area. Specifically, the DTR should require that all samples be collected in locations that are down-current from the dredging.

E.2.3 The DTR's failure to define the size of the construction area means that samples can be collected far from the locus of the dredging activity.

The DTR's failure to define the construction area is a problem because the DTR directs Dischargers to collect water quality monitoring data at specific distances from the construction area: 250 feet and 500 feet, respectively. This could, for example, result in early warning water samples being collected 250 feet, 500 feet, or 1250 feet from the dredging location if the construction area was defined as having a radius of 0 ft, 250 ft, or 1000 ft. To address this problem, the DTR must explicitly define the boundaries of the construction area. By doing so, water sampling locations on the 250 and 500 foot arcs can be consistently identified. To provide the best protection for water quality, DTR should define the "construction area" as a point at the center of the construction activity for the day on which the samples are taken.

E.2.4 The DTR fails to provide the rationale for collecting water samples at a depth of 10 feet.

According to the DTR, water samples must be collected from a depth of 10 feet below the water surface. However, the DTR provides no rationale for selection of the 10 foot water depth for collecting these samples. To best protect water quality, the DTR should require Dischargers to collect water samples at multiple water depths early in the sampling program to identify the depths that have the highest levels of monitored variables. This is an easy and inexpensive solution to the problem because water quality sensors will likely be used to provide real time measurements of turbidity and dissolved oxygen in the field. Alternatively, the results of turbidity measurements taken throughout the water column on each sampling date should be used to identify the water depth that has the highest turbidity. Grab samples for analysis of COCs in surface water should be taken at the water depth with the highest turbidity.

E.2.5 The DTR's failure to specify the time that water samples need to be collected each day means that Dischargers are free to collect samples at times when daily water quality impacts are likely to be the lowest and mask the true water quality impacts during remediation.

The DTR generally requires that water quality sampling be conducted on a daily basis, but fails to specify when during the day such water samples need to be collected. This is a problem because water samples could be collected early in the day, when dredging has just been initiated, or even prior to dredging beginning. In this case, the plume from the dredging activities may not have had time to reach the 250 or 500 sampling arcs. In addition, water samples could be collected at slack tide when the plume is least likely to reach the 250 or 500 foot sampling arcs. To address this problem, the DTR must specify when during the day water quality samples need to be collect. To best protect water quality, I recommend that samples be collected half-way through a flooding or ebbing tide at least four hours after dredging activities are initiated for the day.

E.2.6 The DTR fails to require collection of water samples on at least a daily basis.

The DTR generally requires water quality sampling to be conducted on a daily basis. But if three days of daily monitoring show that no samples exceed water quality targets, the Dischargers can abandon daily water quality monitoring in lieu of weekly monitoring. Sampling would only return to daily monitoring if a "significant change in operations occurs." However, neither the DTR nor the TCAO define the term "a significant change in operations." This is a problem because it is not clear what criteria will be used to trigger a resumption of daily water quality sampling. This is also a problem because it assumes that variability in turbidity or dissolved oxygen levels is associated primarily with operation of the dredge. This is incorrect. Other sources of variability in water quality conditions include variability in the effectiveness of silt curtains or other best management practices, changes in the timing of tidal cycles, alteration of current velocity, and other factors. A project of this size and importance requires a full time monitor (i.e., a person or persons who are dedicated to conducting the remediation monitoring) to evaluate water quality and other conditions, such as the status of silt curtains and other best management practices, on a daily basis. To best protect water quality, the DTR should require daily water quality monitoring and should not sanction weekly monitoring.

E.2.7 The DTR fails to define best management practices for dredging activities.

While the DTR alludes to the application of best management practices (BMPs), no guidance is provided that defines BMPs for dredging activities. Therefore, the DTR should explicitly state that measures to reduce or eliminate the transport of sediments that are resuspended during dredging must be used throughout the dredging program. Such measures may include the use of silt curtains, gunderbooms, mechanical dredge operational controls, use of a closed or environmental bucket, measures that apply to barge operation, and selected work windows.

E.3 Deficiencies of the Remediation Monitoring Requirements—Sediment

Section B.1.1 of the TCAO and in Section 34.1.2 of the DTR indicate that sediment monitoring must be conducted during dredging activities to confirm that remediation has achieved target clean-up levels within the remedial footprint. The sediment component of the Remediation Monitoring program specified in the TCAO and the DTR is inadequate for the following reasons:

E.3.1 The DTR allows Dischargers to collect only one sediment sample from each polygon in the Proposed Remedial Footprint, which will not provide sufficient data to assess compliance with clean-up goals.

The DTR requires that Dischargers conduct sediment monitoring in each of polygons within the remedial footprint. But because the DTR is silent on how many sediment samples Dischargers must collect from within each polygon, Discharges are free to collect only one sample from each polygon.

There is ample evidence in the record demonstrating the variability in sediment chemistry within a given polygon,[6] meaning that collecting only a single sample within each footprint polygon or sediment management unit (SMU), ignores that variability and fails to provide sufficient information to assess compliance with clean-up goals.

In order to collect sufficient information to assess compliance with clean-up goals during remediation, I recommend that each SMU be divided into a number of sediment confirmation sampling areas (SCSAs) that have an area of 2500 ft^2 each (50 feet by 50 feet) or less. A total of nine surficial sediment samples should be collected within each SCSA, including one sediment sample collected from the middle of the SMU and two sediment samples collected north, south, east, and west of the original sampling location, at 25 foot intervals. The sediment sample collected from the middle of the SCSA should be analyzed for the primary COCs identified in the TCAO and the resultant COC concentrations compared to the clean-up goals. If the concentration of one or more of the primary COCs exceeds the corresponding clean-up goal, then additional sediment samples should be analyzed to evaluate the spatial extent of contamination. In this way, the areas that require additional dredging to achieve clean-up goals can be identified with greater certainty.

E.3.2 The DTR fails to identify the locations that must be sampled to confirm that clean-up goals have been met.

This is a problem because sediment sampling may target the historic sampling locations, for which data are already available. Other locations within the remedial footprint that have not been sampled to date may not be characterized. As a result, sediments with elevated levels of contaminants may be missed during sediment monitoring. I recommend that the DTR require that the Discharger must sample in locations that have not previously been sampled. This will be the case if the concept of sampling within sediment confirmation sampling areas is adopted.

E.3.3 The TCAO and the DTR provide inconsistent requirements on sampling depth.

The TCAO requires that samples be collected deeper than the upper 5cm, while the DTR requires that samples be collected deeper than the upper 10cm. The TCAO and the DTR must be revised to provide consistent guidance on target sampling depths.

E.3.4 The DTR's sampling guidance will be difficult, if not impossible to apply systematically at all sampling locations. The DTR should specifically require that samples be collected within the top 10 cm.

[6] For example, see Table A32-30 of the DTR

Instead of identifying specific sampling depths that must be addressed, the DTR provides a narrative that will be difficult, if not impossible, to apply systematically at all sampling locations. Specifically, the DTR provides the following direction: "sample sediments deeper than 10 cm and sample the first undisturbed depth beneath the dredge depth; sample just deep enough to collect a sufficient volume for analysis." This type of narrative requires the sampling team to visually examine each sediment sample and try to identify "undisturbed sediments." It is unlikely that this guidance can be consistently followed. More, importantly, this guidance is inappropriate and its application will ensure that the data needed to determine if the clean-up goals have been met will not be collected by the Dischargers.

To ensure the Dischargers collect sediment samples that will assess impacts to benthic invertebrates exposed to surficial sediments, the DTR should require Dischargers to collect sediment samples within the top 10 cm. Failure to collect surficial sediment samples will ensure that insufficient data are available to determine if beneficial uses at the site are unacceptably affected by contaminated sediments. To address future impacts in areas prone to erosion, the DTR should direct the Dischargers to collect additional samples of deeper sediment in those erosion-prone areas.

E.3.5 The DTR's "120% of background" trigger level for additional dredging is ambiguous and arbitrary.

The DTR states: "If concentrations of COCs in subsurface sediments (deeper than 10 cm) are above 120% of background sediment chemistry levels, then additional sediments will be dredged by performing an additional pass with the equipment." There are three main problems with this approach.

First, the DTR's direction is ambiguous. The DTR could be interpreted to mean additional dredging is required either ***(1)*** if the concentrations of <u>all</u> COCs exceed 120% of background levels or ***(2)*** if the concentrations of <u>one</u> or more COCs exceed 120% of background. This is an important distinction that has the potential to influence the extent of re-dredging at the Shipyard Sediment Site and it must be clarified.

Second, the DTR's additional dredging trigger is arbitrary. The DTR fails to present any evidence or provide any explanation of how requiring an additional dredging pass when the 120% of background sediment chemistry concentrations are exceeded will ensure that the post-remedial SWACs—the Alternative Clean-Up Levels—will actually be met for the entire Shipyard sediment Site.

Third, by establishing decision criteria for evaluating dredge performance that are 20% higher than the background sediment chemistry levels, it is possible that surficial sediments following remediation will have COC concentrations that are higher than the clean-up goals. In turn, the presence of elevated levels of COCs in surficial sediments may lead to calculation of post-remedial SWACs that exceed those predicted in the TCAO and the DTR. Hence, use of decision criteria that are inconsistent with the background sediment chemistry levels could lead to implementation of a clean-up that does not provide adequate protection for beneficial resources (i.e., the Alternative Clean-Up Levels may not be achieved in the near term; i.e., within the next 10 years). The DTR should show the results of calculations that demonstrate that post-remediation SWACs will be met if the concentrations of COCs in all of the remediated areas are equal to 120% of background levels (i.e., equal to 120% of the post-remedial dredge area concentrations listed in Section A2.a of the TCAO).

To address these very real concerns, the DTR language should read: "If the concentrations of one or more COCs in any surficial sediment sample exceed background sediment chemistry levels, then additional sediments will be dredged by performing an additional pass with the equipment over the entire area represented by that sediment sample. The area that was re-dredged must then be re-sampled to confirm that the clean-up goals have been met." In addition, these thresholds for additional pass dredging, or "Triggers for Redredging," should be explicitly presented in the DTR, as follows:

TABLE 3. LIST OF TRIGGERS FOR REDREDGING

Priority COC	Triggers for Redredging
Copper	121 mg/kg DW
Mercury	0.57 mg/kg DW
HPAHs	663 µg/kg DW
PCBs	84 µg/kg DW
TBT	22 µg/kg DW

E.3.7 The DTR fails to specify the criteria when a sand cap would be necessary and who would make such a determination.

The second decision rule indicates that "a sand cap will be placed on the sediment surface, if necessary." Yet, the DTR fails to describe the criteria that would need to be met to justify placement of a sand cap. In addition, the DTR fails to identify who would be responsible for determining if such a sand cap is needed. The third decision rule states that "if no sample can be collected because the equipment cannot penetrate a hard substrate, then this area will be evaluated to determine whether a sand cap is required." However, the DTR fails to describe how such an evaluation should be conducted or who would be responsible for making a decision on the need for, and design criteria for, a sand cap. This decision rule also fails to recognize that sediment samples in areas with hard substrate can frequently be collected by divers. Failure to establish clearly interpretable decision rules that consider the various possible outcomes will almost certainly result in decisions that are not consistent with the expectations of the San Diego Regional Board and other participants in the process.

E.4 Conclusions Regarding the Remediation Monitoring Program

The requirements for conducting Remediation Monitoring are described in Section 34.1 of the DTR. Based on the results of this review of the requirements described in the DTR, the remediation monitoring program that is implemented during remedial activities at the Shipyard Sediment Site will not provide the data and information needed to:

- Assess compliance with water quality standards;
- Evaluate the effectiveness of remedial measures; or,
- Identify the need for further dredging to achieve clean-up goals.

Sections E.2 and E.3 document numerous problems with the remediation monitoring requirements specified in the DTR. These problems are serious because the clean-up activities described in the TCAO are likely to be only minimally protective of beneficial uses at the Shipyard Sediment Site. Accordingly, effective Remediation Monitoring is required to provide the data and information needed to document that water quality standards have not been exceeded during remediation and that clean-up levels have been achieved within the remedial footprint. Failure to collect the necessary and sufficient data on water quality conditions in the vicinity of the construction area and on sediment quality conditions within the remedial footprint will make it impossible to manage the clean-up operations in a way that will assure that the clean-up goals are met. Therefore, it is essential that the Remediation Monitoring program be revised to address each of these critically important issues. The key changes that need to be made to the Remediation Monitoring program include:

E.4.1 The DTR must include detailed requirements for surface-water sampling. These requirements should:

1. Require daily real-time monitoring of turbidity and dissolved oxygen,

2. Require daily water sampling of each primary and secondary COCs;

3. Define the "construction area" as a point in the center of the construction activity;

4. Mandate that water samples be collected half-way through a flooding or ebbing tide at least four hours after dredging activities have initiated for the day at locations down-current from the dredging;

5. Require Dischargers to collect water samples at multiple water depths early in the sampling program to identify the depths that have the highest levels of monitored variables and then require that water be sampled at those depths thereafter;

6. Explicitly list the water quality standards for dissolved oxygen, turbidity, and each primary and secondary contaminant concern and risk-driver that must be met at compliance monitoring locations;

7. Mandate the use of Best Management Practices that include, but are not limited to, silt curtains, gunderbooms, mechanical dredge operational controls, use of a closed or environmental bucket dredge, measures that apply to barge operation, and selected work windows; and

8. Require a full-time monitor to evaluate water quality and Best Management Practices on a daily basis.

E.4.2 The DTR must make the following changes to the sediment portion of the Remediation Monitoring program:

1. Set the required sediment sampling depth at 0-10cm in both the TCAO and DTR;

2. Divide each sediment management unit into a number of sediment confirmation sampling areas (SCSAs) that have an area of 2500 ft^2 each (50 feet by 50 feet) or less. A total of nine surficial sediment samples should be collected within each SCSA, including one sediment sample collected from the middle of the SMU and two sediment samples collected north, south, east, and west of the original sampling location, at 25 foot intervals. The sediment sample collected from the middle of the SCSA should be analyzed for the primary COCs identified in the TCAO and the resultant COC concentrations compared to the clean-up goals. If the concentration of one or more of the primary COCs exceeds the corresponding clean-up goal, then additional sediment samples should be analyzed to evaluate the spatial extent of contamination. This information will be used to determine the scope of additional pass dredging for each SCSA;

3. Specify that an additional dredging pass is required if any priority COC is greater than background and add a table with the explicit triggers provided in Table 3.

4. Specify the criteria for placing a sand cap on the sediment surface.

F. Expert Opinion #4: Post Remedial Monitoring

The requirements for Post Remedial Monitoring, as specified in Section D of the TCAO and in Section 34.2 of the DTR, do not mandate development and implementation of a Post Remedial Monitoring Plan that will provide the data and information needed to determine if the remaining pollutant concentrations in the sediments will not unreasonably affect San Diego Bay beneficial uses. In other words, the current Post Remedial Monitoring requirements do not require collection of the data and information needed to evaluate the effectiveness of remedial measures and identify the need for further remediation to achieve clean-up goals at the Shipyard Sediment Site. Therefore, Post Remedial Monitoring results will not provide a comprehensive basis for objectively evaluating the effectiveness of the remedial measures or the need for further remediation to achieve the clean-up goals at the Shipyard Sediment Site.

F.1 Overview of Post Remedial Monitoring Requirements

As stated in Section D of the TCAO and in Section 34.2 of the DTR,[7] the Dischargers must submit a Post Remedial Monitoring Plan to the San Diego Water Board within 90 days of adoption of the TCAO. The Post Remedial Monitoring Plan must be designed to verify that the remaining pollutant concentrations in the sediments will not unreasonably affect San Diego Bay beneficial uses. Post Remedial Monitoring is to be conducted after the remedial activities have been completed. It is a key component of any sediment remediation because it provides the data and information needed to confirm that the remedial work has been successfully completed and, therefore, to confirm that the clean-up goals have been met.

According to the requirements specified in the TCAO, the Post Remedial Monitoring Plan must include a Sampling and Analysis Plan and a Quality Assurance Project Plan. The TCAO mandates that composite sediment sampling be conducted to confirm that the post-remedial SWACs for the five primary COCs have been met. Accordingly, sediment samples must be "collected at all 65 sampling stations used to develop Thiessen polygons and composited on a surface-area weighted basis" to prepare six sediment samples (that correspond to six polygon groups) for analysis of the five primary COCs. The Post Remedial Monitoring Plan must also include bioaccumulation testing of nine sediment samples using 28-day bioaccumulation tests with the bivalve, *Macoma nasuta*. Furthermore, chemical analysis, toxicity testing, and benthic community assessment must be conducted for sediment samples collected at five locations at the site.

F.2 Deficiencies of the Post Remedial Monitoring Requirements

The post-remediation monitoring program specified in the TCAO and the DTR is inadequate for the following reasons:

F.2.1 Neither the TCAO nor the DTR establish narrative remedial action objectives (RAOs) for each San Diego Bay beneficial use.

The TCAO concludes that the remaining pollutant concentrations in the sediments will not unreasonably affect San Diego Bay beneficial uses. However, neither the TCAO nor the DTR defines the term "will not unreasonably affect San Diego Bay beneficial uses." Without a clear definition of what the remedial actions are intended to achieve, it is difficult to determine if the clean-up was successful in terms of protecting or restoring beneficial uses in San Diego Bay. Therefore, the TCAO and the DTR should be revised to include narrative RAOs and numerical targets so that it can be determined if those objectives are attained.

[7] While the TCAO refers to "Post Remedial Monitoring," (pages 25-31, Attachment 6), the DTR refers to "Post-Remediation Monitoring" (see Section 34.2). This report uses the term "Post Remedial Monitoring" to refer to requirements in both the TCAO and DTR.

For example, one ROA that should be adopted is "to prevent exposure to whole sediments that are sufficiently contaminated to pose moderate or high risks to benthic invertebrates." The numerical targets that should be established to assess attainment of the RAO would be the SQGQ1 values that were used in the SQT evaluation (i.e., 0.25-1.0 for moderate exposure and ≥1.0 for high exposure) and/or the revised thresholds for sediment toxicity set out in Table 6 of this document.

F.2.2 It is not clear that attainment of the Remedial Goals presented in Section D.3.c.1 (Year 2), D.3.c.2 (Year 5), and D.3.c.3 (Year 10) of the TCAO ensure that San Diego Bay beneficial uses will not be unreasonably affected by sediment-associated contaminants at the Shipyard Sediment Site.

The stated Remedial Goals are inadequate for several reasons, including:

- Statistical comparison of the toxicity testing results to the results obtained for reference stations is likely to underestimate sediment toxicity because several stations were included in the reference pool for amphipods and sea urchins that did not meet negative control criteria and because the reference pool for bivalve development is limited to four samples. *See* Finding 17 of the DTR. In short, the thresholds for identifying toxic sediment samples are inappropriate. In addition, some of the protocols for conducting these toxicity tests have been refined since the reference data were generated. Therefore, a better approach would be to generate Sediment Quality Triad data for at least six reference stations as part of the Post Remedial Monitoring program. In this way, the reference data would be directly comparable to the data collected at the site. Toxicity testing should be conducted within numerous polygons located within and outside the Proposed Remedial Footprint to determine if benthic invertebrates are adequately protected. Sediment samples for defining current reference conditions and for evaluating

- Reduction of bioaccumulation levels below the pre-remedial levels would not ensure that aquatic organisms utilizing habitats at the site would have tissue COC concentrations low enough to support beneficial uses. In other words, implementing the remedial goal for bioaccumulation to achieve lower tissue concentrations does not ensure that the bioaccumulation levels are low enough. Therefore, the bioaccumulation data should be evaluated relative to the risks that are posed to aquatic-dependent wildlife and human health associated with exposure to COCs in the tissues of aquatic organisms.

F.2.3 The procedures that are prescribed for calculating Site-Wide SWACs will not provide the data required to determine the concentrations of COCs within each polygon at the Shipyard Sediment Site.

This is important because certain ecological receptors—including benthic invertebrates and certain benthic fish species, such as gobies—have small home ranges and are therefore exposed to contaminants that occur within small geographic areas. The sediment sampling requirements described in paragraphs 1 to 5 of Section D.1.c of the TCAO will provide data on the average levels of COCs in the top 2 cm of sediment contained within six polygon groups only. Additional data on COC concentrations will be generated only if archived sediment samples are analyzed in the future. This means that the data needed to evaluate the spatial extent of attainment of conditions that support beneficial uses will not be available. Importantly, neither the TCAO nor the DTR adequately explain the rationale for when additional data will be generated for the polygon groups.

F.2.4 Compositing surface sediment into six polygon groups is inappropriate because it will mask the true extent of contamination remaining at the Shipyard Sediment Site.

The DTR explains that the goal of the Post Remedial Monitoring program is to verify that remaining pollutant concentrations in the sediments will not unreasonably affect San Diego Bay beneficial uses. The DTR divides the Shipyard Sediment Site into six sampling areas and then directs the Dischargers to use a compositing scheme to evaluate the efficacy of the remediation. This process has significant problems for several reasons.

First, only two of the six groups represent areas where remedial actions will be taking place, and these areas represent a relatively small proportion of the site as a whole. Therefore, the assessment of how successful the clean-up has been will largely rest on composite data from sites that were not remediated. This is an inappropriate basis for evaluating the efficacy of remedial actions.

Second, the six sampling areas are arbitrary. Neither the TCAO nor the DTR provide any explanation of how the six sampling areas were selected, nor do the documents describe how this is a scientifically-defensible method to assess remediation success. I am not aware of any other sediment-contaminated site in the United States that has utilized an investigative sampling program, confirmation sampling program, or post-remedial sampling program that relies on preparation of composite sediment samples using the procedures described in the TCAO. Without a detailed, scientifically-based explanation of how the sites were selected and how it would accurately gauge remediation success, this sampling method is not scientifically justified and is arbitrary.

Third, the Post Remedial Monitoring plan is likely to create a number of practical challenges for a field sampling team. These challenges include ensuring that the correct volume of material is collected from each of the sampling stations and ensuring that these materials are correctly mixed to create six composite sediment samples. Such a program would require careful oversight by regulators to ensure that it is conducted correctly and is unlikely to provide reliable information for determining if the clean-up goals have been met.

Fourth, the Post Remedial Monitoring plan only requires samples for 65 of the 66 polygons in the Shipyard Sediment Site. The Post Remedial Monitoring plan does not require collection of samples from NA22 and excludes NA22 wholesale from the Post Remedial Monitoring plan. NA22 must be included in any Post Remedial Monitoring because it is a part of the Shipyard Sediment Site, regardless of the decision to exclude it from the remedial footprint in the hope that after the Chollas Creek TMDL is completed, another process may be initiated to address existing contamination within NA22.

F.2.5 The 0-2 cm horizon is not the appropriate sediment depth to sample to evaluate attainment of conditions that support beneficial uses.

At most sites, the 0 - 10 cm horizon is sampled to represent conditions in the biologically-active zone. Without further information on the depth of the biologically-active zone within San Diego Bay—not just within the contaminated portions of the Shipyard Sediment Site—is selection of the 0-2 cm horizon as the target sampling depth is not scientifically justified and is arbitrary. The Post Remedial Monitoring program should require samples be collected in the 0-10 cm horizon.

F.2.6 Collecting replicate sub-samples of composite sediment sample is not an appropriate method of evaluating the effectiveness of remedial monitoring COC.

The goal of the Post Remedial Monitoring plan, as described in section 34.2.1 of the DTR, is to verify whether the remediation has been effective in protecting human health and aquatic-dependent wildlife. However, the plan described will not provide the data to draw these conclusions. As written, the plan relies on sub-sampling sediments that have been composited from multiple polygons. This approach will only provide information on the consistency of the homogenization process that is applied to the composite sediment samples. It is therefore an acceptable part of a lab quality assurance plan but it is not an effective approach to analyze variability of COCs at the site post-remediation. Thus, this sub-sampling approach will not provide Regional Board staff with the information necessary to determine whether remediation has been effective at protecting human health or aquatic-dependent wildlife. Any monitoring required should include data that evaluates the level of variability of COC concentrations within individual polygons, within polygon groups, and within the site as a whole.

F.2.7 Trigger Concentrations for Primary COCs that are presented in Section D.1.c.6 of the TCAO and Table 34-1 of the DTR will not effectively identify conditions at the Shipyard Sediment Site that unreasonably affect San Diego Bay beneficial uses.

The Trigger Concentrations are likely to be relatively unhelpful in this respect because they are not based on the concentrations of COCs that need to be achieved to support attainment of the beneficial uses. Rather, they represent a statistical construct that is rationalized based on the assumed variability in COC concentrations at the site. The ineffectiveness of the triggers is demonstrated by the Trigger Concentration for mercury, which is higher than the pre-remedy SWAC of mercury at the Shipyard Sediment Site. It does not make any sense to have Trigger Concentrations, that are intended to provide a basis for determining if further action is needed, that exceed existing concentrations. Even though mercury bioaccumulation is a serious concern at this site, the only way further action can be triggered based on mercury concentrations is if the dredging somehow made the polygons more contaminated than they are today. It is more logical to set the Trigger Concentrations at the predicted post-remedy SWACs, particularly since the triggers are being compared to SWACs calculated based on compositing of sediment samples from 66 sampling stations.

F.2.8 Neither the TCAO nor the DTR provided the rationale for collecting sediment samples at nine sampling stations—SW04, SW08, SW13, SW21, SW28, NA06, NA11, NA12, and NA20—to support bioaccumulation testing.

The TCAO and the DTR should be revised to provide the underlying rationale that was used to select the nine sampling stations for bioaccumulation testing. In addition, there is a need to measure the concentrations of bioaccumulative COCs in both tissue and sediment to interpret the results of these tests. If a 56-day time-to-steady-state bioaccumulation test has not yet been conducted at the Shipyard Sediment Site, such a test should be conducted on one or more sediment samples to support interpretation of the data generated from the 28-day bioaccumulation tests.

F.2.9 The criteria presented in the TCAO for interpreting the results of the bioaccumulation tests—"bioaccumulation should be below pre-remediation levels"—are not effects-based. Because the 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 two years, five years, or ten years after the completion of remedial actions.

In addition, it is not clear how the results of these bioaccumulation tests would be used to inform decisions on the need for further actions at the site. Therefore, the TCAO and the DTR should be revised to describe how the bioaccumulation testing results will be used to identify conditions at the Shipyard Sediment Site that unreasonably affect San Diego Bay beneficial uses. In addition, these documents need to describe how the results from bioaccumulation testing will be used to determine if further action is required at the site.

F.2.10 The requirements for collecting and analyzing sediment samples for evaluating sediment chemistry for benthic exposure and sediment toxicity are inadequate.

The TCAO and DTR indicate that sediment samples are to be collected at a total of five sampling stations—SW04, SW13, SW22, SW23, and NA06—and analyzed for total metals, PAHs, PCBs, and TBT. This is inadequate because it will provide data on only about eight percent of the polygons at the Sediment Shipyard Site. No data for assessing benthic exposure will be collected for 61 of the 66 polygons at the site. As there is substantial potential for resuspension, transport, and deposition of fine sediment during the implementation of the remedy, recontamination of remediated areas or further contamination of unremediated areas could occur.

Therefore, this component of the Post Remedial Monitoring program must be expanded to provide a more robust basis for evaluating exposure of benthic invertebrates to contaminants at the site and for assessing sediment toxicity. To do so, sediment samples must be tested from appropriate selected reference areas. The DTR and TCAO should explicitly identify which protocols need to be used to evaluate toxicity to each indicator species. It addition, the list of analytes should be expanded to include simultaneously-extracted metals, acid-volatile sulfides, additional organotins, and organochlorine pesticides. These additional variables need to be measured to support a robust evaluation of the potential for adverse effects on benthic invertebrates.

F.2.11 Neither the TCAO nor the DTR present decision rules that describe how the sediment chemistry data generated in the Post Remedial Monitoring program will be used to inform decisions on the need for further actions at the site.

While the TCAO indicates that sediment chemistry should be below the SS-MEQ and 60% LAET thresholds, no decision rules are presented that describe the actions that must be taken if the thresholds are exceeded. Therefore, the TCAO and the DTR should be revised to describe how the sediment chemistry results will be used to identify conditions at the Shipyard Sediment Site that unreasonably affect San Diego Bay beneficial uses and to determine if further action is required at the site. In addition, these documents need to list the triggers that will be used for evaluating sediment chemistry for benthic exposure; they should explicitly identify the SS-MEQ thresholds and 60% LAET thresholds that trigger further action. Again, it is unclear why the remedial tools used to evaluate sediment chemistry for the Triad stations—SQGQ1 and frequency of exceedance of SQGs–have been abandoned in favor of the SS-MEQ and 60% LAET values.

F.2.12 Neither the TCAO nor the DTR present decision rules that describe how the sediment toxicity data generated in the Post Remedial Monitoring program will be used to inform decisions on the need for further actions at the site.

While the DTR describes the procedures that were used to interpret sediment toxicity for the purpose of establishing the remedial footprint, no decision rules are presented that describe the actions that must be taken if toxicity to one or more species is observed. Therefore, the TCAO and the DTR should be revised to describe how the sediment toxicity results will be used to identify conditions at the Shipyard Sediment Site that unreasonably affect San Diego Bay beneficial uses and to determine if further action is required at the site. In addition, these documents need to list the triggers that will be used to evaluate the sediment toxicity data. See Table 6 of this document for recommended thresholds for sediment toxicity.

F.3 Conclusions Regarding the Post Remedial Monitoring Requirements

Post Remedial Monitoring represents an essential component of any sediment remediation project. While the requirements set forth in Section D of the TCAO provide some of the guidance needed to ensure that the Dischargers develop and implement an effective Post Remedial Monitoring program, these requirements have a number of deficiencies that, if not corrected, will result in data gaps and uncertainties relative to the effects of contaminated sediments on San Diego Bay beneficial uses. Therefore, the requirements for Post Remedial Monitoring presented in the TCAO and DTR must be revised. Some of the revisions that are needed include:

F.3.1 Narrative remedial action objectives and specific indicators of attainment of those objectives (i.e., targets for specific metrics) should be included in the TCAO.

F.3.2 Sediment samples should be collected from all 66 polygons and evaluated for sediment chemistry to provide the data needed to determine if the site-wide SWAC for the five priority COCs have been met. The sediment samples should not be composited.

F.3.3 Sediment samples for evaluating attainment of the Alternative Clean-Up Levels should be collected from the 0 - 10 cm horizon to better reflect the biologically-active zone in San Diego Bay.

F.3.4 Trigger concentrations should be revised to correspond to the post-remedy SWACs for the five primary COCs.

F.3.5 The rationale for selecting the nine sampling locations for bioaccumulation testing should be provided. In addition, bioaccumulation testing should include a 56-day time-to-steady-state test to support interpretation of the bioaccumulation data.

F.3.6 Biological-effects based criteria should be established for interpreting the results of the bioaccumulation tests.

F.3.7 The number of polygons that are sampled for evaluating sediment chemistry, sediment toxicity, and benthic invertebrate community structure must be increased to include all of the polygons included in the Proposed Remedial Footprint and all of the polygons that are located adjacent to the footprint polygons. Such sampling is required to demonstrate that the Alternative Clean-Up Levels for aquatic organisms have been met throughout the site, not just at five pre-selected locations.

F.3.8 The decision rules that will be used to determine the need for further actions, based on the results of the Post Remedial Monitoring Program, must be clarified. It is inappropriate to empower the Dischargers to make recommendations ***after*** the Post Remedial monitoring data have been collected. This is not in the public interest.

G. Expert Opinion #5: Trigger Exceedance Investigation

The Trigger Exceedance Investigation and Characterization process, described in Section D.4 of the TCAO, will not provide a basis for compelling the Dischargers to conduct further remediation to achieve clean-up goals at the Shipyard Sediment Site.

G.1 Overview of the Trigger Exceedance Investigation and Characterization Process

Section D.4 of the TCAO describes the process that will be undertaken by the Dischargers if one or more exceedances of the post-remediation Site-Wide SWAC Trigger Concentrations are observed based on the results of Post Remedial Monitoring. In this event, the Dischargers must conduct a trigger exceedance investigation and characterization study to determine the cause(s) of the exceedance. The approaches that may be used in the study include:

- Recalculating the 95% UCL by incorporating more recent sampling data;
- Identifying specific sub-areas that caused the exceedance;
- Evaluating changes in site conditions that could have resulted from disturbances since the previous sampling; and/or,
- Analyzing archived samples used to prepare composite samples for the specific COC(s) that exceed the 95% UCL.

After completing the study, the Dischargers are to submit a report that describes the results of the investigation and, if the exceedances are deemed to be significant, include recommendations for addressing the exceedances. Approaches for addressing exceedances could include re-sampling the affected area, re-dredging, natural recovery, re-analysis following the next scheduled sampling event, or other appropriate methods.

G.2 Deficiencies of the Trigger Exceedance Investigation and Characterization Process

The TCAO sets out the process that the Dischargers must follow if the Post Remedial Monitoring Program shows exceedances of the Site-Wide SWAC Trigger Concentrations. The Trigger Exceedance Investigation and Characterization process is an important enforcement tool because it provides a mechanism for addressing any issues that arise after remediation is completed, if the remedial measures were not sufficiently effective to achieve the clean-up goals for the site. This process is essential at the Shipyard Sediment Site because the proposed clean-up is likely to be only marginally protective of beneficial uses and the requirements for Remediation Monitoring are not sufficiently rigorous to ensure that the clean-up goals have been met at the site. However, the Trigger Exceedance Investigation and Characterization process as set forth in the TCAO and DTR fails to function as an effective enforcement mechanism for the following reasons:

G.2.1 Exceedance of the Trigger Concentrations does not trigger further remedial actions.

Exceedance of one or more Trigger Concentrations triggers an investigation to identify the specific sub-areas that are causing the exceedance(s), instead of automatically triggering additional clean-up. The investigation could involve one or more of the four approaches described in the TCAO, such as recalculating 95% UCLs, identifying specific subareas that are causing exceedances, evaluating the effects of spills and other sources, and analyzing archived samples. The results of such investigations must be described in a Trigger Exceedance Investigation and Characterization report. The report must include recommendations for addressing the exceedances, such as conducting additional sampling, re-dredging, natural recovery, continued Post Remedial Monitoring, or other methods. By giving the Dischargers discretion to follow-up on exceedances of Trigger Concentrations using various methods other than additional clean-up, it is virtually certain that additional remedial work will not be conducted at the site following completion of the remedy.

G.2.2 The DTR and TCAO fail to establish Trigger Concentrations based on the Alternative Clean-Up Levels for aquatic life.

The DTR and TCAO only establish Trigger Concentrations based on the Alternative Clean-Up Levels for aquatic-dependent wildlife and human health. As a result, the Trigger Exceedance Investigation and Characterization process ignores exceedances of the effect thresholds for benthic invertebrates and the potential effects on fish associated with exposure to contaminated sediments and/or consumption of contaminated prey.

G.2.3 Trigger Concentrations have been established for five COCs only.

The Trigger Exceedance Investigation and Characterization process ignores exceedances of toxicity thresholds for other chemicals that could be adversely affecting aquatic organisms or other ecological receptors. This is important because arsenic, lead, and zinc were identified as risk drivers for aquatic-dependent wildlife and/or human health. In addition, Trigger Concentrations were established for HPAHs, yet benzo(a)pyrene (BAP) was identified as a key risk driver for aquatic-dependent wildlife and human health. By considering all HPAHs, rather than BAP alone, the potential effects associated with exposure to BAP may be masked.

G.2.4 The Trigger Concentrations that have been established may not provide an effective basis for evaluating the potential for adverse effects on San Diego Bay beneficial uses because they are statistically-based values, rather than effect-based values.

This limitation is emphasized by the Trigger Concentration for mercury (0.78 mg/kg DW), which is higher than the pre-remedy SWAC for this substance (0.75 mg/kg DW). By establishing a Trigger Concentration that is higher than existing concentrations, it is certain that no additional work will be conducted to address issues related to mercury at the site. Yet, mercury is known to be a problem at the Shipyard Site. This example emphasizes that insufficient care and attention has been used to establish the Trigger Concentrations.

G.3 Conclusions Regarding the Trigger Exceedance Investigation and Characterization Process

The Trigger Exceedance Investigation and Characterization process is the one tool that the San Diego Regional Board has to compel the Dischargers to implement the remedial activities set forth in the TCAO and DTR. However, the Trigger Exceedance Investigation and Characterization process, as described in

Section D.4 of the TCAO, does not provide a basis for compelling the Dischargers to conduct further remediation to achieve clean-up goals at the Shipyard Sediment Site. Added to the inadequacies of Remediation Monitoring and Post Remedial Monitoring requirements, the impotence of the Trigger Exceedance Investigation and Characterization process results in a proposed clean-up that is likely to be only marginally protective of beneficial uses. Therefore, this process needs to be revised to ensure that the San Diego Regional Board has the tools it needs to protect the public interest at the Shipyard Sediment Site. Key refinements that are needed to this process include:

TABLE 4. RECOMMENDED TRIGGER CONCENTRATIONS

Metric	Concentration/Value
Copper	159 mg/kg[1]
Mercury	0.68 mg/kg[1]
HPAHs	2,451 µg/kg[1]
PCBs	194 µg/kg[1]
TBT	110 µg/kg[1]
Arsenic	8.7 mg/kg[1]
Cadmium	0.2 mg/kg[1]
Lead	66 mg/kg[1]
Zinc	221 mg/kg[1]
Control-Adjusted Survival of Amphipods	82%[2]
Control-Adjusted Normal Development of Bivalves	76%[2]
Control-Adjusted Fertilization of Echinoderms	70%[2]

[1]From DTR Table 33-8
[2]From Table 6 of this document

G.3.1 The Dischargers should not be given authority to make recommendations regarding the actions that will be taken to address exceedances of the Trigger Concentrations. Rather, the San Diego Regional Board must retain the authority to review the data and make such decisions.

G.3.2 To the extent possible, the TCAO should clearly identify the actions that need to be taken if the Trigger Concentrations are exceeded. While it may not be possible to identify the required actions for all contingencies on an *a priori* basis, certain decision rules should be established in the TCAO. For example, step-out sampling to determine the size of the area that requires re-dredging should be required if conditions sufficient to impact the benthic community are identified within one or more polygons.

H. Summary of Recommendations

The TCAO and the DTR provide a great deal of valuable information for identifying the remedial actions needed to address impacts on designated uses associated with the presence of contaminants at the Shipyard Sediment Site. However, there are a number of important deficiencies in these documents that have the potential to compromise the effectiveness of the clean-up and the monitoring programs that will be conducted to assess its sufficiency. The following recommendations are provided to assist the San Diego Regional Board in revising the TCAO and DTR in a manner that serves the long-term public interest relative to the Shipyard Sediment Site:

H.1 Expand the Proposed Remedial Footprint to include all of the polygons that meet the selection criteria established in the TCAO and DTR. The highest priority additional polygons for inclusion in the remedial footprint include: NA01, NA04, NA07, NA16, NA22, SW06, SW18, SW29.

H.2 Revise the Remediation Monitoring requirements to dictate surface-water sampling locations and timing, to compel the Discharger to collect data on additional chemicals, to identify the water quality standards that must be met for each chemical, and to establish the steps that must be taken if the water quality standards for one or more chemicals are exceeded during remediation.

H.4 Revise the Remediation Monitoring requirements to dictate sediment sampling locations, to specify target sampling depths, and to require that multiple samples be collected from each SMU.

H.5 Revise the Remediation Monitoring requirements to clarify the decisions rules that will be used to determine if sufficient dredging has been conducted within each SMU.

H.6 Revise the Post Remedial Monitoring requirements to clearly state narrative remedial action objectives, to eliminate the collection of composite sediment samples, to include collection and analysis of sediment samples from each polygon, to modify the target sampling depth to 0 - 10 cm, to include chemical analysis of sediment samples collected from all 66 polygons, and to require toxicity for all polygons located within and adjacent to the Proposed Remedial Footprint.

H.7. Revise the Trigger Exceedance Investigation and Characterization process to ensure that the triggers are not higher than existing levels of contaminants at the site, that triggers for additional contaminants are included, that triggers that consider effects on benthic invertebrates and fish are established, and that the remedial actions that must be undertaken if the triggers that are exceeded are clearly described.

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TABLE 5. CHEMICAL AND TOXICOLOGICAL CHARACTERISTICS FOR POLYGONS THAT POSE UNACCEPTABLE RISKS TO FISH

Metric	Threshold Value	NA01	NA04	NA07	NA16	SW06	SW18	SW29
Composite SWAC Ranking Value[1]	5.5	6.8	6.4	9.9	6.7	7.2	6.7	7.5
SS-MEQ[2]	0.9	0.73	0.62	0.97	0.71	0.7	0.68	0.8
P_{max} for Sediment Chemistry[3]	0.49	0.76 (H)	0.74 (H)	0.72 (H)	0.77 (H)	0.69 (H)	0.69 (H)	0.66 (H)
Substances Exceeding SQGs for Sediment[4]	0	mercury, PCBs	mercury	mercury, PCBs	mercury, PCBs	mercury, PCBs	mercury, PCBs	mercury, PCBs
Substances Exceeding WQCs in Pore Water[3]	0	copper, PCB	ND	ND	lead, PCBs	ND	ND	ND
Control-Adjusted Survival of Amphipods[3]	82%	80% (S)	80% (S)	74% (S)	90% (S)	ND	74% (S)	ND
Control-Adjusted Normal Development of Bivalves[3]	76%	49% (S)	84% (S)	88% (S)	3% (S)	ND	64% (S)	ND
Control-Adjusted Fertilization of Echinoderms[3]	70%	86% (S)	88% (S)	102% (S)	84% (S)	ND	83% (S)	ND
Hazard Quotient for Fish ([PCB]/TRV)[3]	1	.25	.77	.16	.24	.05	1	2.59
Number of Criteria Exceeded		7	5	6	6	4	6	4

ND = no data; S = survival; TRV = tissue residue value; SQGs = sediment quality guidelines; WQC = water quality criteria; PCB = polychlorinated biphenyls; H = high; SWAC = surface-area weighted average concentration; P_{max} = maximum probability model.
[1]From Table A33-1 of DTR
[2]Calculated independently using the data in Table A33-3 of the DTR
[3]From MacDonald (2009)
[4]From DTR

TABLE 6. INDIVIDUAL STATION CHARACTERISTICS, SUMMARY STATISTICS, AND 95% LOWER PREDICTIVE LIMITS FOR CONTROL ADJUSTED AMPHIPOD SURVIVAL (%), BIVALVE DEVELOPMENT (% NORMAL), AND URCHIN FERTILIZATION (%) IN THE REFERENCE POOL (TABLE 18-7 OF THE DTR).

Station	Amphipod Survival	Bivalve Development[1]	Urchin Fertilization
CP 2231	76		66
CP 2238	90		36
CP 2243	84		97
CP 2433	84		100
CP 2441	82		102
SY 2231	84	93	99
SY 2243	92	66	92
SY 2433	96	101	79
SY 2441	95	70	90
2235	7		
2241	98		
2242	92		
2243	96		
2256	100		
2257	91		
2258	92		
2260	73		
2265	85		
N	18	4	9
Minimum	71	66	36
Maximum	100	101	102
Mean	88	82.5	85
Std Dev	8.4	17.1	22
RSD	10%	21%	26%
95% PL	72.9	37.4	41.9

[1]The 95% predictive limit for bivalve endpoint is calculated using the same methodology described in SCCWRP and U.S. Navy 2005b. The supporting calculation is provided in the Appendix to Section 18

Table 7. Recalculation of reference envelopes for the toxicity tests used at the Shipyard Sediment Site [1]

Station	Amphipod Survival	Bivalve Development	Urchin Fertilization
CP 2231	76 (excluded)		66 (excluded)
CP 2238	90		36 (excluded)
CP 2243	84		97
CP 2433	84		100
CP 2441	82		102
SY 2231	84	93	99
SY 2243	92	66	92
SY 2433	96	101	79
SY 2441	95	70	90
2235	7 (excluded)		
2241	98		
2242	92		
2243	96		
2256	100		
2257	91		
2258	92		
2260	73 (excluded)		
2265	85		
N	15	4	7
Minimum	82	66	79
Maximum	100	101	102
San Diego Bay Reference Envelope[2]	82-100%	Insufficient Data	79-102%
California SQOs - Non Toxic or Low Toxicity	82-100%	77-100%	None Available

SQOs = sediment quality objectives

[1]Sediment samples from the site with lower survival, development or fertilization than the lower of the reference envelope would be classified as toxic.

[2]Lower limit of reference envelope was calculated as the minimum survival for samples that met test acceptability criteria (i.e., 80% control-adjusted survival).

EXHIBIT 5

COUNSEL FOR DEFENDANTS
LISTED ON ATTACHED PAGE

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UNITED STATES DISTRICT COURT

CENTRAL DISTRICT OF CALIFORNIA

UNITED STATES OF AMERICA, et al., Plaintiffs, vs. MONTROSE CHEMICAL CORPORATION OF CALIFORNIA, et al., Defendants.	No. CV 90 3122-AAH (JRx) MEMORANDUM OF POINTS AND AUTHORITIES IN SUPPORT OF DDT DEFENDANTS' MOTION FOR SANCTIONS DUE TO GOVERNMENT MISCONDUCT
AND RELATED COUNTERCLAIMS, CROSS-CLAIMS AND THIRD-PARTY ACTIONS	Date: June 28, 1999 Time: 10:00 a.m. Place: 312 North Spring Street Courtroom 15

1565

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INTRODUCTION AND SUMMARY OF ARGUMENT

Defendants Montrose Chemical Corporation of California, Chris-Craft Industries, Inc., Rhône-Poulenc Ag Company, Inc., Atkemix Thirty-Seven, Inc., Stauffer Management Company, and Zeneca Holdings, Inc. (the "DDT Defendants" or "Defendants") submit this memorandum of points and authorities in support of their motion for sanctions due to substantial and pervasive government misconduct.

As described fully below, Plaintiffs United States of America and State of California (collectively the "government") have engaged in a pattern of egregious misconduct in the preparation and presentation of their expert reports. The government filed this purportedly billion-dollar action in 1990 without any scientific basis upon which to proceed. In a demonstrable example of making allegations first and then frantically searching to find evidence to support them, the government retained numerous putative "experts" and paid them over $30 million to support their claims. However, much to their dismay, the government's expert studies actually showed that the Palos Verdes Shelf has made a remarkable recovery since the early 1970s.[1] Virtually all the biota in and around the Shelf are more abundant and plentiful than ever -- and all the while, the DDT continues to be further buried.[2]

The government will not concede this fact, however, having spent eight years and over $30 million on this case. Instead, the government has resorted to intentional misconduct to hide the truth. Despite its heightened responsibility to "turn square corners" and act honestly in the conduct of this litigation, the government repeatedly has misrepresented and sought to conceal key scientific data and research findings that completely undermine the government's allegations

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[1] *See* Janet K. Stull, "Ocean Monitoring off Palos Verdes, Southern California, 1970-1995," Oceans '96 MTS/IEEE Conference Proceedings (1996) at 304 ("[t]here have been remarkable improvements in marine ecological conditions on the Palos Verdes Shelf and slope"), attached as Exhibit 1 to the Affidavit of Paul B. Galvani, Esq. ("Galvani Aff."), filed herewith.

[2] Indeed, the government concluded before this case was brought, in 1989, that the DDT in the sediments at the Palos Verdes Shelf is being permanently buried and does not represent a human health or environmental threat. *See* "Analysis of the Section 301(h) Secondary Treatment Variance Application by Los Angeles County Sanitation Districts for Joint Water Pollution Control Plant, Prepared by US EPA, Region 9 at 67 (Galvani Aff. Exh. 2).

of injury from the presence of DDT for which the Defendants may be responsible.

This is a serious allegation and the Defendants do not make it lightly. The government's misconduct goes far beyond simply proffering unsupported expert conclusions based upon shoddy science. The actions of the government and its scientific experts cannot be chalked up to mere incompetence. Time and again in this litigation, the testimony of the government's designated experts and the documents reflecting their research have led to the same troubling pattern: the government's experts, under the direction of senior governmental officials, repeatedly and intentionally have hidden their data and research findings from the Defendants when those data and findings do not support the government's case. Instances of misconduct have not been isolated, but rather abound. In the depositions of at least seven of the government's experts, the expert has admitted that the government *intentionally* sought to conceal important scientific data showing the absence of injury to natural resources. Virtually all the experts have admitted that the efforts at concealment occurred with the knowledge of -- and even at the direction of -- the National Oceanic and Atmospheric Administration ("NOAA") and the United States Environmental Protection Agency ("EPA").[3]

The government's misconduct infects every major substantive area of its case -- including injury to wildlife, sediment fate and transport, and economic damages. The government's pattern of misrepresenting and attempting to conceal key scientific data and findings warrants exclusion of expert evidence and *de novo* review of any decision by EPA. The Defendants are also entitled to their attorneys' fees and other costs incurred in uncovering the government's misconduct and bringing the instant motion. Finally, the government should not be allowed to recover the millions of dollars in assessment costs arising from the work of experts whose reports

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[3] Moreover, in a transparent effort to prevent the Defendants from unearthing this misconduct, the government has impeded the Defendants' access to the documents reflecting the data and research findings that the government seeks to bury. The government has admitted that from 1990 to 1995 -- the period during which most of the scientific research was conducted -- the government permitted its experts to *destroy* their drafts, working papers and other research materials. Only after certain of the experts admitted to destroying many key documents under questioning by Defendants' counsel, and Defendants told the government to stop allowing the experts to destroy key documents, did the government instruct its experts to retain documents such as draft reports and workpapers.

are infected with such misconduct.

STATEMENT OF FACTS

A. After Filing Its Complaint In 1990, The Government Sought Expert Opinion To Support Its Allegations of Multi-Billion Dollar Environmental Damage

After the government filed this action in 1990, the Defendants sought repeatedly to have the government identify the alleged injuries to natural resources and the cause of such injuries, by means of discovery requests and a proposed case management order. The government rebuffed all such inquiries, responding that these matters were "being studied." *See* Memorandum in Support of Defendants' Proposed Case Management Order (November 30, 1990). The reason for the government's stalling soon became clear -- the government had not undertaken scientific study of the allegedly injured natural resources before filing the complaint. Instead, the government undertook its investigation only after the initiation of this action.

It was not until October 1994 -- more than four years after filing the suit -- that the government finally revealed the purported scientific underpinnings of its claims. The government identified over 80 experts and disclosed the reports setting forth the experts' research findings.[4]

B. The Initial Depositions Of The Government's Experts Revealed That The Government Had Engaged In Misconduct

The Defendants began taking the depositions of the government's experts in March 1995. Only two depositions were begun, however, before the Court granted summary judgment to the Defendants on statute of limitations grounds on March 22, 1995. Nevertheless, the government's pattern of misconduct emerged immediately in these depositions, beginning with the government's expert on kelp bass, Dr. Robert Spies.

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[4] Plaintiffs' Identification of Testimonial Experts Pursuant to Amended Order Re: Experts (Amending Order Dated March 2, 1993), Dated March 13, 1994, and Federal Rule of Civil Procedure 26(a)(2) ("1994 Expert Designation") (Galvani Aff. Exh. 3).

1. **Misconduct in the government's fish research - Dr. Robert Spies**

The government's case as to the fish focused on purported impairment of reproductive capacity.[5] The government's scientists performed extensive studies both in the laboratory and in the field on the purported impact of DDT on fish's reproductive success.[6] The government's studies on fish evaluated not their actual reproduction, but the effect of DDT on various "indicators" of reproductive success, such as hatching success, number of fertilized eggs, and hormones purportedly linked to reproductive success (such as testosterone).

Dr. Robert Spies -- then the government's leading fish expert -- performed several studies for the government on kelp bass, including one in which he and his team compared kelp bass from the Palos Verdes Shelf with "clean" fish from a control site (Santa Catalina).[7] The government paid Dr. Spies approximately $1.5 million for his team's work.[8] Nonetheless, Dr. Spies's field study showed the exact opposite of what the government had hoped it would: no statistically significant reproductive impairment to the Palos Verdes fish. To the contrary, Dr. Spies found that the fish collected from the Palos Verdes Shelf had *more successful rates of reproduction* than at the control site.[9] Or, as Dr. Spies put it in a draft report initially concealed

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[5] NOAA, U.S. Department of Interior, State of California, Draft Injury Determination Plan, Damage Assessment: Los Angeles/Long Beach Harbors, Palos Verdes Shelf, and Ocean Dump Sites, ("Injury Determination Plan") (March 8, 1991) at 44-49 (Galvani Aff. Exh. 4).

[6] The government's benchmark for "injury" to the fish populations was whether research showed a statistically significant difference in the reproductive indicators between fish that were exposed to DDT and fish that were not exposed to chemicals. *See* Injury Determination Plan at 44.

[7] Dr. Spies' team included Dr. Peter Thomas, who himself engaged in misconduct on another fish study. *See infra* at pp. 9-10.

[8] Deposition of Dr. Robert Spies, conducted March 13-17, 1995 ("Spies Depo.") at 136 (Galvani Aff. Exh. 5).

[9] Spies Depo. at 68. Specifically, Dr. Spies testified as follows:

> Q. In fact, the fish at Palos Verdes, according to your 1993 field study, showed a higher reproductive success rate than the fish at Santa Catalina in every category, didn't it?
>
> A. That's correct.

from defendants: "There is a large difference in fertilization success between sites, with fish from Palos Verdes having an average fertilization success of about 34.8 ±32% (SD), while those from Catalina having 9 ±16%, and the difference is significant (P= 0.01)."[10] Dr. Spies's attempts to correlate the DDT levels in fish with their production of fertilizable eggs was similarly unavailing: he found that "None of the data for [total] DDT . . . in liver shows a significant difference in concentration between fish that did and did not produce fertilizable eggs."[11] The government had spent over a million dollars and disproved its own theories.

To deal with this nettlesome result, before submitting it to the Defendants, the government purged Dr. Spies's report of the adverse field study results.[12] The purge was not entirely thorough, however: two pages of unmarked and unidentified data were inadvertently left at the back of the version of the report produced to the Defendants. Those two pages, innocuously titled "Data: 1993 Field Spawn Fish," led the Defendants to discover the significant results that had been deleted from its version of the report.

When questioned about the deleted data, Dr. Spies admitted the data had been deleted on the advice of a NOAA-appointed peer reviewer, during a discussion with a senior NOAA official responsible for the government's oversight of this entire case, John Cubit.[13] Dr. Spies also admitted that the identity of that particular peer reviewer was nowhere disclosed, but on the contrary had been omitted from the list of peer reviewers in the report.[14]

Id.; see also id at 529.

[10] Dr. Robert Spies, Draft Final Report for Southern California Fish Injury Studies, dated May 12, 1994 ("Draft Spies Report") at 74 (Galvani Aff. Exh. 6). As was the case with many of the expert materials in this case, the government initially did not provide Dr. Spies's drafts or workpapers to Defendants; Dr. Spies himself testified that he had destroyed them. However, after Defendants' unrelenting demands for the materials, the government itself produced a copy of one of Dr. Spies's earlier drafts, which apparently had been retrieved by one of the government lawyers in the case. Other drafts that Dr. Spies created have never been produced.

[11] *See* Draft Spies Report at 73.

[12] Spies Depo. at 523-29; Draft Spies Report at 66 (PFX003 04534).

[13] Spies Depo. at 520-25.

[14] Spies Depo. at 543-44.

The two pages of reproductive data were the tip of a very large, carefully submerged iceberg. Dr. Spies not only was forced to concede that his research showed the fertilizability and hatchability success of the Palos Verdes fish were higher than those of the control fish, he also admitted that he had concealed his data showing that 100% of the Palos Verdes fish produced fertilizable eggs, compared to only 64% of the control fish.[15] Dr. Spies *knew*, when he drafted his report in 1994, that *DDT had no statistically significant relationship to a kelp bass' ability to produce fertilizable eggs* -- and yet, after consulting with the government, he deleted these findings from his final report, and the government knowingly provided the expurgated version to the Defendants and to the Special Master.[16]

2. Misconduct in the government's economic damages survey - Dr. Raymond Kopp

In addition to Dr. Spies, the other government expert whose deposition was begun in 1995 prior to the granting of summary judgment was Dr. Raymond Kopp, the lead author of the government's economic damages report. Through Dr. Kopp, the government has attempted to support its substantial claim for so-called "lost use" damages based on representations to the public that the government *knew* to be false. Specifically, the government seeks damages of $575 million as compensation for the supposed value of the lost use of natural resources injured by DDT. This huge number was developed for the government by Dr. Kopp's team of consultants, who were paid almost $6 million, and is based on a door-to-door public opinion survey of approximately 2,000 Californians. The consultants provided the survey respondents with information that supposedly accurately described reproductive injuries to four species living in the Southern California Bight: kelp bass, white croaker, bald eagles, and peregrine falcons. Specifically, the survey respondents were provided with these representations regarding natural resource injuries:

Two species of fish are having problems producing young in one place off the South

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[15] *See* Draft Spies Report at 73 (PFX003 04541).

[16] Spies Depo. at 520.

Coast. These are White Croaker and Kelp Bass.

> Two of the many species of birds living along the South Coast also have reproduction problems. They are the Bald Eagles and Peregrine Falcons.
>
> Many scientists have studied why these four species of fish and birds are having reproduction problems along the South Coast but not elsewhere along the California coast. They agree that these reproduction problems are caused by a deposit of two chemicals that are trapped in the sediment on the bottom of the ocean. These chemicals are DDT and PCBs.[17]

Based on these injuries, the respondents were then asked hypothetically how much they would pay to remedy the Palos Verdes Shelf sediments and supposedly eliminate the purported injuries in less time than would occur naturally. However, despite the fact that the survey was conducted *after* the government's biological experts had completed their studies proving these stated injuries to be inaccurate, the 1994 survey questionnaire used outdated assumptions about injuries that the government had provided to the survey team in 1991. As set forth in detail in the Defendant's impending motion to strike the contingent valuation study, the government *knew* these assumptions were false at the time the survey was conducted, and that the survey results cannot be used to support a claim for alleged "lost non-use" damages.[18]

The government cannot defend its conduct by claiming that it was unaware until too late that the survey information about fish and bird reproduction was false. The survey was not completed until August 1994.[19] Dr. Spies's field study showing no reproductive impairment in kelp bass was conducted in 1993, and a draft of the results was provided to NOAA at least as early as April 1, 1994. By the same token, the white croaker research upon which the

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[17] NRA, Inc., "Prospective Interim Lost Use Value Due to DDT and PCB Contamination in the Southern California Bight" (1994) at 11 ("NRA Report") (Galvani Aff. Exh. 7).

[18] For example, as described above, the government knew that Dr. Spies' studies failed to show any reproductive impairment in the kelp bass. The government's white croaker experts had no more success in showing reproductive impairment than Dr. Spies, as outlined below. Similarly, one of the government's peregrine falcon experts, Brian Walton, was shown Dr. Kopp's survey at his deposition and testified repeatedly that a number of the survey's key statements about injuries to peregrine falcons were also false and inaccurate. Nonetheless, the government presented the misleading results from Dr. Kopp's study and continues to rely on them today.

[19] NRA Report at 149.

government relied had been completed by 1988, and the results presented to NOAA in a paper prior to the start of this litigation, as discussed below. NOAA obviously was aware that the factual basis for the survey was false. In addition to the indefensibility of using the misleading survey results in the first instance, that misconduct is compounded each day that the government continues to rely on those results now that their experts have admitted there is no basis for claiming reproductive differences in fish or peregrine falcons between the Palos Verdes Shelf and elsewhere.

C. The Government Withdrew Half Its Experts

Following the dismissal of the natural resource damages case on statute of limitations grounds in March 1995, the government appealed to the Court of Appeals and discovery of the government's experts was therefore stayed for over two years. On February 25, 1997, the Court of Appeals reversed this Court's entry of summary judgment on Count I, and the mandate issued in May 1997. The Defendants then attempted to resume depositions of the government's experts, but the government moved for a further stay of discovery of their experts. Accordingly, Defendants were not able to resume depositions until September 23, 1997.

In the meantime, the government filed an amended designation of expert witnesses in May 1997, when it was clear the case would again proceed.[20] The government withdrew more than half the original number of expert witnesses, dropping from 81 to 38.[21] Among the expert witnesses deleted by the government was Dr. Spies, whose kelp bass study had cost over $1.5 million -- a sum that the government still seeks to recover from the Defendants. The government attempted to block the Defendants from taking the depositions of the withdrawn experts, obviously aware that their findings would undermine the government's case.

Recognizing that the government might be attempting to conceal scientific findings, the

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[20] *See* Amended May 1997 Attachment A: Revised List of Testifying Expert Witnesses ("1997 Expert Designation") (Galvani Aff. Exh. 8).

[21] The government, however, announced at the same time that EPA would take over from NOAA issues relating to the sediment contamination and that EPA would continue to rely on the work of a number of the withdrawn experts.

Court ordered that the Defendants were entitled to take discovery "to substantiate their allegations of misconduct by [the government] or [its] experts, including deposing all persons designated by [the government], including withdrawn experts."[22] The Defendants then proceeded to depose several more of the government's experts and former experts -- a process that unearthed still more misconduct.

1. Further misconduct in the government's fish research - Drs. Peter Thomas, Jo Ellen Hose and Jeffrey Cross

a. *Concealed data showing no reproductive effect on Atlantic croaker*

Dr. Peter Thomas was the co-author of Dr. Spies' intentionally incomplete and inaccurate 1994 report.[23] Although the report by Spies and Thomas was discredited at Dr. Spies's 1995 deposition and both the report and Dr. Spies were withdrawn from the case, the government nevertheless decided to proceed with Dr. Thomas as an expert in this litigation. The government charged Dr. Thomas with linking DDT to reproductive injury in fish. Dr. Thomas needed a new report, however, since his report with Dr. Spies was withdrawn. Because he had not done any research on the impact of DDT on fish in Southern California, other than his discredited work with Dr. Spies, Dr. Thomas recycled a report he had done for the EPA in 1991 on a fish in the Gulf of Mexico, the Atlantic croaker (as distinguished from the white croaker), simply submitting that study with a new cover.

In utilizing Dr. Thomas' "new" report, the government ignored the fact that Dr. Thomas' study was for the Gulf of Mexico, not the Palos Verdes Shelf, and examined a type of fish, the Atlantic croaker, that is not even *found* on the Palos Verdes shelf.[24] Worse yet, Dr. Thomas admitted on cross-examination that while the report he submitted included entire sections lifted

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[22] Order Re: Defendants' Application for Independent Review of the Special Master's May 27 and May 28 Minute Orders ¶ 1 (filed Oct. 6, 1997) (Galvani Aff. Exh. 9).

[23] Dr. Thomas testified that he was aware of the deletion from the report of the kelp bass data showing the reproductive success of Palos Verdes Shelf, and that he had not taken any steps to prevent that deletion. *See* Deposition of Peter Thomas, conducted April 6-9, 1998 ("Thomas Depo.") at 204-07 (Galvani Aff. Exh. 10).

[24] Thomas Depo. at 235-36.

verbatim from his 1991 EPA report,[25] he intentionally omitted those sections detailing the reproductive *success* of the fish. In fact, those omitted sections showed that *DDT caused no impairment in the Atlantic croaker's reproductive success.*[26] As Dr. Thomas wrote in his 1991 report (but deleted from the version of the report furnished to defendants): "[E]xposure to o,p'-DDT did not significantly alter any of the reproductive success parameters of eggs and larvae . . . Fertilization success was 100% in all groups and the percent hatch and viable percent hatch declined at comparable rates[.]"[27]

Dr. Thomas found himself in an awkward position. His report to the EPA concluded that the Atlantic croaker suffered no reproductive injury from DDT; yet he was charged with showing that DDT caused reproductive harm. Faced with this dilemma, Dr. Thomas decided not to report his actual results on reproductive success -- that is, the number of eggs spawned by each fish and the viability of those eggs over a period of time -- and instead to focus on endocrine measurements which have never been linked to reproductive success. Nevertheless, Dr. Thomas talked about these endocrine measurements in terms of "reproductive function," as though they were a proxy for "reproductive success."[28] Thus, Dr. Thomas deleted his data on actual reproductive success, since it was helpful to Defendants, and disguised the concealment by instead writing about "reproductive function," which at first blush seemed the same thing, but was not.

b. *Concealed data showing no reproductive effect on white croaker*

Drs. Jeffrey Cross and Jo Ellen Hose are the government's experts on injury to the white

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[25] Thomas Depo. at 72-73.

[26] Thomas Depo. at 20-23.

[27] *See* Peter Thomas & Lee A. Fuiman, Biomarkers of Reproductive Function and Larval Fitness in Croaker Exposed to Pesticides (undated, unpublished manuscript) at 18 (PFX005 00889) (Galvani Aff. Exh. 11).

[28] Thomas Depo. at 49-52, 63-76.

croaker.[29] Their expert report in this case is based upon research they conducted in 1985 and 1988, before this litigation began. Drs. Hose and Cross studied white croaker using fish from Los Angeles Harbor (the test fish) and from Dana Point (the control fish); their expert report claims to detail how DDT affects reproduction in the Los Angeles Harbor fish population. As was the case with Dr. Thomas, however, it turns out that Drs. Hose and Cross utilized only carefully selected portions of their data from 1985 and 1988 to support their conclusions. Like both Drs. Spies and Thomas, they *intentionally omitted highly probative data that directly contradict the theory that DDT harms fish reproduction.*

The white croaker report prepared by Drs. Hose and Cross unequivocally states that DDT "substantially contributed" to decreased reproductive function in white croaker.[30] Upon examination, however, it became clear that any negative correlation the experts found between DDT and reproductive success was not statistically significant (and therefore scientifically immaterial), and could be explained entirely by chance alone.[31] On the other hand, Drs. Hose and Cross had found statistically significant *positive* correlations between the presence of DDT in fish and four measures of reproductive success in the fish.[32] In other words, Hose and Cross found that the more DDT present in fish, the more reproductive success -- the more eggs the fish produces (fecundity), the larger the mean diameter of the fish oocytes (early-stage eggs), the greater the maximum diameter of the fish oocytes, and the heavier the ovaries -- all positive

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[29] *See* Deposition of Dr. Jeffrey N. Cross, conducted March 3-6, 1998 ("Cross Depo.") at 547-49 (Galvani Aff. Exh. 12).

[30] *See* Jo Ellen Hose & Jeffrey Cross, "Evaluation of Evidence for DDT- and/or PCB-Induced Reproductive Impairment in White Croaker" (as amended 1997) ("1997 Hose & Cross Report") at ii (Galvani Aff. Exh. 13).

[31] Cross Depo. at 129-30. Incredibly, scientists within NOAA concluded early on that Dr. Cross' work was of no use in establishing reproductive impairment, admitting: "Unfortunately, too few fish were sampled to perform appropriate statistical tests to evaluate statistical correlations between tissue concentrations of DDTs . . . and measures of reproductive impairment." *See* December 3, 1991 Memorandum from Bruce McCain to Bill Connor (Galvani Aff. Exh. 14). The government ignored these conclusions, however, and proceeded to rely on the invalid study.

[32] *See* Cross Depo. at 107.

indicators of reproductive success.[33] However, *none* of this exculpatory evidence appears in the experts' report. Instead, the government included statistically *insignificant* evidence of reproductive harm in the report, and excluded all statistically *significant* evidence of reproductive benefit.

Drs. Hose and Cross also omitted an entire category of relevant data from their final report. When they studied the reproductive indicators for the two geographic groups of white croaker in 1985, they did so by allowing some fish to spawn naturally while inducing others to spawn by injection with a hormone. One would never know this from reading the report, however; that document details only the reproductive data for the hormonally-induced fish. Why did Drs. Hose and Cross delete the information about fish that spawned naturally? The answer is in the unpublished 1986 paper by Drs. Hose and Cross, describing the 1985 study on which their expert report in this action is based. The 1986 paper -- which the government refused to provide to the Defendants despite repeated demands, and which was produced only *after* the deposition of Dr. Cross -- contains the data for *both* the hormonally-induced fish *and* the naturally spawning fish.[34] The 1986 paper concludes that "[a]mong naturally spawned fish from the two sites [L.A. Harbor and Dana Point], there were no differences in the number of eggs spawned, fertilization success, or viable fertilization."[35] In other words, Drs. Hose and Cross had concluded that the "clean" control fish and the "contaminated" test fish had *no significant difference in reproductive success* when they were allowed to spawn naturally. That data was excised completely from the experts' data set and appears nowhere in their final report. If Defendants had not learned about and pursued production of the 1986 unpublished paper, Defendants would never have uncovered this concealment.

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[33] *See id.*

[34] Jeffrey N. Cross and Jo Ellen Hose, "Determination of Assimilative Capacity: Impact of Contaminants on Reproduction of Marine Fish" (May 1, 1986) (unpublished manuscript) ("1986 Hose & Cross Report") at 25, Table 2 (PFX006 0768) (Galvani Aff. Exh. 15).

[35] 1986 Hose & Cross Report at 11 (PFX006 0754).

c. ***Concealed data showing adverse effects due to metals contamination***

Drs. Hose and Cross also knew that DDT and PCBs were not the only possible environmental causes of potential reproductive problems in white croaker. Therefore, they also studied other environmental factors linked to reproductive failure in fish, including the presence of metals in fish tissue. Drs. Hose and Cross reported that the data showed no difference in the metals in the two groups of fish; as they said in their report: "concentration of metals (cadmium, copper, and zinc) were generally similar in 1985 fish from San Pedro Bay and Dana Point . . . and thus do not appear associated with the reproductive effects observed in San Pedro Bay croaker."[36] However, Defendants demanded their actual underlying data, which the government initially resisted. When Defendants finally were able to pry the data out of the government, the data actually showed a statistically significant difference in cadmium levels between the test fish and the control fish -- the opposite of what Drs. Cross and Hose reported![37] These metals, as the government well knew, are quite capable of causing the very type of reproductive impairments that Drs. Hose and Cross were trying to attribute to DDT -- making it impossible for Drs. Hose and Cross to conclude that DDT was the culprit.[38] Knowing that, Drs. Hose and Cross concealed the data and misrepresented the results.

2. **Misconduct in the government's modeling of fate and transport of the sediments - Dr. Robert Eganhouse**

The government advocates remedial measures at the Palos Verdes Shelf because the Bight's natural resources purportedly will be injured far into the future if no action is taken as the consequence of the alleged continuing release of DDT and PCBs from the Palos Verdes Shelf sediments into the water column.[39] The actual data which the government experts collected from

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[36] 1997 Hose & Cross Report at 18 (Galvani Aff. Exh. 13).

[37] *See* Cross Depo. at 458-59.

[38] *See* Cross Depo. at 445-47.

[39] *See* Second Amended Complaint for Natural Resource Damages, Response Costs and Declaratory Relief Under 42 U.S.C. § 9607(a) ("Second Amended Complaint") ¶¶ 35, 56 (Galvani Aff. Exh. 16).

their study of the Shelf contradicts that theory. Those data show unequivocally that the sediments most affected by DDT are in fact not available to animals at the Shelf and that the DDT-containing sediments are being further buried each year by new sediment deposits. Thus, the government searched for a way to argue that the DDT in the buried sediments would make its way to the surface sediments and become bioavailable to animals. The government's proposed solution took the form of a mathematical model of future concentrations of DDT in the sediments on the Palos Verdes shelf.[40] According to the government's model, the sediment particles containing the peak concentrations of DDT will be excavated from their buried state by small organisms living in the sediments; once at the surface, the DDT will be released from the surface sediments into the overlying water column via processes of resuspension and desorption.

Dr. Robert Eganhouse of the U.S. Geological Survey was the only geochemist employed as part of NOAA's expert team. Dr. Eganhouse was assigned the tasks of (i) calculating the rate at which new sediments are being deposited on the Palos Verdes Shelf; and (ii) calculating the degree to which DDT is desorbed from the sediment particles into the porewaters[41] of the Shelf, which can be used to calculate a flux into the overlying water column.[42] Dr. Eganhouse completed both of these tasks and was paid over $500,000 for his efforts. His results, however, were directly contrary to what the government hoped to show in its chemical fate and transport models. Therefore, as in other instances, the government ignored Dr. Eganhouse's scientific evidence, dropped him from its expert roster, and attempted to conceal everything about his

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[40] *See* D.E. Drake, C.R. Sherwood, P.L. Wiberg, "Predictive Modeling of the Natural Recovery of the Contaminated Effluent-Affected Sediment, Palos Verdes Margin, Southern California" (October 1994) ("Sediment Modeling Report") (Galvani Aff. Exh. 17). The focus of the Sediment Modeling Report is p,p'-DDE, a prevalent metabolite of DDT that serves as a proxy for total DDT in the modeling work.

[41] "Porewaters" refers to the water molecules found between the sediment particles in the bed at the ocean floor.

[42] *See* Robert P. Eganhouse, "Geochemical Process Studies on the Palos Verdes Shelf, Draft Final Report" at 6 (July 7, 1994) ("Eganhouse July Draft") (Galvani Aff. Exh. 18).

work -- including the fact that he had even done it.[43]

a. ***Concealed data showing a high sedimentation rate***

A key variable in the government's chemical fate and transport model is the rate at which new sediments are being deposited on top of the existing sediments at the Palos Verdes Shelf. The more rapidly the existing sediments are being buried, the more difficult it is for the government to argue that the buried DDT concentrations will make their way back to the surface. The government model predicts future sedimentation rates using recent depositional rates at the Shelf during the 1980's and early 1990's. Dr. Eganhouse was instructed to calculate these recent historical rates employing a methodology he had developed in previously-published work.

Dr. Eganhouse employed his methodology and calculated that, from 1981 to 1992, 2.0 centimeters of new sediment had been deposited per year on a specific part of the Palos Verdes Shelf. He reported this result in an August 1994 draft report that was then circulated among the other government scientists.[44] Dr. Eganhouse's sediment deposition rate was then incorporated into the modeling work of other government experts.[45] The government, however, discovered that the sediment model with Dr. Eganhouse's sedimentation rate of 2.0 cm/yr could not produce the desired prediction, *i.e.* that buried DDT would be brought back to the surface in the future. The government solved this dilemma by deleting Dr. Eganhouse's 2.0 cm/yr rate from their final reports in October 1994 and using a much lower rate of 0.4 cm/yr.[46] Not only was Dr.

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[43] In fact, the Defendants stumbled upon the existence of Dr. Eganhouse's unreported work by chance. A single hand-drawn graph in the personal notebook of one of the government's other experts, Dr. Robert Wheatcroft, led the Defendants to begin asking about Dr. Eganhouse's work. Only after several government experts had testified about seeing Dr. Eganhouse's results did the Department of Justice lawyers admit that they had in their possession Dr. Eganhouse's draft reports.

[44] *See* Robert P. Eganhouse, "Geochemical Process Studies on the Palos Verdes Shelf" at 5 (August 26, 1994) ("Eganhouse August Draft") (Galvani Aff. Exh. 19).

[45] *See* Christopher R. Sherwood, "One-Dimensional (Vertical) Model of Bed-Sediment Contamination Profiles" at 10, 11, Table 5 (August 3, 1994) ("Sherwood App. B August Draft") (Galvani Aff. Exh. 20).

[46] *See* C.R. Sherwood, "One-Dimensional (Vertical) Model of Bed-Sediment Contamination Profiles" at 30, Table 5 (October 1994) ("Sherwood App. B Final Report") (Galvani Aff. Exh. 21). In a later supplement to this report, the sedimentation rate used in the

Eganhouse's rate not used in the expert reports, but all references to his having even done the work disappeared from the final reports, as well. Remarkably, the government is demanding reimbursement from the Defendants for the over $500,000 paid to Dr. Eganhouse for his work.

For his part, Dr. Eganhouse testified that he was never informed why the government deleted the sedimentation rate he had calculated. He was not included in any discussions leading up to the decision to delete his rate from the modeling work. Moreover, he stands by the accuracy of his calculation to this day, and has presented his findings to at least two scientific conferences.[47] Nowhere in its expert reports does the government ever acknowledge that Dr. Eganhouse's sedimentation rate calculation of 2.0 cm/yr exists, much less explain why the rate was rejected in favor of another rate one-fifth its size.

b. ***Concealed data showing extremely low DDT desorption and loss potential***

A second key process in the government's sediment modeling efforts is molecular diffusion of DDT from the sediment porewaters into the overlying water column, which the government contends accounts for over half the DDT lost from the sediments.[48] Diffusion occurs when there is a flux of a substance like DDT from an area of high concentration to an area of low concentration. Thus, in order for DDT molecules to diffuse upward from areas of high sediment concentration to areas of low sediment concentration (that is, from deep in the sediments upward), the sediment porewaters must contain higher concentrations of DDT in the deeper

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model runs was increased slightly, from 0.4 cm/yr to 0.44 cm/yr. Here again, however, there was no mention or use of Dr. Eganhouse's 2.0 cm/yr rate. *See* C.R. Sherwood, D.E. Drake, P.L. Wiberg, "Supplement to Predictive Modeling of the Natural Recovery of the Contaminated Effluent-Affected Sediment Palos Verdes Margin, Southern California" at 2-3, 7, Table 2 (Galvani Aff. Exh. 22).

[47] *See* R.P. Eganhouse, "Depositional History of Coastal Sediments Impacted by Municipal Wastewater Discharge: Reconstruction using Molecular Stratigraphy," Poster for American Geophysical Union Meeting, January 16, 1996 (Galvani Aff. Exh. 23); R.P. Eganhouse, "Depositional History of Sediments Near A Major Submarine Municipal Wastewater Outfall System," Abstract from American Chemical Society Meeting, March 24-26, 1996 (Galvani Aff. Exh. 24).

[48] *See* Sherwood App. B. Final Report at 35 (Galvani Aff. Exh. 21).

layers than at the sediment surface. Dr. Eganhouse was responsible for the measurement of DDT concentrations in the porewaters and the use of those measurements to calculate the degree to which DDT on Palos Verdes Shelf sediments actually desorbs from particles into adjacent porewater.

Dr. Eganhouse completed the porewater concentration measurements and presented his findings to the sediment modeling team and to the Department of Justice in the spring of 1994.[49] The results, however, were just the opposite of what the government wanted to see: Dr. Eganhouse discovered that porewater DDT concentrations are actually highest at the surface of the sediments and decrease with depth. That profile indicates that the diffusion of DDT would proceed from the sediment surface *into* the sediment bed, not from porewater deep in the sediments toward the sediment surface. Dr. Eganhouse also determined the degree to which DDT woul desorb from particles. His direct observations showed that DDT would be up to two orders of magnitude more likely to remain as sediment particles (rather than desorbing into porewater) than predicted by the government. Therefore, Dr. Eganhouse's measurements directly contradicted the government's theory that contaminants are transferred from deeper sediments to the surface and instead indicated that the government's computer models significantly overestimated diffusive losses from the sediments.

Here again, the government solved its problems by "deep sixing" Dr. Eganhouse's work and deleting any reference to it in other draft reports.[50] However, this left the government with no support for its theory that a substantial amount of "molecular diffusion" is occurring. Accordingly, in the few weeks leading up to the publication of their final report on the model, another government expert, Dr. Sherwood, generated a completely separate calculation of

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[49] *See* Robert Eganhouse, "DOJ Presentation 5/12/94: Geochemical Process Studies on the Palos Verdes Continental Margin" at 7-8 (PMX053 0545) (Galvani Aff. Exh. 25).

[50] Again, it was only fortuitous that the Defendants ever learned about Dr. Eganhouse's work. There was a vague reference to a porewater gradient in another expert's handwritten notes, which Defendants then spent considerable time and money to track down, ultimately discovering Dr. Eganhouse's measurement activity. Even then, however, the government resisted providing the Eganhouse data, until Defendants took the issue to the Special Master.

molecular diffusion that yielded the results the government wanted.[51] His new calculation -- which replaced Dr. Eganhouse's *actual measurements* of Palos Verdes shelf porewater DDT concentrations -- was generated from an uncalibrated *model* that previously had been used to assess PCBs (not DDT) in the sediments of Boston Harbor (not Southern California). [52] Dr. Sherwood testified he was not an expert in this area, that he had no experience in calculating molecular diffusion, and that he had no prior familiarity with the model he used.[53] In fact, although Dr. Sherwood knew that the model's author was a student studying for a master's degree, he did not know anything about who the student was, or how the student had derived the model.[54]

Following the burial of his findings (and despite the payment of more than half a million dollars for his work), Dr. Eganhouse was summarily deleted from the government's list of experts.[55]

3. Misconduct in the government's foodweb/pathway modeling

Dr. John Connolly is the government's "foodweb/pathway" modeling expert; his task was to create a model that would accurately reflect the transfer of DDT from the sediments at the Shelf into sediment-dwelling organisms and into the water, and from there to higher levels of the food chain.

One of the fundamental steps in such a model is to determine how much DDT is available to the organisms from the sediment. At his deposition, Dr. Connolly testified that "one of the first things that [h]e did on the project was to take all of the available data and begin to analyze

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[51] Deposition of Christopher Sherwood, conducted September 23-26, 1998 ("Sherwood Depo.") at 947-49 (Galvani Aff. Exh. 26).

[52] Sherwood App. B. Final Report at 35, 80 (Galvani Aff. Exh. 21); Sherwood Depo. at 970.

[53] Sherwood Depo. at 938-39.

[54] Sherwood Depo. at 967-71.

[55] *See* 1994 Expert Designation at 26 (Galvani Aff. Exh. 3); 1997 Expert Designation at 16-19 (Galvani Aff. Exh. 8).

that data to develop some understanding of contaminant levels along the west coast of the United States."[56] While his report includes a figure that purports to show the result of that analysis, his real findings are not presented. The figure in his report shows a significant DDT peak at the Palos Verdes Shelf. At his deposition, however, Dr. Connolly admitted that the figure distorts what he actually found. In fact, he had earlier created, but omitted reference to in his report, an accurate figure showing that DDT concentrations were higher at three other points along the California coastline than at the Palos Verdes Shelf.[57] Instead, after a request from a Department of Justice lawyer for "a chart that illustrates in effect a *cancer or ulcer of DDT* and/or PCB contamination on the PV Shelf,"[58] Dr. Connolly devised the admittedly distorted figure that is included in his report, and deleted his accurate one.

In the final figure, Fig. 1-4 of Dr. Connolly's report, the concentrations at the Palos Verdes Shelf appear higher than anywhere else along the coast. To get this result, Dr. Connolly admitted, it was necessary to fudge the distances over which the data points were averaged. By distorting the scale for his figure, Dr. Connolly purposely obscured his relevant finding that there were other potentially major sources of DDT along the California coastline. Instead, his report presents an inaccurate and misleading depiction of the Palos Verdes Shelf as having the highest concentration of DDT along the Pacific coast, when it does not.

4. <u>Misconduct in the government's marine mammal research</u>

a. *<u>Did not disclose data showing lack of causation</u>*

The government designated only one expert on marine mammals, John Calambokidis. Mr. Calambokidis submitted to the government in August 1994 what he considered to be the final version of his report on marine mammals. In this version of his report, Mr. Calambokidis presented a species-by-species description of the data he gathered concerning a causal link

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[56] Deposition of John Connolly, conducted July 13-17, 1998 ("Connolly Depo."), at 349 (Galvani Aff. Exh. 27).

[57] *Id.* at 376-78.

[58] *Id.* at 202 (quoting Connolly Depo. Exh. 13, PPX 012 0709 (Galvani Aff. Exh. 28)) (emphasis added).

between contaminants and injuries to 21 species of marine mammals in the Southern California Bight. He had very little success in finding such a link, however. For 20 of the 21 species he studied, Mr. Calambokidis reported in the August 1994 version of his report that there was *no evidence* establishing a causal link between injuries to that species in the Southern California Bight and exposure to contaminants.[59] In fact, in many cases, Mr. Calambokidis' August 1994 report presented the findings of studies in which injuries to marine mammals were specifically attributed to causes *other* than contaminants like DDT.[60]

NOAA immediately took steps to remove the unhelpful information from Mr. Calambokidis' August 1994 report. Specifically, Dr. Cubit of NOAA (who was also involved with Dr. Spies' deletions) "recommended" to Mr. Calambokidis that he prepare another draft of his marine mammal report and delete from the new draft all references whatsoever to causation of injuries.[61] Mr. Calambokidis did just that, and his final report (the one submitted to the Defendants) was finished a month later, in September 1994. Mr. Calambokidis and the NOAA representative, Dr. Cubit, had reviewed the August 1994 report page by page, marking the passages that NOAA "recommended" deleting.[62]

With all this causation information deleted from the September 1994 final version of Mr.

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[59] *See, e.g.*, John Calambokidis, "Injury From PCBs and DDTs to Marine Mammals in the Southern California Bight (August 1994) at 21, 22, 26, 34, 37, 43 ("Calambokidis August 1994 Draft Report") (Galvani Aff. Exh. 29).

[60] Calambokidis August 1994 Draft Report at 22, 26.

[61] Deposition of John A. Calambokidis, conducted November 3, 1997 ("Calambokidis Depo.") at 82-84 (Galvani Aff. Exh. 46).

[62] Calambokidis Depo. at 82-84; 233-34. For example:

> Q. For example, on page 37 [of the August 1994 Draft Report] at the bottom, you talk about northern sea lions and you concluded that there weren't any data that could link the decline of the population of northern sea lions to DDT or its metabolites or PCBs in southern California, is that right?
> A. Yes.
> Q. And you took that out of your report after Mr. Cubit told you to, right?
> A. Yes, related to injury.

Calambokidis Depo. at 123-24.

Calambokidis' report, the September 1994 final report leaves the *impression* that DDT is having an adverse effect on the marine mammals, when in fact Mr. Calambokidis and NOAA were fully aware that just the opposite is true.[63]

b. ***Did not disclose recent data showing lower concentrations***

Mr. Calambokidis' report claimed to present all published and unpublished data on levels of DDT and PCB concentrations in Southern California Bight marine mammals. Mr. Calambokidis said in his report that he had conducted a "literature search" for such data and also directly contacted researchers to track down any other sources of relevant data.[64] These concentration data were presented in tables at the end of his report; most of the data reported were sampled during the 1960's and 1970's, and none was more recent than the early 1980's.[65] What Mr. Calambokidis failed to mention in his report, however, is that he was aware of at least two sets of data sampled in the 1990's showing far lower chemical concentrations in marine mammals than those in his report -- and that he did not put these test data in his report, or even mention the data's existence.

One of these two excluded data sets was actually gathered by another of the government's own experts in this case. The Injury Determination Plan mentioned that NOAA had access to tissues from 20 sea lion pups gathered in 1991 that it intended to sample as part of its research. This sampling was completed and Mr. Calambokidis asked NOAA for the results, so that he

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[63] In a letter dated April 6, 1999, Karen S. Dworkin, Esq. of the U.S. Department of Justice -- having reviewed a draft of this memorandum served pursuant to Fed. R. Civ. P. 11(c)(1)(A) -- asserted that the Defendants are not entitled to seek sanctions relating to injury to marine mammals because the government is no longer seeking damages for injury to marine mammals. Ms. Dworkin further stated that the government "plan[s] to delete the reference to marine mammals in the proposed Third Amended Complaint, at paragraph 36, line 22" (Galvani Aff. Exh. 50). To date, however, the government has taken no steps to effect this change. The government's assertion of injury to marine mammals remains before the Special Master as part of the pending motion to amend, and the government has done nothing to alert the Special Master of its intention to modify its motion. Nor has the government taken any other steps to cure the numerous other instances of misconduct set forth herein.

[64] *See* John Calambokidis, Marine Mammal Exposure to PCB and DDT Contamination in the Southern California Bight (September 1994) at 3-4 ("Calambokidis Final Report") (Galvani Aff. Exh. 30).

[65] Calambokidis Final Report, Tables 4-10.

could include the data in his report. *NOAA refused to give him these data.*[66] The reason for NOAA's refusal is quite clear: the concentration data from 1991 show significantly lower levels than the old data Mr. Calambokidis put in his report.[67] There is no mention anywhere in Mr. Calambokidis' report that these data had even been gathered.

The second set of data was gathered by the County of Los Angeles. In response to a letter from Mr. Calambokidis, the County provided him with the results of recently-completed sea lion sampling conducted for DDT and PCBs. These data were shared with Mr. Calambokidis in March 1994, long before the completion of his final report in September 1994. Here again, however, the new data were not presented in Mr. Calambokidis' tables, and the existence of the data was not even mentioned in his report.[68] The reason for this omission is also clear: the new Los Angeles County data, like the new NOAA data, showed contaminant concentrations levels far below the levels from the old data in Mr. Calambokidis' report.[69]

Mr. Calambokidis signed the September 1994 report -- purporting to present all available marine mammal concentration data -- and it was submitted to the Defendants, despite the fact that both Mr. Calambokidis and the government knew that it was based on 20-year-old, outdated data that was no longer accurate. As a result, while contaminant levels in these animals have fallen drastically since the 1970's, Mr. Calambokidis' report hides that fact, as the government intended.[70]

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[66] Calambokidis Depo. at 110-12.

[67] For instance, in the ten premature sea lion pups gathered in 1991, the mean level of p,p'-DDE in the animals' blubber was 40 ppm, as compared with 944 ppm and 779 ppm in the blubber of premature pups gathered in 1970 and 1972, respectively. *See* John P. Connolly, *et al.*, Southern California Bight Damage Assessment Foodweb/Pathways Study (1997) at 2-32 ("Hydroqual Report") (Galvani Aff. Exh. 31).

[68] Again, these data were produced only after the Defendants subpoenaed them.

[69] Calambokidis Depo. at 163-71.

[70] The government contends that it was not improper to prevent the 1991 NOAA sea lion data from being included in Mr. Calambokidis' report because a table summarizing the data was included in the materials produced by a *different* government expert. This argument is baseless. The government presented to the Defendants and to the Special Master a misleading report that disguises a downard trend in marine mammal contaminant concentrations. The misleading

5. **Misconduct in the government's sediment toxicity research**

The government also claims that the sediments on the ocean floor at the Palos Verdes shelf have been "injured." NOAA set out to prove this injury by establishing that the concentrations of DDT and PCBs in the sediments are sufficiently high to be toxic to invertebrates living in the sediments (*e.g.*, worms, shrimp, sea urchins). For this task, NOAA hired Donald MacDonald, who derived threshold concentrations of DDT and PCBs in the sediments above which sediment-dwelling organisms purportedly would be injured. In deriving these thresholds, Mr. MacDonald did not conduct any field or laboratory studies himself, but instead relied only on a literature review of studies conducted by others.

As it turns out, however, Mr. MacDonald used the data unethically. Mr. MacDonald professed in his report to have used the data from all relevant studies to determine that sediments with concentrations of DDT over 7.15 parts per million are toxic to sediment-dwelling organisms. At his deposition, however, Mr. MacDonald admitted that he derived this threshold *without* taking into account the results of a study prepared by EVS Consultants, one of the government's former experts in this case. EVS's study was conducted on sediments and organisms from the Palos Verdes Shelf and showed *no toxic effect* from DDT concentrations as high as *267 parts per million* -- many times higher than Mr. MacDonald's supposed toxicity threshold of 7.15 parts per million. Although he was aware of the EVS study, MacDonald failed even to mention in his report that the EVS study had been conducted.[71]

The government's motive here is clear. Mr. MacDonald is now the government's sole designated expert on injury to sediments, and the results of the EVS study (the cost of which the government is still seeking to recover from the Defendants) are nowhere to be found in any of the government's expert reports. The government is trying desperately to ignore the results of the

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character of that report is in no way cured by the fact that the Defendants and the Special Master could have ferreted out the key missing data from the mass of materials produced by another of the government's 80-plus expert witnesses.

[71] Deposition of Donald MacDonald, conducted September 23-26, 1997 ("MacDonald Depo.") at 440-41, 449 (Galvani Aff. Exh. 32).

EVS study because the results are damaging to the government's claims.

6. **The EPA proceeding is tainted fruit of the poisonous NOAA tree**

The EPA has been an active participant in the manipulation, distortion and non-disclosure of expert data. The Second Amended Complaint was brought by the United States "at the request and on behalf of the Administrator" of EPA.[72] Count 2 seeks recovery of response costs allegedly incurred in connection with EPA's performance of response activities at the upland Torrance plant site. As for the Palos Verdes shelf sediments, EPA's initial strategy was to leave that fight to NOAA and the State of California, in the form of the natural resources damages claim (Count 1 of the Second Amended Complaint). EPA determined in 1990, after the filing of the original complaint in this action, that it would not initiate a response action for the Palos Verdes Shelf. Only after the natural resources damages claim was dismissed by this Court on statute of limitations grounds did EPA reverse course and decide to assert its regulatory jurisdiction over the Palos Verdes Shelf. On July 10, 1996, while the appeal of the dismissal was pending in the Ninth Circuit, EPA announced that it would undertake a study known as an engineering evaluation and cost analysis ("EE/CA") to assess whether it should take response action on the Palos Verdes Shelf. The motive for this about-face became clear when the government then told the Ninth Circuit that its consideration of plaintiffs' pending appeal of the natural resource damage case's dismissal based on the statute of limitations would be unnecessary because the EPA administrative action mooted the statute of limitations question.

At the same time, EPA announced that it would treat the Palos Verdes Shelf as though it were part of the upland Montrose National Priorities List site, even though the Shelf is noncontiguous and over twelve miles away from the factory site. EPA attempted to effect this change by fiat, apparently out of fear that it could not independently satisfy the NPL listing requirements. The Defendants rebuffed EPA's attempted end-run around the limitations problem by means of litigation in the D.C. Circuit. *See Montrose Chemical Corporation of California v. Environmental Protection Agency*, 132 F.3d 90 (D.C. Cir. 1998). To this day, EPA

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[72] *See* Second Amended Complaint at 1 (Galvani Aff. Exh. 16). This quoted language is also used in the government's proposed Third Amended Complaint.

still has not concluded the formal process of amending the National Priorities List to include the Palos Verdes Shelf.

In pursuing the EE/CA proceedings, EPA is hoping to convert NOAA's sediment case against the Defendants into a case that is subject only to administrative record review under an "arbitrary and capricious" review standard, and thus avoid this Court's full scrutiny. *See* CERCLA § 113(j), 42 U.S.C. § 9613(j). Worse, the government is using the EPA to repackage many of NOAA's damages experts.

One of the EPA's first actions after initiating the EE/CA was to place NOAA's expert reports into the administrative record, and to allow its own experts to rely on the work of NOAA's experts. The government then sought to shield EPA's experts in the EE/CA process from discovery, so that the Defendants could not question them on their reliance on the NOAA experts' work. At the same time, NOAA "withdrew" a number of the experts it had designated in this action, and whose reports are being relied upon by the EPA's experts. NOAA asserted that the Defendants could not take these experts' depositions, a position this Court rejected.

In the EE/CA process, EPA ostensibly is "considering" whether it will order the Defendants to institute the capping or reimburse EPA for as much as $125 million to place a "cap" of new sand on top of the existing Palos Verdes Shelf sediments, in water 200 feet deep -- a feat never before undertaken. In reality, the discovery taken to date shows clearly that EPA long ago decided that the Defendants would be ordered to undertake or pay for the capping project; having pre-selected the capping remedy in violation of law, EPA then tried to manufacture the evidence to justify its decision.[73] EPA has in addition attempted to shield its lack of scientific support for capping by manipulating the Technical Advisory Committee process: EPA has repeatedly sought to block the Defendants' efforts to present to the members of

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[73] The evidence of EPA's having preselected capping as the ultimate response action is described fully in a June 15, 1998 letter from José R. Allen, Esq. to John Lyons, Esq. (EPA Assistant Regional Counsel) (Galvani Aff. Exh. 33). Indicative of the government's approach is the instruction given by a Department of Justice lawyer to the "capping" experts: "Stress strong points in print tell [us] the weak points." *See* Deposition of James E. Clausner, conducted October 20-21, 1998 ("Clausner Depo.") at 22-23 & Exh. 3 (typewritten notes, page PRX007 0104) (Galvani Aff. Exh. 51).

the TAC significant technical evidence and then simply refused to call a meeting for over a year in the wake of the Defendants' criticism of EPA's draft reports. Moreover, as shown below, EPA's expert work is as unethical as that of NOAA.

a. ***Human health risk assessment***

The government would justify its proposed cap on the Palos Verdes Shelf on an alleged risk to human health purportedly caused by DDT in white croaker from the Palos Verdes Shelf. EPA hired SAIC to perform a so-called human health risk assessment to quantify the alleged risk. In July 1997, SAIC completed a draft risk assessment that purported to estimate the increased risk of cancer to Southern California anglers from eating fish they caught at the Palos Verdes Shelf. A copy of that report was provided to defendants.

The Defendants criticized SAIC's report for failing to use a state-of-the-art "Monte Carlo" analysis that uses statistical probabilities to more accurately predict the risks than other types of health risk assessments. SAIC already had submitted its human health risk assessment to the EPA *with* a Monte Carlo analysis included. That analysis showed significantly *lower* health risks to all categories of anglers studied than the risks shown in the report that the government provided to the Defendants. Indeed, even using SAIC's overly-conservative assumptions, the initial Monte Carlo analysis showed that the risks were either within or very close to EPA's conservative acceptable risk range. Not only had the analysis been done, but Frederick Schauffler, the EPA representative overseeing the response action proceedings -- who admittedly is not an expert in risk assessments[74] -- had *instructed SAIC to remove the Monte Carlo analysis* from the draft risk assessment, and then submitted the sanitized version to the Defendants, all the while denying the existence of the Monte Carlo analysis.[75]

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[74] *See* Deposition of Frederick Schauffler, conducted February 4, 1998 ("Schauffler Depo.") at 262 (Galvani Aff. Exh. 34).

[75] Such prevarication calls Mr. Schauffler's and EPA's credibility into serious question. As described at length in the June 15, 1998 letter from José R. Allen, Esq. to John Lyons, Esq. (EPA Assistant Regional Counsel), *see* Galvani Aff. Exh. 33, EPA's handling of the response action proceedings and the Palos Verdes Shelf Technical Advisory Committee has been riddled with manipulative tactics designed to deny the Defendants information about and input into EPA's decision.

The government then set out to ensure that SAIC's Monte Carlo analysis would be reworked to find risk estimates high enough to justify a cap. Because EPA could not change the underlying data (since the data had been obtained from outside sources, *i.e.*, LACSD and SCCWRP), it was forced to change the assumptions. Therefore, EPA directed SAIC to incorporate a series of assumptions about anglers' exposure to DDT that have absolutely no basis in reality. This manipulation produced a new SAIC Monte Carlo analysis in December 1997, which calculated much higher risk levels than the original results rejected by EPA in July. SAIC's project manager, Naomi Feger, was deposed in January 1998 pursuant to Rule 30(b)(6); she admitted that the deletion of the original Monte Carlo analysis and the changes to the assumptions were done at EPA's instruction, and that SAIC knew of no factual basis for the crucial new assumptions. In fact, there is no basis, as the government well knew.

The most egregious of the changed exposure assumptions is SAIC's wild overstatement of the amount of white croaker being caught and eaten from the Palos Verdes Shelf. SAIC derived its assumptions concerning fish consumption rates by California anglers from a survey, the Santa Monica Bay Seafood Consumption Study ("SMBSCS"), which had been conducted in 1991 and 1992 by the Southern California Coastal Water Research Project. The SMBSCS studied fish consumption rates of anglers throughout the Santa Monica Bay, an area that includes, but is many times larger than, the Palos Verdes shelf. To be of use to EPA in this litigation, SAIC's risk calculations must reflect the percentage of the Santa Monica Bay fish consumption attributable to the Palos Verdes shelf (where the concentrations of DDT and PCBs are higher than in the Santa Monica Bay generally). SAIC's original analysis pegged this percentage at 50%. In response to comments on the July 1997 draft risk assessment, however, SAIC acknowledged that "there is no scientific basis for the [50%] value . . ."[76] Incredibly, EPA then instructed SAIC instead to utilize in its new analysis a 100% fraction -- that is, to assume that *every single fish* reported in the SMBSCS was caught at the Palos Verdes shelf, even though the Palos Verdes Shelf comprises

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[76] *See* October 15, 1997 Electronic mail message from Naomi Feger (SAIC) to Fred Schauffler (EPA), attaching responses to comments on the July 1997 Draft Human Health Risk Evaluation (Feger Exh. 18) (MEP204 0992-1005) at MEP 204 0998 (Galvani Aff. Exh. 35).

only 2% of the area of the Santa Monica Bay.[77]

This 100% assumption, which by itself caused SAIC's estimates of risk to double, is pure fantasy. In fact, the SAIC scientist who was the primary author of the human health risk assessment privately complained to Ms. Feger in written correspondence that she could not "stand up . . . and defend" this assumption.[78] And understandably so. According to SAIC's analysis, the vast majority of the human health risk is attributable to consumption of just one species, the white croaker. Yet, the SMBSCS -- which assessed over 2,300 anglers on 99 days over the course of a year -- did not find a *single angler* who had caught and eaten white croaker from the Palos Verdes shelf.[79] Ms. Feger admitted that SAIC is not aware of a single angler who caught and consumed white croaker from the Palos Verdes shelf.[80] Nevertheless, EPA and SAIC proceeded to base the human health risk assessment on the fiction that just the opposite was true, *i.e.*, that 100% of the white croaker consumed is from the Palos Verdes shelf.

The result of the EPA's changed assumptions was to inflate the alleged risk to human health to a level that exceeds the EPA's threshold response levels. EPA has thus manipulated the work of its experts in order to create out of whole cloth the appearance of a risk to human health, when the very data on which EPA and its experts claim to rely showed no such risk actually exists.

b. *EE/CA*

At the deposition of Dr. Charles Phillips, primary author of the EE/CA, it became clear that EPA had borrowed a page from NOAA's book in handling its expert witnesses. As was the

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[77] *See* Deposition of Naomi Feger, conducted January 19-21, 1998 ("Feger Depo"), at 497-98, 506 (Galvani Aff. Exh. 36).

[78] *See* Electronic mail message from Iris Winstanley to Naomi Feger (Galvani Aff. Exh. 37).

[79] *See* Feger Depo. at 545-46. There is no significant fishing activity on the Shelf because it is not accessible without a boat, and anglers who go out in their own private boats or who pay to go on party boats choose not to fish in the area of LACSD's outfall and do not target the white croaker, which is colloquially known as "sewer trout."

[80] *See* Feger Depo. at 409, 546.

case with John Calambokidis (the sea mammal expert who was shielded from the most recent data), Mr. Phillips was not provided with a large amount of data and information that was directly relevant to his work but which was harmful to the government's theories.

SAIC's justification for placing a sediment cap on the Palos Verdes Shelf turns in part on the model of sediment transport created by NOAA's experts (as well as on the ill-fated health risk assessment). According to this model, buried particles containing DDT are transported from the deep sediments to the sediment surface by two processes, bioturbation and molecular diffusion[81]; these particles are then resuspended in the water column by the force of waves during storm events; once in the water column, the DDT supposedly separates from the particles and becomes bioavailable. A key assumption of this model is that parts of the Palos Verdes Shelf will in the near future become erosional -- that is, more sediment will leave the seabed surface than will be added from other sources. Dr. Phillips was given these models by the government so that he could use them to justify a cap over the sediments to prevent the fictitious erosion. What he was not provided, however, included the following:

- A study *commissioned by EPA* in 1989 in which EPA concluded exactly the opposite of its current position: namely, that the Palos Verdes Shelf would *not* become erosional, but rather the deeply-buried DDT reservoir would remain buried.[82]
- Data gathered by Dr. Robert Eganhouse of the United States Geological Survey, in which his measured porewater concentrations of DDT and his findings were directly at odds with the government's theory that contaminants are transferred to the surface from the deeper sediments through the process of molecular

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[81] Bioturbation is the process by which organisms in the sediments move the buried sediment particles to the surface by ingesting and defecating the particles or by pushing them aside to make burrows. Molecular diffusion involves the movement of DDT in porewater from areas of higher porewater concentration to areas of lower porewater concentration.

[82] *See* Deposition of Charles Phillips, conducted June 2-4, 1998 ("Phillips Depo.") at 612-14 (Galvani Aff. Exh. 39).

diffusion.[83]

- Dr. Eganhouse's conclusion that the recent rate of sedimentation at the Shelf has been several times higher than the sedimentation rate used in the government's model, and that is therefore contrary to the government's theory that the Palos Verdes Shelf will become erosional.[84]

Dr. Phillips testified that all these matters (which he had not been told about) would have been important for him to consider in determining whether a cap is appropriate on the Shelf.[85] Nevertheless, the government intentionally hoodwinked Mr. Phillips by keeping him in the dark about all this information.

The upshot is that EPA is about to order a capping remedy that will cost $100 million, in reliance on expert reports that were explicitly manipulated by the government.[86]

ARGUMENT

I. THE GOVERNMENT'S MISCONDUCT WARRANTS SEVERE SANCTIONS

Through manipulation of expert reports, reliance upon misleading survey results, and attempted concealment of data, the government has systematically undermined the integrity of the judicial process in this action. The government's flagrant abuses deserve strong sanctions

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[83] *See* Phillips Depo. at 132-33.

[84] *See* Phillips Depo. at 646.

[85] *See* Phillips Depo. at 132-38, 618-21.

[86] The Defendants have uncovered the instances of government misconduct described above despite the government's best efforts to prevent it. The government has allowed its experts to destroy certain key documents. Just one of many examples is Dr. Robert Spies, the government's fish biologist. Dr. Spies testified at his deposition that he destroyed the drafts of his report, as well as the criticisms he received from the scientists who peer reviewed his report. Spies Depo. at 16-20; 47. Despite this case being filed in 1990, not until *April 1995* did the government ever instruct its experts to retain all the materials in their files relating to their work on this case. Up until that time -- for the first five years of this litigation -- the government told its experts that they could freely destroy documents if that was their customary business practice, even if that business practice had never involved expert testimony in litigation. *See* Plaintiffs' Responses to Chris-Craft's Second Set of Interrogatories at 21-22 (Galvani Aff. Exh. 47). Moreover, the government's April 1995 instruction was issued only after the Defendants took the depositions of Drs. Spies and Kopp in March 1995, wherein the witnesses testified to destroying key documents.

designed to deprive the government of the fruit of its misconduct and to deter such abuses in the future. Because the expert discovery abuses have tainted every substantive aspect of the government's case -- injury to wildlife, sediment fate and transport, economic damages and the EPA's work -- the Court should impose the following sanctions to restore the integrity to these proceedings:

(i) exclusion of all evidence of the work of the experts who engaged in misconduct from all proceedings against the Defendants and preclusion of the government from recovering as response costs the amounts paid by the government to those experts for their tainted work.

(ii) exclusion of all other expert evidence relying on the work of the experts who engaged in misconduct from all proceedings against the Defendants;

(iii) exclusion of all expert evidence designed to replace evidence otherwise excluded from all proceedings against the Defendants;

(iv) a ruling that the government is not entitled to reimbursement of assessment costs relating to expert reports that have been excluded by virtue of the Court's order or otherwise withdrawn;

(v) a *de novo* standard of review of any remedial decisions or administrative orders issued by EPA in connection with the Palos Verdes Shelf; and

(vi) monetary sanctions, including an award to Defendants of attorneys' fees and other costs incurred in uncovering the government's misconduct and bringing this motion.

Such an order is authorized by both the Court's inherent powers and the Federal Rules of Civil Procedure, and is required to remedy the government's abuses and to prevent similar misconduct in the future.

The pervasive misconduct uncovered by the Defendants is unacceptable from any litigant, but is especially disturbing when perpetrated by the government. The government, as the representative of the taxpayers who fund its litigation, has an especially high standard of conduct. In light of its special duty, and because of its reprehensible conduct during this litigation, the government is deserving of serious sanctions.

A. The Government has a Heightened Standard of Conduct when Acting as a Litigant

The government is subject to a higher standard of conduct than a private litigant. The Supreme Court described the special duty of the government in *Berger v. United States*, 295 U.S. 78 (1935), a criminal action:

> The United States Attorney is the representative not of an ordinary party to a controversy, but of a sovereignty whose obligation to govern impartially is as compelling as its obligation to govern at all; and whose interest, therefore, in a criminal prosecution is not that it shall win a case, but that justice shall be done. . . . It is as much his duty to refrain from improper methods calculated to produce a wrongful conviction as it is to use every legitimate means to bring about a just one.

Id. at 88.

Courts have extended the government's heightened duty to civil litigation as well. In *Freeport-McMoRan Oil & Gas Co. v. Federal Energy Regulatory Comm'n*, 962 F.2d 45, 47 (D.C. Cir. 1992), the court acknowledged the notion that "government lawyers have obligations beyond those of private lawyers." The court explained, "The Supreme Court [in *Berger*] was speaking of government prosecutors, but no one, to our knowledge . . . has suggested that the principle does not apply with equal force to the government's civil lawyers." *Id. See also EEOC v. Los Alamos Constructors, Inc.* 382 F. Supp. 1373, 1383 (D.N.M. 1974) ("Although [*Berger*] was a criminal case, what was there said as to the responsibilities of government lawyers is fully applicable to government counsel in civil cases.").[87]

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[87] Numerous other courts have held government litigants to a higher standard of conduct without explicitly relying on *Berger*. *See Chilcutt v. United States*, 4 F.3d 1313, 1327 (5th Cir. 1993) ("Governmental attorneys should model the ideals of integrity and ethics rather than attempt to circumvent them."); *Wahad v. FBI*, 813 F. Supp. 224, 227 (S.D.N.Y. 1993) ("While sanctions are severe measures, they are appropriate particularly in cases such as this where it is the government that disobeys court orders; the government is charged with the enforcement of law and should set examples for others to follow."); *Perry v. Golub*, 74 F.R.D. 360, 366 (N.D. Ala. 1976) (dismissal of government's claims was appropriate as a sanction for refusing to comply with a production order: "Governmental agencies which are charged with the enforcement of laws should set the example of compliance with Court orders. Regrettably . . . Governmental agencies too often set the contrary example of resistance to discovery."); *United States by Mitchell v. Choctaw County Board of Education*, 310 F. Supp. 804, 810 (S.D. Ala. 1969) ("The U.S. has a higher duty than an ordinary adversary. It is the representative of all the people, by the will of the people surviving on and expending the people's tax money and should

Indeed, this Court has recognized the government's heightened duty to litigate in good faith. In *United States v. Dahlstrum*, the Court observed that

> [t]he need to employ this Court's supervisory powers to remedy governmental misconduct was powerfully expressed by Mr. Justice Brandeis in his famous dissenting opinion in *Olmstead v. United States*, 277 U.S. 438 (1928). . . . "In a government of laws, existence of the government will be imperilled if it fails to observe the law scrupulously. . . . If the Government becomes a lawbreaker, it breeds contempt for law."

493 F. Supp. 966, 974 (C.D. Cal. 1980) (Hauk, J.). The Court found that the government (specifically, the IRS) acted in "institutional bad-faith" and dismissed the criminal indictment against the taxpayer. *See id.*

In the instant litigation, the Court specifically admonished the government that it was expected to "turn square corners,"[88] which the Court then underscored by expressly authorizing discovery concerning the Defendants' allegations of government misconduct. This heightened duty is especially appropriate where, as here, the government is taking every advantage of the enormous discretion that resides in government agencies. For instance, EPA's decision on whether the Defendants must spend millions of dollars to cap the Palos Verdes Shelf -- if the government had its way -- would be subject to record review and an "arbitrary and capricious" standard. *See* CERCLA § 113(j), 42 U.S.C. § 9613(j). With expansive powers like these comes a weighty responsibility to wield them honestly and fairly. Unfortunately, the government has forsaken its obligation to "turn square corners" and instead has cut corners at every opportunity. The government has plainly failed to meet its obligations to the Court, the public and the Defendants to conduct this litigation in a forthright manner.

B. The Government Must be Subject to a More Severe Penalty than a Private Litigant

Because it is held to a heightened standard of conduct, the government is also subject to more severe penalties when it engages in misconduct:

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be charged with a high standard of conduct in litigation.").

[88] *See* Transcript of March 18, 1991 Hearing (Hauk, J.) at 61 (Galvani Aff. Exh. 40).

> The effectiveness of and need for harsh measures is particularly evident when the disobedient party is the government. "[T]he public interest requires not only that Court orders be obeyed but further that Governmental agencies which are charged with the enforcement of laws should set the example of compliance with Court orders."

United States v. Sumitomo Marine & Fire Ins. Co., 617 F.2d 1365, 1370 (9th Cir. 1980) (quoting *Perry,* 74 F.R.D. at 366). In *Sumitomo*, the Court of Appeals upheld the district court's sanction of precluding the government from introducing any evidence on the issue of damages. *See id.* at 1367-70. In affirming the lower court, the Court of Appeals emphasized that "[i]f harsh measures were not taken in such cases, the government and 'other parties to other lawsuits would feel freer . . . to flout other discovery orders of other district courts.'" *Id.* at 1370 (quoting *National Hockey League v. Metropolitan Hockey Club, Inc.*, 427 U.S. 639, 643 (1976)).

Despite this higher standard of conduct, the government's actions in this case fall well below even the standard applicable to an ordinary litigant. The government and its scientists should be setting the example for honest and accurate scientific analysis. They should be shining a beacon of light on their work, inviting comment and criticism, *i.e.*, so as to arrive at the unvarnished truth and the result that best serves the public interest. Expert witnesses, by definition, traverse waters with which the Court is unfamiliar. The Court must be able to rely on expert scientists -- even those retained by litigants within the adversarial process -- to conform to certain basic standards of scientific practice. Instead, the government has pursued a path of manipulation and non-disclosure of evidence. The government has violated its public trust to conduct principled litigation, and its duties under the Federal Rules of Civil Procedure. The government is deserving of harsh sanctions.

II. EXCLUSION OF EXPERT EVIDENCE IS AN APPROPRIATE SANCTION FOR THE GOVERNMENT'S FLAGRANT MISCONDUCT

This Court has broad authority under its inherent powers and the Federal Rules of Civil Procedure to fashion sanctions that befit the seriousness of the misconduct. In addition to the specific authority set forth in the Federal Rules -- in particular, Rule 37(b) and Rule 11 -- the Court possesses general inherent powers to sanction litigants. *See, e.g., Roadway Express, Inc. v. Piper*, 447 U.S. 752 (1980) (employing both inherent powers and Rule 37(b) to sanction attorney's conduct). As the Supreme Court has stated: "[A] federal court [is not] forbidden to sanction bad-faith conduct by means of the inherent power simply because that conduct could also be sanctioned under the statute or the Rules. . . . [T]he court ordinarily should rely on the Rules rather than the inherent power. But if in the informed discretion of the court, neither [a] statute nor the Rules are up to the task, the court may safely rely on its inherent power." *Chambers v. NASCO, Inc.*, 501 U.S. 32, 50 (1991).

A. The Government's Unethical Conduct Warrants the Exclusion of Expert Evidence under the Court's Inherent Powers

District courts "are invested with inherent powers that are 'governed not by rule or statute but by the control necessarily vested in courts to manage their own affairs so as to achieve the orderly and expeditious disposition of cases.'" *Unigard Sec. Ins. Co. v. Lakewood Eng'g & Mfg. Corp.*, 982 F.2d 363, 368 (9th Cir. 1992) (quoting *Chambers*, 501 U.S. at 43). Indeed, a district court's decision to impose sanctions under its inherent powers is reviewed for abuse of discretion, and will not be reversed "absent a definite and firm conviction that the district court made a clear error of judgment." *Halaco Eng'g Co. v. Costle*, 843 F.2d 376, 379 (9th Cir. 1988). To the contrary, the *failure* to exclude expert testimony may be an abuse of discretion if its effect is to prejudice a party's case. *See Wang Labs., Inc. v. Mitsubishi Elec. Am., Inc.*, Nos. 92-4698, 92-3891, 1994 WL 471438, at *2 (C.D. Cal. Apr. 14, 1994) (citing *Scott & Fetzer Co. v. Dile*, 643 F.2d 670, 673 (9th Cir. 1981)).

Therefore, a court's inherent powers include "'broad discretion to make discovery and evidentiary rulings conducive to the conduct of a fair and orderly trial. Within this discretion lies the power . . . to exclude testimony of witnesses whose use at trial . . . would unfairly prejudice an opposing party.'" *Id.* (quoting *Campbell Indus. v. M/V Gemini*, 619 F.2d 24, 27 (9th Cir. 1980)). *Accord Lewis v. Telephone Employees Credit Union*, 87 F.3d 1537, 1557 (9th Cir. 1996); *Glover v. Bic Corp.*, 6 F.3d 1318, 1329 (9th Cir. 1993). The sanction of exclusion serves the dual goals of remedying the prejudicial effects of discovery abuse and deterring future abuses.[89] *See Sumitomo*, 617 F.2d at 1369.

In determining the need for and appropriateness of a particular discovery sanction, courts are guided by two primary factors: the risk of prejudice to the party seeking sanctions and the effectiveness of less drastic sanctions. *See, e.g., Wendt v. Host Int'l, Inc.*, 125 F.3d 806, 814 (9th Cir. 1997); *Wanderer v. Johnston*, 910 F.2d 652 (9th Cir. 1990).[90]

1. *The Government's Misconduct has Prejudiced the Defendants*

Prejudice due to misconduct is present where "the plaintiff's actions impair the defendant's ability to go to trial or threaten to interfere with the rightful decision of the case." *Adriana Int'l Corp. v. Thoeren*, 913 F.2d 1406, 1412 (9th Cir. 1990) (citing *Malone*, 833 F.2d at 131). Irreparable harm is not required, even where the sanction is dismissal. *See Wyle v. R.J. Reynolds Indus., Inc.*, 709 F.2d 585, 589 n.1 (9th Cir. 1983). "Failure to produce documents as ordered . . . is considered sufficient prejudice." *Adriana*, 913 F.2d at 1412.[91]

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[89] A court may exclude evidence under its inherent powers not only for bad faith or willfulness, but also for mere fault. *Unigard*, 982 F.2d at 368 n.2; *see also Penk v. Oregon State Bd. of Higher Educ.*, 816 F.2d 458, 466 (9th Cir. 1987) ("No showing of willful disobedience is required for an exclusion order."). Nonetheless, not only the government's fault, but also its bad faith and willful misconduct, cannot be gainsaid. *Cf. Fjelstad v. American Honda Motor Co.*, 762 F.2d 1334, 1341 (9th Cir. 1985) (adopting the district court's definition of "willfulness" as "disobedient conduct not shown to be outside the control of the litigant"). The government could not hope to feign ignorance of its experts' concealment of data and alterations of drafts. In many instances, these actions came at the *direction* of the government.

[90] In *Wendt*, the Ninth Circuit *in dictum* identified three other factors in determining whether "a sanction" is proper: the public's interest in expeditious resolution of litigation; the court's need to manage its docket; and the public policy favoring disposition of cases on their merits. 125 F.3d at 814. Before *Wendt*, these factors were employed only in cases involving the sanctions of dismissal or default. *See, e.g., Wanderer v. Johnston*, 910 F.2d 652, 656 (9th Cir. 1990); *Malone v. United States Postal Serv.*, 833 F.2d 128, 130 (9th Cir. 1987). In any event, application of these three factors clearly supports the imposition of an exclusion sanction. Excluding the corrupted evidence would streamline these proceedings and, in the event that this case goes to trial, avoid lengthy and costly cross-examination of the tainted experts. Second, exclusion would enable the court to exert control of the discovery process, which has been abused by the government. Finally, exclusion would help ensure that the government does not profit from its misconduct, while allowing the case ultimately to be determined on its merits.

[91] *See also Anheuser-Busch, Inc. v. Natural Beverage Distribs.*, 69 F.3d 337, 354 (9th Cir. 1995) (finding that prejudice exists where a litigant is "forced . . . to rely on incomplete and spotty evidence" as the result of destruction and concealment of documents); *G-K Properties v. Redevelopment Agency of San Jose*, 577 F.2d 645, 647 (9th Cir. 1978) (finding that by withholding financial information and responding tardily to discovery requests, litigants caused "impermissible prejudice to their opponents"); *Wm. T. Thompson Co. v. General Nutrition Corp.*,

The government's misconduct here satisfies this standard many times over. Significant in this regard is the *pattern* of government misconduct -- including misconduct at managerial levels at NOAA and EPA -- that has emerged during discovery. The government has repeatedly sought to conceal information from the Defendants and the Court and, in some instances, even from its own experts. When the Defendants have stumbled upon evidence of the existence of this information and demanded its production, the government has strenuously resisted providing it. Even if the Defendants have uncovered all the instances of government manipulation, the effort required to unearth such misconduct has already prejudiced the Defendants. The named plaintiffs initially retained over 80 expert witnesses, who have produced dozens of expert reports. EPA has added many additional experts to justify the government's decision to cap the Palos Verdes Shelf. The Defendants have been forced to spend an inordinate amount of time, effort, and money tracking down the concealed data. The Defendants should have been able to use these resources to address the merits of the government's case. The Defendants also have been forced to spend tens of millions of dollars in defending themselves against the government's unsupported claims. This incalculable expenditure of time and money has caused irreparable prejudice to the Defendants.[92] Conversely, the government should be precluded from assessing the costs of its disqualified or withdrawn experts upon the Defendants. It is outrageous for the government even to attempt to collect millions of dollars of costs for experts who engaged in the type of wrongdoing described herein.

Moreover, the Defendants will be prejudiced by the government's apparent strategy of withdrawing -- and thereby shielding -- the experts who have been tainted by misconduct. For instance, Dr. Robert Spies was designated as the government's lead kelp bass expert in the 1994

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593 F. Supp. 1443, 1450, 1455 (C.D. Cal. 1984) (suggesting that prejudice resulted from the destruction of materials essential to the merits of the case).

[92] The government cannot be heard to respond that the Defendants have not been prejudiced by the government's attempts at concealment because the Defendants have ultimately been given some portions of the undisclosed materials. The government has resisted providing these materials and done so only after repeated demands from the Defendants -- resulting in much unnecessary delay and expense.

Expert Designation, yet was dropped from the amended 1997 version following the revelations of hidden data in his 1995 deposition. Similarly, Dr. Robert Eganhouse, whose results on sedimentation rate and porewater concentrations the government tried to conceal, was withdrawn from the sediment modeling team between the 1994 and 1997 versions of the Expert Designation. The government's motive is obvious: by protecting these experts from cross-examination at trial, the government hopes to avoid the negative impact of its misconduct on the trier of fact. The unfairness of this maneuver will be compounded if the government is then allowed to replace the withdrawn experts with new experts who can be "cleansed" of the prior wrongdoing. A fair trial would be impossible under those circumstances.[93]

2. *Exclusion is the Minimum Effective Sanction*

In order to remedy this prejudice and deter future abuses, all evidence of the work of any expert who engaged in misconduct, as well as any expert evidence that relies on such tainted work or that is intended to replace it, should be excluded.

Exclusion orders are a common sanction for discovery abuses of even lesser severity than at issue here. For example, in *Unigard Security Ins. Co. v. Lakewood Eng'g & Mfg. Corp.*, 982 F.2d 363 (9th Cir. 1992), the district court precluded plaintiff's experts from testifying that an electric space heater manufactured by defendant had caused a fire on board a yacht insured by the plaintiff. This sanction was imposed because the plaintiff had *inadvertently* destroyed the heater prior to trial. *See id.* at 365-66. The Ninth Circuit affirmed, concluding that the spoliation of evidence had prejudiced the defendant and rendered a fair trial impossible, and thus that evidence as to causation "was properly excluded as an exercise of the district court's inherent powers." *Id.* at 368. The appellate court also approved the district court's determination that any lesser

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[93] In addition, the government admits that it did not instruct its experts until April 1995 (following entry of the Court's March 3, 1995 discovery order) to retain all the materials in their files relating to their work in this case. Until that time, the government allowed its experts to do whatever they pleased with their workpapers and other documents, resulting in the destruction of many significant materials. No fewer than four of the government's experts have thus far admitted to destroying their draft reports after the litigation was filed. *See* Spies Depo. at 16-20, 47; Deposition of Raymond J. Kopp, conducted March 6, 1997 ("Kopp Depo.") at 54-62 (Galvani Aff. Exh. 38); MacDonald Depo. at 1033-35; Deposition of Homa J. Lee, conducted December 2, 1997 ("Lee Depo.") at 38-39, 42-43 (Galvani Aff. Exh. 48).

sanction, such as an adverse presumption against the plaintiff, would have been ineffective, reasoning that such a presumption would have "paled next to the testimony of the expert witness." *Id.* at 369 (citation omitted); *see also United States v. Sumitomo Marine & Fire Ins. Co.*, 617 F.2d 1365 (9th Cir. 1980) (affirming order precluding the government from introducing *any* evidence of its damages as a sanction for its repeated delays and failures to produce documents); *Cabinetware Inc. v. Sullivan*, No. 90-313, 1991 WL 327959 (E.D. Cal. July 15, 1991) (rejecting as too lenient the magistrate judge's recommendation of a rebuttable presumption as a sanction for evidence spoliation).

In the instant case, any sanction short of exclusion -- of the experts engaged in misconduct, those who relied on the work of such experts, and any expert who would replace the otherwise excluded or withdrawn experts -- would be wholly inadequate to remedy the government's abuses. To begin with, the government's initial concealment of unhelpful results and later withdrawal of discredited reports makes the government's scientific case impervious to a meaningful review and cross-examination by the Defendants. The adversarial process is gutted if the adversary does not have unfettered access to the data and methods used by the expert so as to reproduce the expert's study and test its credibility before the trier of fact. This is one reason why the government's misconduct here is so pernicious: the government still seeks to withhold the tools the Defendants need to demonstrate to the trier of fact the inadequacy of the government's scientific analyses. This conduct is unbecoming of any litigant, and unacceptable from our government. It must be sanctioned and sanctioned severely.

In addition, as described above, EPA has assumed responsibility for much of the prosecution of the Palos Verdes Shelf claims by initiating response action proceedings. The government's stated intention is for EPA to complete its EE/CA and issue a report of decision on the Palos Verdes shelf sediments long before the natural resource damage action goes to trial. EPA will base its decision on the work of both the NOAA and EPA experts, and then assert that its decision is subject only to administrative record review pursuant to CERCLA § 113(j), 42 U.S.C. § 9613(j). Indeed, all the NOAA expert reports have already been made part of the administrative record index. Thus, according to EPA's planned course of action, the expert reports that are the product of the government's scientific misconduct will form the basis for EPA's decision to require the Defendants to pay for a multi-million dollar remedy at the Palos Verdes Shelf, and EPA's decision may be subject to only an "arbitrary and capricious" review based upon the written materials in the administrative record.

3. *Expert Evidence Intended to Replace Excluded Evidence Should Also Be Barred*

Under the circumstances of this case, in order for an exclusion order to accomplish its twin goals of remediation and deterrence, *see Sumitomo*, 617 F.2d at 1369, any "replacement" expert evidence offered in lieu of the excluded evidence should be barred. Excluding only the evidence from experts who engaged in altering reports or who relied on the corrupted data would be no sanction at all, as those experts have already been discredited. *United States v. Moss-American, Inc.,* 78 F.R.D. 214, 217 (E.D. Wis. 1978) (exclusion of experts who engaged in misconduct "is really no penalty at all since the [data] and witnesses have already been thoroughly discredited by the testimony adduced at the . . . depositions").

The government has already withdrawn over *40* expert witnesses from its original list, including Dr. Robert Spies, the kelp bass expert who purged from his report the findings of an entire study showing no reproductive effect due to DDT concentrations in the fish. Moreover, the government has signaled its intent to continue this strategy of withdrawing those experts who are discredited in their depositions and replacing them with a fresh wave of new experts. In a letter to counsel for the Defendants, the government's lead lawyer asserted *ipse dixit* that the government is entitled in the year 2003 to designate *new* experts and reports and to "supplement" its existing expert reports *after* the completion of the expert discovery period.[94]

The government's goal could not be clearer: it intends to erase its misconduct for purposes of the trial by withdrawing the expert perpetrators of that misconduct (or at least those who are caught), making them unable to be impeached at trial. In place of the tainted experts, the government will replace them with new, "clean" experts who, having neither produced nor relied

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[94] *See* July 1, 1998 Letter from Adam M. Kushner, Esq. to Paul B. Galvani, Esq. (Galvani Aff. Exh. 41).

on the manipulated reports, would presumably be immune to impeachment. This is egregious. If not prevented, this tactic would enable the government simply to sweep its multi-million-dollar transgressions -- for which they seek to charge the Defendants -- under the rug and start anew. Even if an order excluding all tainted evidence prevented the government from profiting from its misconduct, it nevertheless would not serve the deterrent effect that exclusion orders are intended to have. Such an order must therefore exclude all replacement expert evidence. *See Hagans v. Henry Weber Aircraft Distribs., Inc.*, 852 F.2d 60, 63-64 (3d Cir. 1988) (where plaintiff's expert pilot initially failed to reveal during discovery that he had conducted a flight test as part of his investigation, district court was justified in excluding both the expert and any substitute pilot expert).

In addition, excluding only the evidence that has already been uncovered as tainted assumes that the Defendants have uncovered everything the government is trying to hide. In light of the pervasiveness of the misconduct and the government's efforts to conceal its abuses, that is a dubious assumption. Having engaged in concealment, the government should shoulder the uncertainties of its own misconduct. *Cf. National Ass'n of Radiation Survivors v. Turnage*, 115 F.R.D. 543, 557 (N.D. Cal. 1987) ("Where one party wrongfully denies another the evidence necessary to establish a fact in dispute, the court must draw the strongest allowable inferences in favor of the aggrieved party"); *see also Nation-Wide Check Corp. v. Forest Hills Distribs., Inc.*, 692 F.2d 214, 218 (1st Cir. 1982) (the court should "plac[e] the risk of an erroneous judgment on the party that wrongfully created the risk").

Therefore, the only effective way both to remedy and deter the government's discovery abuses is to order the exclusion of (i) evidence of the work of all experts who engaged in misconduct; (ii) expert evidence that relies on the work of such experts; and (iii) all expert evidence designed to replace evidence otherwise excluded. Such a sanction is especially appropriate where, as here, the transgressor is the government. *See Sumitomo*, 617 F.2d at 1370 ("The effectiveness of and need for harsh measures is particularly evident when the disobedient party is the government."). In light of the government's egregious conduct, the court's inherent powers provide it ample authority to order this relief, without ever needing to reach the separate sanctioning authority under Rules 37(b) and 11. Indeed, although the government's violations of the May 31, 1994 discovery order comprises an additional ground for sanctions (as described in the following section), the sanctions sought herein would be entirely justified under the Court's inherent powers even if the discovery order had never been entered.

B. The Government's Concealment of Evidence and Destruction of Key Expert Documents Are Violations of the Court's Discovery Order, Warranting Sanctions Pursuant to Rule 37(b)

In addition to the Court's inherent powers, Rule 37(b) of the Federal Rules of Civil Procedure also authorizes the relief requested by the Defendants. Rule 37(b) permits courts to sanction a litigant who "fails to obey an order to provide or permit discovery."[95] As noted above, the government has repeatedly flouted this Court's May 13, 1994 discovery order, which requires that "designations of experts and productions of expert documents shall be subject to Federal Rule of Civil Procedure 26(a)(2)(B)."[96] In turn, Rule 26(a)(2)(B) provides that the proponent of expert opinions must produce "the data or other information considered by the witness in forming the opinions."

Certainly, the government's repeated attempts to conceal data and research findings, as well as its failure to instruct its experts to retain key underlying documents, constitute failure to produce "data or other information" as required by the Federal Rules. There can be no question that the government experts "considered" the information that they later sought to conceal, data generated from their *own* research studies and materials contained in the initial

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[95] Rule 37(b) sanctions in general, and exclusion orders in particular, serve three general purposes:

> Preclusionary orders ensure that a party will not be able to profit from its own failure to comply. Rule 37 strictures are also specific deterrents and, like civil contempt, they seek to secure compliance with the particular order at hand. Finally, . . . courts are free to consider the general deterrent effect their orders may have on the instant case and on other litigation, provided that the party on whom they are imposed is, in some sense, at fault.

Sumitomo, 617 F.2d at 1369 (citations omitted).

[96] *See* Amended Order Re: Experts (Amending Order Dated March 2, 1993) (Galvani Aff. Exh. 44).

drafts of their expert reports but deleted from the final versions.

Rule 37(b)(2)(B) specifically authorizes the sanction of exclusion, permitting courts to enter orders "prohibiting [the disobedient] party from introducing designated matters in evidence." *See also Sumitomo*, 617 F.2d at 1369-70 (discussing exclusion of evidence under Rule 37(b)). The determination of whether to impose sanctions is the same under Rule 37(b) and the court's inherent powers. *See Adriana*, 913 F.2d at 1412 n. 4 (describing the case law of Rule 37(b) and inherent power sanctions as "interchangeabl[e]").[97] Accordingly, the discussion above concerning the appropriateness of exclusion as a sanction under inherent powers applies with equal force to the propriety of an exclusion sanction under Rule 37(b).

C. The Government's Allegations of Injuries Known to be Unsupported by Scientific Evidence is a Blatant Violation of Rule 11 Warranting Sanctions

Rule 11 of the Federal Rules of Civil Procedure is designed to deter abusive pretrial tactics and streamline litigation. *Golden Eagle Distrib. Corp. v. Burroughs Corp.*, 801 F.2d 1531, 1536 (9th Cir. 1986). Rule 11 imposes upon any party signing a document submitted to a federal court an affirmative duty of inquiry into the document's factual and legal foundation before it is filed. *See Business Guides, Inc. v. Chromatic Communications Enters., Inc.*, 498 U.S. 533, 541 (1991); *Golden Eagle*, 801 F.2d at 1536. "It also . . . emphasizes the duty of candor by subjecting litigants to potential sanctions for insisting upon a position after it is no longer tenable . . . ." Fed. R. Civ. P. 11, 1993 Advisory Committee Notes. The standard of inquiry is one of reasonableness under the circumstances. *Hudson v. Moore Bus. Forms, Inc.*, 836 F.2d 1156, 1159 (9th Cir. 1987). Rule 11 sanctions may therefore be imposed even in the absence of bad faith. *Chambers*, 501 U.S. at 47; *Yagman v. Republic Ins.*, 987 F.2d 622, 628 (9th Cir. 1993); *Hudson*, 836 F.2d at 1159.

Rule 11 sanctions are available for a variety of misconduct, including failure to produce

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[97] "The standard of review for the district court's exclusion of evidence is the same under both Rule 37 and the court's inherent powers." *Unigard*, 982 F.2d at 367 (abuse of discretion standard); *accord Halaco*, 843 F.2d at 379. Moreover, with respect to Rule 37 sanctions, "[a] determination that an order was disobeyed is entitled to considerable weight because a district judge is best equipped to assess the circumstances of the non-compliance." *Adriana Int'l Corp. v. Thoeren*, 913 F.2d 1406, 1411 (9th Cir. 1990) (quoting *Halaco*, 843 F.2d at 379).

responsive documents,[98] destruction of relevant documents,[99] and other misleading omissions and manipulation of information.[100] "The court has significant discretion in determining what sanctions, if any, should be imposed for a violation . . . ." Fed. R. Civ. P. 11, 1993 Advisory Committee Notes.[101] *Accord Turnage*, 115 F.R.D. at 562; *Continental Air Lines, Inc. v. Group Sys. Int'l Far East, Ltd.*, 109 F.R.D. 594, 599 (C.D. Cal. 1986); *United Food & Commercial Workers Union v. Armour & Co.*, 106 F.R.D. 345, 350 (N.D. Cal. 1985). Exclusion of evidence is an appropriate sanction for Rule 11 violations. *See Turnage*, 115 F.R.D. at 558.[102]

Here, the government has violated Rule 11's affirmative duty of inquiry by alleging injuries to natural resources that it *knows* to be factually unsupported. Despite the findings of its experts, revealed in their 1994 expert reports, that virtually all the biota at the Palos Verdes Shelf are more abundant and plentiful than ever, the government continues to reiterate in papers filed with the Court its allegations that DDT and PCBs are injuring these natural

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[98] *See, e.g.,National Ass'n of Radiation Survivors v. Turnage,* 115 F.R.D. 543, 555 (N.D. Cal. 1987) ("Plaintiffs have established that the defendant failed to produce clearly responsive documentary evidence over the course of discovery in this litigation. These omissions reflect the consistent failure of defendant and its counsel to conduct reasonable factual inquiries prior to filing various discovery responses and other pleadings, papers, and motions. The omissions are sanctionable . . . under Rule 11 where the undisclosed documents and information refuted the asserted factual basis for other motions, pleadings, or papers subsequently filed by defendant.").

[99] *See, e.g., id.* at 558 n. 4 ("To the extent that the documents destroyed were specifically responsive to outstanding discovery requests, sanctions are also appropriate under Rule 11 insofar as the destroyed documents contradicted the facts asserted in applicable pleadings, papers, or motions . . . .").

[100] *See, e.g., In re Ronco, Inc.*, 838 F.2d 212, 218 (7th Cir. 1988) ("While the appellant did not misstate an empirical fact, it did omit facts that were highly relevant to an accurate characterization of the facts that were stated. . . . The presentation amounts, in its totality, to a half-truth that can be just as misleading, sometimes more misleading, than an absolutely false representation.").

[101] The language of Rule 11 authorizes courts to "impose an appropriate sanction," including "directives of a nonmonetary nature." Fed. R. Civ. P. 11(c).

[102] *See also W.W.W. Pharmaceutical Co. v. Gillette Co.*, 984 F.2d 567, 570 n.2 (2d Cir. 1993); *Banco de Ponce v. Buxbaum*, No. 90-6344, 1992 WL 309565, at *21 (S.D.N.Y. Oct. 14, 1992) (citing "Standards and Guidelines for Practice under Rule 11 of the Federal Rules of Civil Procedure," American Bar Association Section of Litigation, 121 F.R.D. 101, 124 (1988)), *vacated on other grounds*, 7 F.3d 220 (2d Cir. 1993).

resources. In its latest motion to amend the complaint, filed November 21, 1997, the government confirms that its "theories of recovery [for natural resource damages] are unchanged in the proposed Third Amended Complaint." Indeed, in the attached proposed Third Amended Complaint, the government again alleges (as it has since 1990, before the government's experts undertook their studies) as follows:

> DDT and PCBs, including DDT and PCBs discharged by the defendants, are now and will remain available in the future in the environment, including the marine sediments of the Palos Verdes Shelf, in concentrations that endanger the public health and safety, and have caused and will continue to cause injury to natural resources . . . including the ocean and harbor sediments, fish, birds and marine mammals.[103]

Further, the government submitted to this Court in support of its Motion for Leave to File and Serve a Third Amended Complaint a memorandum dated July 9, 1996, in which the government continued wrongly to assert, among other things, that their expert studies show a relationship in kelp bass and white croaker "between reproductive impairment and body burdens of DOT . . . ."[104] The government's awareness of the lack of evidentiary support for its claims is made manifest on each occasion that it took affirmative steps to conceal data or rewrite expert reports that contained information unhelpful to its case. In light of this *intentional* camouflaging, there can be no doubt whatever that the government did not undertake a reasonable inquiry of the facts supporting its complaint prior to filing it, and that even if it did, it no longer can have a reasonable belief in the factual basis for many of its claims.

The government has filed and continues to pursue claims that it knows are unsupported by fact, has attempted to conceal data, has selectively edited expert reports in order to conform to

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[103] Proposed Third Amended Complaint ¶ 36 (Galvani Aff. Exh. 49). The government also continues to rely on Dr. Kopp's contingent valuation survey as a measure of natural resource damages. *See* Plaintiffs' Interrogatory Responses to the Special Master's May 28, 1997 Civil Minute Order, as Corrected on June 3, 1997 (Galvani Aff. Exh. 45).

[104] July 9, 1996 Memorandum from Andrew Lincoff and Michael Montgomery to Keith Takata, Exhibit K to Plaintiff's Memorandum of Points and Authorities in Support of Plaintiffs' Motion for Leave to File and Serve a Third Amended Complaint (Galvani Aff. Exh. 42). The government also submitted the same memorandum to the Circuit Court of Appeals for the Ninth Circuit. *See* July 10, 1996 Letter from Edward J. Shawaker to Cathy A. Catterson, Clerk, United States Court of Appeals for the Ninth Circuit and attachments thereto (Galvani Aff. Exh. 43).

the goals of its lawsuit, and has allowed clearly relevant evidence to be destroyed. The government has done all this despite an affirmative duty of investigation under Rule 11, and despite its obligation, noted earlier, to conform to a heightened standard of conduct. Compounding these misdeeds is the government's failure to withdraw its claims for reimbursement for the cost of expert work that has been withdrawn -- including approximately \$1.5 million for Robert Spies and \$500,000 for Robert Eganhouse. The government still insists that the Defendants pay for all of the discredited expert work. Such flagrant violations of Rule 11 must be met with a sanction that will serve the dual purposes of ensuring justice and deterring discovery abuse. An order excluding all tainted and replacement expert evidence would accomplish that goal.

III. THE COURT SHOULD EMPLOY A *DE NOVO* STANDARD OF REVIEW TO ANY REMEDIAL DECISIONS OR ADMINISTRATIVE ORDERS ISSUED BY EPA IN CONNECTION WITH THE PALOS VERDES SHELF

Exclusion of the government's expert evidence at trial does not, by itself, provide the Defendants a complete remedy for the government's misconduct. Regardless what happens at the trial of the natural resource damage claims, EPA will attempt to proceed under CERCLA -- based on the same tainted expert reports -- to force the Defendants to fund costly remedial actions at the Palos Verdes shelf. Indeed, the government contends that whatever decision it reaches in the EE/CA process will be subject only to administrative record review and an "arbitrary and capricious" standard under CERCLA. *See* CERCLA § 113(j), 42 U.S.C. § 9613(j). To exclude the government's tainted expert evidence at trial with one hand, while with the other hand giving deferential review to the same evidence as part of the administrative record in the EE/CA proceedings, would be to grant the government a free pass for its misconduct. The taint of the government's misdeeds cannot be fully removed from this case unless the full light of day is allowed to shine on the government's expert work. The case law dictates that EPA's decision be subject to full *de novo* review.

Although an agency's decision is entitled to a presumption of regularity, "that presumption is not to shield [the agency's decision] from a thorough, probing, in-depth review." *Citizens to Preserve Overton Park v. Volpe*, 401 U.S. 402, 415 (1971). Where, as here, the record demonstrates that the government has abused the considerable discretion granted its agencies as regulatory decision-makers, any presumption of regularity is rebutted. For instance, in *Latecoere Int'l, Inc. v. U.S. Dep't. of the Navy*, 19 F.3d 1342 (11th Cir. 1994), the court declined to limit its review of an agency decision to the record because the plaintiff had made a "'strong showing of bad faith or improper behavior'" on the agency's part. *Id.* at 1357 (quoting *Overton Park*, 401 U.S. at 420)). As in this case, the *Latecoere* plaintiff cited evidence that the agency decision-makers had surreptitiously biased their decision-making process.

EPA participated with NOAA in concealing data and manipulating the results of the expert witnesses regarding conditions on the Palos Verdes Shelf. Indeed, as described in the Statement of Facts, EPA itself withheld crucial information from its own contractor, SAIC, and instructed SAIC to utilize unfounded assumptions regarding fish consumption at the Palos Verdes Shelf in order to manufacture EPA's desired result. This improper and bad faith conduct by EPA demonstrates the inherent unreliability of the decisions rendered by the agency and highlights the need for an Article III Court to review those decisions *de novo*, excluding evidence arising from the tainted experts' reports.

IV. THE GOVERNMENT SHOULD BE REQUIRED TO PAY THE ATTORNEYS' FEES AND OTHER EXPENSES INCURRED BY DEFENDANTS IN UNCOVERING THE GOVERNMENT'S MISCONDUCT

In addition to the other sanctions imposed by the Court for the government's misconduct, the Defendants should also be awarded compensation for their attorneys' fees and other expenses incurred in uncovering the government's misconduct and bringing this motion. Rule 37(b), Rule 11 and the Court's inherent powers all serve as bases for an award of expenses as an additional sanction for misconduct. Rule 37(b) authorizes a court to grant reasonable expenses, including attorneys' fees, caused by a party's failure to comply with a discovery order, unless the failure was substantially justified or other circumstances make an award of expenses unjust. *See Hyde & Drath v. Baker*, 24 F.3d 1162, 1171 (9th Cir. 1994). The plain language of Rule 11 also allows for the award of "reasonable expenses and attorney's fees incurred in presenting or opposing the motion." Fed. R. Civ. P. 11(c)(1)(A).[105] In the instant case, the Defendants had to pursue a difficult and expensive discovery process in order to uncover the omissions and misrepresentations of the government's expert witnesses. It is reasonable that the Defendants should be compensated for expenses incurred in uncovering the government's misconduct and bringing it to the attention of the Court. *See Turnage*, 115 F.R.D. at 558 (ordering reimbursement for all fees and costs related to the preparation and bringing of the motion for sanctions under Rules 11 and 26(g), in addition to fees and costs incurred in ascertaining the documents destroyed by the defendant and in reconstructing those documents).[106]

In addition to fee provisions under the Rules, the inherent power of the courts may also be used to assess attorneys' fees for the willful disobedience of a court order. *See Chambers v. NASCO, Inc.*, 501 U.S. 32, 45 (1991); *Roadway Express, Inc. v. Piper*, 447 U.S. 752, 766 (1980). Such fee-based sanctions may also be imposed under inherent powers when a party practices a fraud upon the court, *see Chambers*, 501 U.S. at 44, or when a party in bad faith delays or disrupts the litigation, *see id.* at 46. In the instant case, the Defendants have shown government liability for all the above scenarios. The government has disobeyed the Court order of March 1993; it has misled this Court through manipulative scientific practices; and it has delayed and disrupted the course of discovery. The government should be liable for the expenses and attorneys' fees of the Defendants with respect to all matters related to the misconduct.

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[105] This plain language of the present Rule 11 overrides any prior rule in the Ninth Circuit disallowing attorney's fees. *See Margolis v. Ryan*, 140 F.3d 850, 854-55 (9th Cir. 1998); *Buster v. Greisen*, 104 F.3d 1186, 1190 n.5 (9th Cir. 1997).

[106] *See In re Air Crash Disaster*, 90 F.R.D. 613, 618, 621-22 (N.D. Ill. 1981) (costs and fees incurred in depositions, motions and court appearances related to destruction of report); *Veeder v. Trustees of Boston College*, 85 F.R.D. 13 (D. Mass. 1979) (expenses incurred in searching for document by means of deposition and subpoena duces tecum); *see also Roadway Express, Inc. v. Piper*, 447 U.S. 752, 763, 100 S. Ct. 2455, 2462-63, 65 L. Ed. 2d 488 (1980) ("Both parties and counsel may be held personally liable for expenses, 'including attorney's fees,' caused by the failure to comply with discovery orders.") (quoting *National Hockey League v. Metropolitan Hockey Club, Inc.*, 427 U.S. 639, 643 (1976); *Sumitomo*, 617 F.2d at 1371 (sanction for attorney's fees imposed against government counsel was within the bounds of Rule 37(b)).

CONCLUSION

In cases like this, the government is a litigant charged with the public trust. It must turn square corners not only because it should be a model litigant, but also because it has a broader mandate to pursue the environmental outcome that is in the public's best interest. The government is not in this game to "win," but to bring about the right result. Here, the government has done just the opposite, by putting the scientific truth-finding process second in line behind its desire to win at all costs. In order to remedy this misconduct and deter similar conduct in the future, the Court should issue an order:

(i) excluding all evidence of the work of all experts who engaged in misconduct from any proceeding against the Defendants;

(ii) excluding all other expert evidence that relies on the work of all experts who engaged in misconduct from any proceeding against the Defendants;

(iii) excluding all expert evidence designed to replace evidence otherwise excluded from any proceeding against the Defendants;

(iv) holding that the government is not entitled to reimbursement of assessment costs relating to expert reports that have been excluded by virtue of the Court's order or otherwise withdrawn;

(v) decreeing that a *de novo* standard will be employed in reviewing any remedial decisions or administrative orders issued by EPA in connection with the Palos Verdes Shelf; and

(vi) compensating Defendants for their attorneys' fees and other costs incurred in uncovering the government's misconduct and bringing this motion.

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Dated: April 28, 1999

EXHIBIT 6

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Attorneys for the
State of California

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CLERK, U.S. DISTRICT COURT
CENTRAL DISTRICT OF CALIFORNIA
BY DEPUTY

UNITED STATES DISTRICT COURT

CENTRAL DISTRICT OF CALIFORNIA

WESTERN DIVISION

UNITED STATES OF AMERICA, and STATE OF CALIFORNIA, Plaintiffs, v. MONTROSE CHEMICAL CORPORATION OF CALIFORNIA, et al. Defendants.	Case No. CV 90-3122-R ~~[PROPOSED]~~ ORDER RE: SANCTIONS AGAINST STATE OF CALIFORNIA
AND RELATED COUNTERCLAIMS, CROSS CLAIMS, AND THIRD PARTY CLAIMS.	

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WHEREAS, this Court, on June 26, 2000, granted the Defendants' Motion for Sanctions; and

WHEREAS, this Court, on July 5, 2000, entered the Order imposing sanctions, annexed hereto as Exhibit A; and

WHEREAS, pursuant to said Order, the Court directed the State Plaintiffs and the Defendants to file further papers regarding the State's claim of non-involvement in the misconduct of experts found by the Court; and

WHEREAS, the said parties made such filings, and the Court held argument thereon on July 24, 2000.

NOW, THEREFORE, it is ORDERED:

1. The sanctions order annexed hereto as Exhibit A, is reaffirmed in all respects.

2. The State Plaintiffs may not rely in any respect upon John Cubit, JoEllen Hose, Raymond Kopp, Ronald McDonald, and Michael Palermo, all of whom are excluded as witnesses;

3. Any other jointly-designated experts who were stricken pursuant to the Order annexed hereto may testify for the State of California but that testimony shall be applicable only to the California position to which those experts will testify, not to the federal position.

IT IS SO ORDERED THIS 1st day of August, 2000.

Honorable Manuel L. Real
United States District Judge

Respectfully submitted,

Peter J. Gregora
Attorney for the State of California

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EXHIBIT A

UNITED STATES DISTRICT COURT
CENTRAL DISTRICT OF CALIFORNIA
CIVIL MINUTES - GENERAL

CASE NO.: CV-90-3122-R **Date: JUNE 26, 2000**

TITLE: UNITED STATES OF AMERICA et al V. MONTROSE CHEMICAL etc et al

PRESENT:

HON. MANUEL L. REAL, JUDGE

William Horrell
Deputy Clerk

Leonore LeBlanc
Court Reporter

ATTORNEYS PRESENT FOR PLAINTIFFS:

Steven O'Rourke DOJ
John Saurenman Dep A/G
Layn Phillips
Peter Gregora
Ellen Mahan
Steven Talson

ATTORNEYS PRESENT FOR DEFENDANTS:

Paul Galvani
Karl Lytz
Cary Lerman
Jose Allen

PROCEEDINGS: 1) State of California's motion requesting the Court enter the Government's proposed order re State law counterclaims
2) Hearing re sanctions due to be levied against government due to governmental misconduct

AS TO MOTION # 1, THE COURT HAS SIGNED THE ORDER RE STATE LAW COUNTERCLAIMS, THEREBY RENDERING THE MOTION MOOT.
THE COURT HEARS ARGUMENT OF COUNSEL RE MOTION # 2. THE COURT ORDERS: SUPPLEMENTATION OF THE RECORD OF ALL EPA RESPONSE ACTIVITIES WITH RESPECT TO PALOS VERDES SHELF; TO PRECLUDE RECOVERY OF EPA'S COSTS RELATED TO THE P.V. SHELF TECHNICAL ADVISORY COMMITTEE; TO STRIKE THE EXPERTS LISTED IN EXHIBIT A OF DEFENDANTS' ALTERNATE PROPOSED ORDER, WITH THE EXCEPTION OF ROBERT SPIES, ROBERT EGANHOUSE, JOHN CONNOLLY, AND PETER THOMAS; TO PRECLUDE THE U.S. FROM INTRODUCING EXPERTS TO REPLACE THE STRICKEN EXPERTS; TO PRECLUDE THE U.S.' RECOVERY OF COSTS INCURRED IN CONNECTION WITH THE STRICKEN AND WITHDRAWN EXPERTS. DEFENDANTS' MAY BRING A MOTION TO RECOVER THEIR COSTS AND ATTORNEY FEES IN CONNECTION WITH THEIR MOTION RE GOVERNMENT MISCONDUCT. THE STATE PLAINTIFFS SHALL FILE RESPONSE PAPERS RE THEIR CLAIMS NON-INVOLVEMENT IN THE EXPERT MISCONDUCT BY JULY 11, 2000, DEFENDANTS SHALL RESPOND BY JULY 18, 2000, AND THE MATTER SHALL BE SET FOR HEARING ON JULY 24, 2000 AT 10:00 A.M.

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EXHIBIT 7

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UNITED STATES DISTRICT COURT
CENTRAL DISTRICT OF CALIFORNIA
CIVIL MINUTES - GENERAL

CASE NO.: CV-90-3122-R

Date: JUNE 26, 2000

TITLE: UNITED STATES OF AMERICA et al V. MONTROSE CHEMICAL etc et al

==

PRESENT:

HON. MANUEL L. REAL, JUDGE

William Horrell
Deputy Clerk

Leonore LeBlanc
Court Reporter

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EXHIBIT 8

Ⓘ Orders 6/28
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② Orders Binder
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③ Gen. Plead.
LATHAM & WATKINS
SAN DIEGO

COUNSEL FOR DEFENDANTS
LISTED ON ATTACHED PAGE

UNITED STATES DISTRICT COURT
CENTRAL DISTRICT OF CALIFORNIA

UNITED STATES OF AMERICA, et al., Plaintiffs, vs. MONTROSE CHEMICAL CORPORATION OF CALIFORNIA, et al., Defendants.	NO. CV 90-3122-R
AND RELATED COUNTERCLAIMS, CROSS-CLAIMS AND THIRD-PARTY ACTIONS.	[ALTERNATIVE PROPOSED] ORDER AWARDING RELIEF ON DEFENDANTS' MOTION FOR SANCTIONS

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Attorneys for Defendants,
Counterclaimants, and Cross-Claimants
AVENTIS CROPSCIENCE USA INC., and
ATKEMIX THIRTY-SEVEN, INC.

ORDER

WHEREAS, this matter came on for hearing before this Court on June 26, 2000, upon (1) the DDT Defendants' (hereinafter the "defendants") Motion For Sanctions Due To Government Misconduct, dated April 28, 1999; (2) Plaintiffs' Memorandum Of Points And Authorities In Opposition To DDT Defendants' Motion for Sanctions Due To Government Misconduct, dated June 4, 1999; (3) the Reply Memorandum In Further Support Of DDT Defendants' Motion For Sanctions Due To Government Misconduct, dated July 1, 1999; (4) Plaintiffs' Surreply Memorandum in Further Opposition to DDT Defendants' Motion for Sanctions Due to Government Misconduct, dated August 19, 1999; (5) the Supplement To DDT Defendants' Motion For Sanctions Due Government Misconduct, dated May 19, 2000; (6) Plaintiffs' Memorandum In Response To Court's April 17, 2000 Order And In Further Opposition To DDT Defendants' Motion For Sanctions Due To Government Misconduct, dated May 22, 2000; (7) Defendants' Reply to Plaintiffs' Supplemental Opposition To Defendants' Motion For Sanction Due To Government Misconduct, dated June 4, 2000; (8) Plaintiffs' Memorandum In Response To Defendants' Supplement To DDT Defendants' Motion For Sanctions Due Government Misconduct And Further Opposition To Defendants' Motion For Sanctions, In The Interests Of Justice, Based On New Information, dated June 5, 2000; (9) Defendants' Reply To New Allegations In Plaintiffs' June 5, 2000 Memorandum In Opposition to Motion For Sanctions Due To Government Misconduct; (10) the declarations and exhibits in support of each of the above; and (11) the statements and arguments of counsel; and

WHEREAS, on June 26, 2000, after considering the defendants' motion and all papers filed in support thereof, the plaintiffs' opposition thereto and all papers filed in support thereof, the arguments of the parties, and all other pertinent matters, this Court, pursuant to the authority of Rules 11 and 37 of the Federal Rules of Civil Procedure and the Court's inherent authority, GRANTED the defendants' motion sanctioning the plaintiffs and set down for further hearing the issue of the relief to be awarded the defendants; and

WHEREAS, the Court finds the presence of willful misconduct, bad faith, and fault by the plaintiffs amounting to a pattern of pervasive misconduct over an extended period of time, knowingly undertaken by plaintiffs and having the attempted effect of undermining the administrative and Court processes, creating the existence of extraordinary circumstances for which it is found that lesser sanctions would not adequately address the harm done to defendants and the Court, all as set forth in defendants' motion papers, exhibits and affidavits, which the Court expressly finds to be credible, and further finds that plaintiffs' attempted explanations of their conduct, individually and collectively, are neither credible nor adequate to explain their misconduct; and

WHEREAS, the Court has considered a range of alternative sanctions, but has determined that such sanctions would be inadequate because of the seriousness and persistence of such misconduct, and that therefore more severe sanctions are required under the circumstances;

NOW, THEREFORE, it is hereby ORDERED that:

(1) All claims under Count II of the Third Amended Complaint, including without limitation all issues relating to capping (including the pilot capping project), institutional controls, and/or selection of other response actions, and all claims relating to the Palos Verdes Shelf, the Montrose DDT Plant, the Montrose Plant Property, and property and locations in their vicinity (all as defined in paragraphs 1 and 2 of the Third Amended Complaint), shall be tried on a *de novo* basis, commencing on October 4, 2000, with the plaintiffs to bear the burden of proof with respect to all issues;

(2) The reports and all other work of the experts who engaged in misconduct described in the defendants' motion papers and as listed on Exhibit A hereto, and the reports and all other work of any other experts who rely on the work of the experts who engaged in such misconduct, are hereby STRICKEN and EXCLUDED from any proceeding against the defendants;

(3) Plaintiffs are forever PRECLUDED from introducing any expert evidence designed to replace, or relating to the same or similar subject matter as, the expert reports and other evidence stricken and excluded under paragraph (2) above;

(4) Plaintiffs' claims for costs in connection with any expert reports and other evidence stricken and excluded under paragraph (2) above are hereby DISMISSED with prejudice and without leave to amend or renew, and plaintiffs shall have the burden to demonstrate that any costs sought to be recovered are not related to said reports or other evidence;

(5) Defendants are hereby AWARDED their reasonable attorneys' fees and costs in connection with their efforts to unearth and rebut the government's misconduct, including without limitation discovery and work related to the motion for sanctions, in an amount to be determined by the Special Master; and

(6) Because of the misconduct of the plaintiffs in general, and in particular the deliberate misbilling of U.S. Department of Justice ("DOJ") costs, including without limitation DOJ attorney time, as response costs, plaintiffs are PRECLUDED from recovering DOJ costs or fees in connection with this action.

IT IS SO ORDERED this ______ day of _________, 2000.

HONORABLE MANUEL L. REAL
United States District Judge

Submitted by:

ROPES & GRAY
One International Place
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Telephone: (617) 951-7000

By Paul B. Galvani /PB
Paul B. Galvani
Harvey J. Wolkoff

Attorneys for Defendants, Counterclaimants, and Cross-Claimants Aventis CropScience USA Inc. and Atkemix Thirty-Seven, Inc.

Dated: June 28, 2000

EXHIBIT A

Plaintiffs' Purported Experts Stricken Due To Misconduct

1. John Calambokidis
2. John P. Connolly
3. Jeffrey N. Cross
4. David E. Drake
5. Robert Eganhouse
6. Jo Ellen Hose
7. Raymond Kopp
8. Donald D. MacDonald
9. Michael Palermo
10. Charles Phillips
11. K. John Scott
12. Christopher Sherwood
13. Robert Spies
14. Peter Thomas
15. Patricia Wiberg
16. Iris Winstanley

PROOF OF SERVICE

STATE OF CALIFORNIA, COUNTY OF LOS ANGELES

I am employed in the County of Los Angeles, State of California. I am over the age of 18 and not a party to the within action; my business address is 300 South Grand Avenue, Los Angeles, California 90071.

On June 28, 2000, I served the foregoing document(s) described as

[ALTERNATIVE PROPOSED] ORDER AWARDING RELIEF ON DEFENDANTS'MOTION FOR SANCTIONS

on Counsel in this action by placing a true copy thereof enclosed in a sealed envelope addressed as follows:

(SEE ATTACHED LIST)

/_/ (BY MAIL) I deposited such envelope with postage thereon fully prepaid in the United States mail at a facility regularly maintained by the United States Postal Service at _________ California.

/X/ (BY MAIL IN THE ORDINARY COURSE OF BUSINESS) I am readily familiar with the firms' practice for the collection and processing of correspondence for mailing with the United States Postal Service and the fact that the correspondence would be deposited with the United States Postal Service that same day in the ordinary course of business; on this date, the above-referenced correspondence was placed for deposit at Los Angeles, California and placed for collection and mailing following ordinary business practices.

/_/ (BY PERSONAL SERVICE) /_/ By personally delivering copies to the person served. (STATE/FEDERAL)

/_/ I delivered such envelope by hand to the offices of the addressee pursuant to CCP § 1011. (STATE/FEDERAL)

/X/ I declare under penalty of perjury under the laws of the State of California and the United States of America that the above is true and correct.

Executed on June 28, 2000, at Los Angeles, California.

Wendy Constantino

Wendy Constantino

UNITED STATES V. MONTROSE, ET AL.
CV-90-3122-R

SERVICE LIST

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6. **For Los Angeles County Third-Party Defendants That Discharge to the JOS:**

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10. **Third-Party Defendants Orange County Municipalities and Sanitation Districts in Orange County:**

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11. THIRD-PARTY DEFENDANTS VENTURA COUNTY AND MUNICIPALITIES AND SANITATION DISTRICTS IN VENTURA COUNTY:

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12. THIRD-PARTY DEFENDANT MUNICIPALITIES, AND WATER AND SANITATION DISTRICTS IN SAN BERNARDINO COUNTY:

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EXHIBIT 9

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN DIEGO REGION

In re: Tentative Cleanup and Abatement Order No. R9-2010-0002 (Shipyard Sediment Cleanup)	**Presiding Officer King**

SAN DIEGO COASTKEEPER'S AND ENVIRONMENTAL HEALTH COALITION'S MOTION TO AMEND EXPERT AND NON-EXPERT WITNESS DESIGNATIONS

San Diego Coastkeeper and Environmental Health Coalition hereby move to amend their expert and non-expert witness designations initially provided on July 19, 2010, pursuant to California Code of Civil Procedure §2034.610(a). Through this motion, San Diego Coastkeeper and Environmental Health Coalition intend to limit and specify their witness testimony from that initially indicated and to include a witness declaration for Donald MacDonald, required pursuant to § 2034.260(c) of the California Code of Civil Procedure. This motion will not prejudice any Designated Party because San Diego Coastkeeper and Environmental Health Coalition have not added any new witnesses nor expanded the subjects on which the remaining witnesses will testify.

San Diego Coastkeeper and Environmental Health Coalition seek to amend their witness designations as follows:

Expert witness retained for the purpose of forming and expressing an opinion in anticipation of the hearing (Cal. Code of Civ. Procedure §2034.210(b)):

Donald MacDonald
Principal Researcher and Director
MacDonald Environmental Services
#24-4800 Island Highway N
Nanaimo, British Columbia V9T 1W6 CANADA

Potential expert witness, but not retained for the purpose of forming and expressing an opinion in anticipation of the hearing:

Katie Zeeman
Toxicologist
U.S. Fish and Wildlife Service
6010 Hidden Valley Road
Carlsbad, CA 92011

Non-Expert Witnesses:

Laura Hunter
Associate Program Director
Environmental Health Coalition
2727 Hoover Ave., Suite 202
National City, CA 91950

Joy Williams
Research Director
Environmental Health Coalition
2727 Hoover Ave., Suite 202
National City, CA 91950

Ms. Hunter and Ms. Williams are available to testify regarding the report entitled "Survey of Fishers on Piers on San Diego Bay, Results and Conclusion," referenced on Page 1-25 of the Draft Technical Report on behalf of Environmental Health Coalition. BAE is seeking to depose Ms. Sonia Rodriquez, presumably about the "Survey of Fishers on Piers on San Diego Bay, Results and Conclusion." Ms. Rodriquez is a former employee of Environmental Health Coalition, and is not available to be deposed, but Ms. Hunter and Ms. Williams will be able to provide testimony on the survey in her absence.

San Diego Coastkeeper and Environmental Health Coalition remove the following previously-designated witnesses from their witness list: Clay Clifton, Jen Kovecses, Bruce Reznik, Diane Takvorian, Ed Kimura, and Steve Bay. The foregoing individuals may provide public comment in the form of policy statements at the hearing, but are not prepared to submit comments containing evidence beyond policy-statements.[1]

For these reasons, and in light of the fact that limiting the witness list and testimony subjects will not prejudice any Designated Party but will aid in streamlining the discovery process, we respectfully request the Presiding Officer grant San Diego Coastkeeper's and Environmental Health Coalition's Motion to Amend Expert and Non-expert Witness Designations.

Respectfully Submitted on August 6, 2010 by:

Jill M. Witkowski, Cal. Bar No. 270281
Staff Attorney
San Diego Coastkeeper
2825 Dewey Rd, Suite 200
San Diego, CA 92106
619-758-7743
jill@sdcoastkeeper.org

On behalf of San Diego Coastkeeper and
Environmental Health Coalition

[1] *See* Presiding Officer King's February 16, 2010 Order at II.B.2.

DECLARATION OF JILL M. WITKOWSKI

I, Jill M. Witkowski, declare as follows:

1. I am Staff Attorney for San Diego Coastkeeper and counsel for Environmental Health Coalition in this matter.
2. I make this declaration based upon information and belief.

Expert Witness Declaration: Donald MacDonald

3. Donald MacDonald is Principal Researcher and Director of MacDonald Environmental Services. He is an expert in environmental toxicology and chemistry, ecosystem-based resource management, water quality/water use interactions, and sediment quality assessment—including contaminated sediment and remediation plans. His qualifications are outlined in the attached curriculum vitae.
4. Dr. MacDonald is expected to provide testimony regarding various aspects of the Tentative Cleanup and Abatement Order and Draft Technical Report, as well as an additional remediation footprint that would address impacts on benthic invertebrates and other wildlife using the site.
5. Dr. MacDonald has agreed to testify at the hearing on the Tentative Cleanup and Abatement Order.
6. Dr. MacDonald will be sufficiently familiar with the pending action to submit to a meaningful oral deposition concerning the specific testimony, including any opinion and its basis, that he is expected to give at the hearing on the Tentative Cleanup and Abatement Order.

7. Dr. MacDonald's hourly expert fees for providing deposition testimony is $225, and his hourly expert fee for consulting with San Diego Coastkeeper and Environmental Health Coalition is $145.56.

8. Dr. MacDonald is available to be deposed in San Diego on August 11, 12, or 13, 2010, with August 11th or 12th being the most convenient days for Mr. MacDonald

Meet and Confer on Motion to Amend

9. On August 3, 2010, I e-mailed to counsel for all Designated Parties a proposed copy of San Diego Coastkeeper's and Environmental Health Coalition's Motion to Amend Expert and Non-Expert Witness Designations. I requested that all counsel respond to me by close of business on August 5, 2010.

10. At 1:45pm on August 5, 2010, I re-sent my original e-mail to counsel for all Designated Parties requesting a response from those who had not yet responded.

11. As of close of business on August 5, 2010, I received responses of no objection from BAE, the Cleanup Team, and the Port. None of the other parties responded to my attempts to meet and confer.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Executed this 6th day of August, 2010 at San Diego California

Jill M. Witkowski

DONALD D. MACDONALD

#24-4800 ISLAND HWY N ■ NANAIMO, BRITISH COLUMBIA V9T 1W6 ■ PHONE: 250-729-9623 ■ FAX: 250-729-9628 ■ E-MAIL: MESL@SHAW.CA

EDUCATION:

Bachelor of Science, Zoology
(Fisheries Biology; Environmental Physiology, Comparative Biochemistry)
University of British Columbia, 1982

SPECIALIZATION:

Principal of MacDonald Environmental Sciences Limited, which was established to provide scientific consulting services in the fields of fisheries and aquatic resource management, stream ecology, environmental quality guidelines and policy development, environmental risk and hazard assessment, and information and technology transfer.

Specialist environmental toxicology and chemistry, ecosystem-based resource management, water quality/water use interactions, and sediment quality assessment.

PROFESSIONAL MEMBERSHIPS:

American Fisheries Society
- President Western Division; Past-President, Canadian Aquatic Resources Section; Nominations Committee; Chair, Wetlands Conservation Committee; Newsletter Committee; Membership Committee.

Aquaculture Association of Canada
Association of Professional Biologists of British Columbia
Canadian Association on Water Pollution Research and Control
International Association on Water Pollution Research and Control
Society of Environmental Toxicology and Chemistry

OTHER PROFESSIONAL ACTIVITIES:

1986-1988	Newsletter Editor, North Pacific International Chapter, American Fisheries Society
1987-1989	Chair, Membership Committee, North Pacific International Chapter, American Fisheries Society
1992-1994	Chair, Wetlands Conservation Committee, Canadian Aquatic Resources Section, American Fisheries Society
1990-1994	Vice-President, President-Elect, President, and Past-President, Canadian Aquatic Resources Section, American Fisheries Society
1995-Present	Canadian Director and Chair, Board of Directors, Sustainable Fisheries Foundation
1997-2001	Vice-President, President-Elect, President, and Past-President, Western Division, American Fisheries Society
2000-2001	Member, Membership Committee, American Fisheries Society
2003-2006	Award of Excellence Committee, American Fisheries Society
2005-2006	Member, Science Advisory Board for Contaminated Sites in British Columbia
2006-Present	Board or Directors, Mid-Island Science, Technology & Innovation Council (MISTIC)

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PROFESSIONAL CERTIFICATIONS:

Fisheries Professional-Certified (American Fisheries Society)

Registered Professional Biologist (Association of Professional Biologists of British Columbia)

EXPERIENCE:

AQUATIC BIOLOGIST - February 1989 to Present

MacDonald Environmental Sciences Limited, #24 - 4800 Island Highway North, Nanaimo, B.C. V9T 1W6 Independent consulting on environmental impact assessment, natural resource damage assessment, ecological risk assessment, fisheries and aquatic resource management, environmental quality, stream ecology, computer data management, and information and technology transfer. Projects include the development of water quality guidelines, sediment quality guidelines, tissue residue guidelines, environmental quality monitoring programs, fisheries co-management programs, ecosystem-based management, ecological risk assessments, natural resource damage assessments, and the assessment of environmental quality.

WATER QUALITY OBJECTIVES OFFICER - September 1984 to February 1989

Water Quality Branch, Inland Waters, Environment Canada, 502 - 1001 West Pender Street, Vancouver, B.C. V6E 2M9 Compilation, management and statistical analysis of existing and new information generated to support the formulation of water quality objectives in waters of significant federal interest; generation of water quality criteria information through toxicological, water quality, and other studies; design and implementation of monitoring programs to assess compliance with water quality objectives; preparation of reports and other publications on information developed to formulate water quality objectives; organization of workshops and information exchange sessions on water quality guidelines and objectives; provision of information and advice to technical committees established to resolve the International Joint Commission reference on the Flathead River. Supervisor: Dr. D. Valiela, Head Water Quality Objectives Division

TECHNICAL PLANNING COORDINATOR - November 1983 to September 1984

Water Quality Branch, Inland Waters, Environment Canada. 502 - 1001 West Pender Street, Vancouver, B.C. V6E 2M9 Planning and development of regional water quality programs, including long- and short-term logistics and budgetary requirements and inter-project coordination; planning, organization, expedition, and supervision of special field studies and sampling projects for water quality analysis; pollution surveillance and sediment sampling; planning and implementation on national water quality monitoring programs to assess national trends and conditions. Supervisor: Dr. W.E. Erlebach, Chief Water Quality Branch

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PUBLICATIONS AND TECHNICAL REPORTS:

Journal/Book Publications

Clark, M.J.R., D.D. MacDonald, P.H. Whitfield, and M.P. Wong. 2009. Designing monitoring programs for water quality based on experience in Canada. Part II - Monitoring Tools - Problem Characterization and Data Quality Objectives. In Review.

MacDonald, D.D., M.J.R. Clark, P.H. Whitfield, and M.P. Wong. 2009. Using water sampling for decision making for status and trends: Part III - Ecosystem Based Management and Water Quality Objectives - Problem Characterization and Data Quality Objectives. In Review.

MacDonald, D.D. M.J.R. Clark, P.H. Whitfield, and M.P. Wong. 2009. Designing monitoring programs for water quality based on experience in Canada I. Theory and framework. Trends in Analytical Chemistry 28(2):204-213.

Ingersoll, C.G., N.E. Kemble, J.L. Kunz,, W.G. Brumbaugh, D.D. MacDonald, and D. Smorong. 2009. Toxicity of sediment cores collected from the Ashtabula River in Northeastern Ohio, USA, to the amphipod *Hyalella azteca*. Archives of Environmental Contamination and Toxicology 57(2):315-329.

Bay, S.M., W. Berry, P. Chapman, R. Fairey, T. Gries, E. Long, D. MacDonald, and S. Weisberg. 2007. Evaluating consistency of best professional judgment in the application of a multiple lines of evidence sediment quality triad. Integrated Environmental Assessment and Management 3(4):491-497.

Long E.R., C.G. Ingersoll, and D.D. MacDonald. 2006. Calculation and uses of mean sediment quality guidelines: A critical review. Environmental Science and Technology 40(6)1726-1736.

Ingersoll, C.G., S.M. Bay, J.L. Crane, L.J. Field, T.H. Gries, J.L. Hyland, E.R. Long, D.D. MacDonald, and T.P. O'Connor. 2005. Ability of sediment quality guidelines to estimate effects or no effects of sediment-associated contaminants in laboratory toxicity tests or in benthic community assessments. *In:* Wenning RJ, Batley G, Ingersoll CG, editors. Use of sediment quality guidelines (SQGs) and related tools for the assessment of contaminated sediments. 497-556. SETAC Press. Pensacola Florida.

MacDonald, D.D., R.S. Carr, D. Eckenrod, H. Greening, S. Grabe, C.G. Ingersoll, S. Janicki, R.A. Lindskoog, E.R. Long, R. Pribble, G. Sloane, and D.E. Smorong. 2004. Development, evaluation and application of sediment quality targets for assessing and managing contaminated sediments in Tampa Bay, Florida. Archives of Environmental Contamination and Toxicology 46(2):147-161.

Knudsen, E.E., D.D. MacDonald, and Y.K. Muirhead, editors. 2004. Sustainable management of North American fisheries. American Fisheries Society, Symposium 43, Bethesda, Maryland.

Carr, R.S., J.M. Biedenbach, and D.D. MacDonald. 2003. Comparison of sediment quality guideline values derived using sea urchin porewater toxicity test data with existing

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guidelines. *In:* Porewater Toxicity Testing: Biological, Chemical, and Ecological Considerations R.S. Carr and M. Nipper (Eds). Setac Press. Pensacola, Florida.

Crane, J.L. and D.D. MacDonald. 2003. Applications of numerical sediment quality targets for assessing sediment quality conditions in a U.S. Great Lakes Area of Concern. Environmental Management 32(1):128-140.

Nipper, M. R.S. Carr, W.J. Adams, W.J. Berry, G.A. Burton Jr., K.T. Ho, D.D. MacDonald, R. Scroggins, and P.V. Winger. 2003. Recommendations for research related to biological, chemical, and ecological aspects of sediment pore water: The way forward. *In:* Porewater Toxicity Testing: Biological, Chemical, and Ecological Considerations R.S. Carr and M. Nipper (Eds). Setac Press. Pensacola, Florida.

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EXHIBIT 10

CALIFORNIA

Water Boards

STATE WATER RESOURCES CONTROL BOARD

REGIONAL WATER QUALITY CONTROL BOARDS

WATER QUALITY CONTROL PLAN FOR ENCLOSED BAYS AND ESTUARIES - PART 1 SEDIMENT QUALITY

Effective August 25, 2009

STATE WATER RESOURCES CONTROL BOARD

California Environmental Protection Agency

State of California
Arnold Schwarzenegger, Governor

California Environmental Protection Agency
Linda S. Adams, Secretary

State Water Resources Control Board
http://www.waterboards.ca.gov

Charles R. Hoppin, Chair

Francis Spivy-Weber, Vice Chair

Tam M. Doduc, Member

Arthur G. Baggett, Jr., Member

Dorothy Rice, Executive Director

Jonathan Bishop, Chief Deputy Director

Thomas Howard, Chief Deputy Director

History of Plan
Adopted by the State Water Resources Control Board on September 16, 2008
Approved by the Office of Administrative Law on January 5, 2009
Approved by the U. S. Environmental Protection Agency on August 25, 2009

Prepared by
Chris Beegan, Ocean Unit, Division of Water Quality

STATE WATER RESOURCES CONTROL BOARD
RESOLUTION NO. 2008-0070

ADOPTION OF A WATER QUALITY CONTROL PLAN FOR
ENCLOSED BAYS AND ESTUARIES – PART 1 SEDIMENT QUALITY

WHEREAS:

1. California Water Code section 13393 requires the State Water Resources Control Board (State Water Board) to develop sediment quality objectives for toxic pollutants for California's enclosed bays and estuaries.

2. In 1991, the State Water Board adopted a workplan for the development of sediment quality objectives for California's enclosed bays and estuaries (1991 Workplan).

3. Due to funding constraints, the State Water Board did not implement the 1991 Workplan; consequently, litigation by environmental interests against the State Water Board ensued.

4. In August 2001, the Sacramento County Superior Court ruled against the state and ordered the State Water Board to initiate development of sediment quality objectives. On May 21, 2003, the State Water Board adopted a revised workplan.

5. Based upon the scope of work in the revised workplan, staff developed narrative sediment quality objectives to protect benthic communities, which utilize an approach based upon multiple lines of evidence.

6. Narrative sediment quality objectives have also been developed to protect human health from exposure to contaminants in fish tissue.

7. Staff also developed an implementation program for the narrative sediment quality objectives based upon input from the Scientific Steering Committee, Sediment Quality Advisory Committee, and staff of the State Water Board and the Regional Water Quality Control Boards (Regional Water Boards), and staff from other state and federal agencies. The work that has been completed, to date, is Phase 1 of the sediment quality objectives program.

8. The State Water Board recognizes this effort is an iterative process. Staff additionally have initiated a second phase of the sediment quality objectives program (Phase 2), which includes extensive sediment sampling in the Delta; further development of the estuarine chemistry, sediment toxicity, and benthic community indicators; and completion of a more prescriptive framework to address human health and exposure to contaminants in fish tissue. The tools, indicators, and framework developed under Phase 2 will be adopted into the draft plan in 2010. Phase 3 is proposed as the development, within available resources, of a

framework to protect fish and/or wildlife from the effects of pollutants in sediment. During Phases 2 and 3, staff would continue to evaluate the tools developed during the initial phase and the implementation language. As the Water Boards experience grows, the draft plan would be updated and amended as necessary to more effectively interpret and implement the narrative objectives.

9. In the process of developing SQOs, the State Water Board has identified the need to address statewide consistency in the regulation of dredging activities under the water quality certification program. While this issue is outside the scope of this plan, the State Water Board will consider initiating policy development in the future to address regulation of dredging activities under the water quality certification program.

10. The State Water Board's Clean Water Act section 303(d) listing policy was adopted prior to the development of SQOs and without the benefit of the scientific evidence supporting their development. The State Water Board recognizes the need to ensure that the listing policy and this plan are consistent. The State Water Board will, therefore, consider amending the 303(d) listing policy in the future to ensure consistency with this plan.

11. Staff has responded to significant verbal and written comments received from the public and made minor revisions to the draft plan in response to the comments.

12. In adopting this draft plan, the State Water Board has considered the requirements in Water Code section 13393. In particular, the sediment quality objectives are based on scientific information, including chemical monitoring, bioassays, and established modeling procedures; and the objectives provide adequate protection for the most sensitive aquatic organisms. In addition, sediment quality objectives for the protection of human health from contaminants in fish tissue are based on a health risk assessment.

13. As required by Water Code section 13393, the State Water Board has followed the procedures for adoption of water quality control plans in Water Code sections 13240 through 13247, in adopting this draft plan. In addition to the procedural requirements, the State Water Board has considered the substantive requirements in Water Code sections 13241 and 13242. The State Water Board has considered the past, present, and probable future beneficial uses of estuarine and bay waters that can be impacted by toxic pollutants in sediments; environmental characteristics of these waters; water quality conditions that can reasonably be achieved through the control of all factors affecting sediment quality; and economic considerations. Adoption of this draft plan is unlikely to affect housing needs or the development or use of recycled water. Further, the State Water Board has developed an implementation program to achieve the sediment quality objectives, which describes actions to be taken to achieve the objectives and monitoring to determine compliance with the objectives. Time schedules to achieve the objectives will be developed on a case-by-case basis by the appropriate Regional Water Board.

14. This draft plan is consistent with the state and federal antidegradation policies (State Water Board Resolution No. 68-16 and 40 C.F.R. Section 131.12, respectively). No lowering of water quality is anticipated to result from adoption of the draft plan. The draft plan contains scientifically-defensible sediment quality objectives for bays and estuaries, which can be consistently applied statewide to assess sediment quality, regulate waste discharges that can impact sediment quality, and provide the basis for appropriate remediation activities, where necessary. Adoption of the draft plan should result in improved sediment quality.

15. The Resources Agency has approved the State and Regional Water Boards' planning process as a "certified regulatory program" that adequately satisfies the California Environmental Quality Act (CEQA) requirements for preparing environmental documents. State Water Board staff has prepared a "substitute environmental document" for this project that contains the required environmental documentation under the State Water Board's CEQA regulations. (California Code of Regulations, title 23, section 3777.) The substitute environmental documents include the "Draft Staff Report – Water Quality Control Plan for Enclosed Bays and Estuaries, Part 1. Sediment Quality," the environmental checklist, the comments and responses to comments, the plan itself, and this resolution. The project is the adoption of sediment quality objectives and an implementation program, as Part 1 of the Water Quality Control Plan for Enclosed Bays and Estuaries.

16. CEQA scoping hearings were conducted on October 23, 2006 in San Diego, California, on November 8, 2006 in Oakland, California, and on November 28, 2006 in Rancho Cordova, California.

17. On September 26, 2007, staff circulated the draft plan – Part 1 Sediment Quality for public comment.

18. On November 19, 2007, the State Water Board conducted a public hearing on the draft plan and supporting Draft Staff Report and Substitute Environmental Document. Written comments were received through November 30, 2007.

19. The State Water Board adopted the Plan on February 19, 2008, and submitted it to the Office of Administrative Law (OAL) on February 29, 2008. Review by OAL revealed that the statutorily-required newspaper notification of the November 2007 hearing had not occurred. The State Water Board has, therefore, noticed and conducted a new public hearing for the draft plan on September 16, 2008.

20. In preparing the substitute environmental documents, the State Water Board has considered the requirements of Public Resources Code section 21159 and California Code of Regulations, title 14, section 15187, and intends these documents to serve as a Tier 1 environmental review. The State Water Board has considered the reasonably foreseeable consequences of adoption of the draft plan; however, project level impacts may need to be considered in any subsequent environmental analysis performed by lead agencies, pursuant to Public Resources Code section 21159.1.

21. Consistent with CEQA, the substitute environmental documents do not engage in speculation or conjecture but, rather, analyze the reasonably foreseeable environmental impacts related to methods of compliance with the draft plan, reasonably foreseeable mitigation measures to reduce those impacts, and reasonably feasible alternatives means of compliance that would avoid or reduce the identified impacts.

22. The draft plan could have a potentially significant adverse effect on the environment. However, there are feasible alternatives or feasible mitigation measures that, if employed, would reduce the potentially significant adverse impacts identified in the substitute environmental documents to less than significant levels. These alternatives or mitigation measures are within the responsibility and jurisdiction of other public agencies. When the sediment quality objectives are implemented on a project-specific basis, the agencies responsible for the project can and should incorporate the alternatives or mitigation measures into any subsequent project or project approvals.

23. From a program-level perspective, incorporation of the mitigation measures described in the substitute environmental documents will foreseeably reduce impacts to less than significant levels.

24. The substitute environmental documents for this draft plan identify broad mitigation approaches that should be considered at the project level.

25. Pursuant to Health and Safety Code section 57400, the draft Water Quality Control Plan for Enclosed Bays and Estuaries – Part 1 Sediment Quality has undergone external peer review through an interagency agreement with the University of California.

26. This draft plan must be submitted for review and approval to the State Office of Administrative Law (OAL) and the United States Environmental Protection Agency (USEPA). The draft plan will become effective upon approval by OAL and USEPA.

27. If, during the OAL approval process, OAL determines that minor, non-substantive modifications to the language of the draft plan are needed for clarity or consistency, the Executive Director or designee may make such changes consistent with the State Water Board's intent in adopting this draft plan, and shall inform the State Water Board of any such changes.

THEREFORE BE IT RESOLVED THAT:

The State Water Board:

1. Approves and adopts the CEQA substitute environmental documentation, including all findings contained in the documentation, which was prepared in accordance with Public Resources Code section 21159 and California Code of

Regulations, Title 14, section 15187, and directs the Executive Director or designee to sign the environmental checklist;

2. After considering the entire record, including oral testimony at the public hearing, hereby adopts the proposed Water Quality Control Plan for Enclosed Bays and Estuaries – Part 1 Sediment Quality;

3. Directs staff to submit the administrative record to OAL for review and approval; and

4. If, during the OAL approval process, OAL determines that minor, non-substantive modifications to the language of the draft plan are needed for clarity or consistency, directs the Executive Director or designee to make such changes and inform the State Water Board of any such changes.

5. Directs staff to initiate appropriate proceedings to amend the section 303(d) listing policy by February 2009.

CERTIFICATION

The undersigned Acting Clerk to the Board does hereby certify that the foregoing is a full, true, and correct copy of a resolution duly and regularly adopted at a meeting of the State Water Resources Control Board held on September 16, 2008.

AYE:	Chair Tam M. Doduc Arthur G. Baggett, Jr. Charles R. Hoppin Frances Spivy-Weber
NAY:	None
ABSENT:	Vice Chair Gary Wolff, P.E., Ph.D
ABSTAIN:	None

Jeanine Townsend

Jeanine Townsend
Clerk to the Board

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ATTACHMENTS

I. INTENT AND SUMMARY

A. INTENT OF PART 1 OF THE WATER QUALITY CONTROL PLAN FOR ENCLOSED BAYS AND ESTUARIES (PART 1)

It is the goal of the State Water Resources Control Board (State Water Board) to comply with the legislative directive in Water Code §13393 to adopt sediment quality objectives (SQOs). Part 1 integrates chemical and biological measures to determine if the sediment dependent biota are protected or degraded as a result of exposure to toxic pollutants* in sediment and to protect human health. Part 1 is not intended to address low dissolved oxygen, pathogens or nutrients including ammonia. Part 1 represents the first phase of the State Water Board's SQO development effort and focuses primarily on the protection of benthic* communities in enclosed bays* and estuaries*. The State Water Board has committed in the second phase to the refinement of benthic community protection indicators for estuarine waters and the development of an improved approach to address sediment quality related human health risk associated with consumption of fish tissue.

B. SUMMARY OF PART 1

Part 1 includes:

1. Narrative SQOs for the protection of aquatic life and human health;
2. Identification of the beneficial uses that these objectives are intended to protect;
3. A program of implementation that contains:
   a. Specific indicators, tools and implementation provisions to determine if the sediment quality at a station or multiple stations meets the narrative objectives;
   b. A description of appropriate monitoring programs; and
   c. A sequential series of actions that shall be initiated when a sediment quality objective is not met including stressor identification and evaluation of appropriate targets.
4. A glossary that defines all terms denoted by an asterisk

II. USE AND APPLICABILITY OF SQOS

A. AMBIENT SEDIMENT QUALITY

The SQOs and supporting tools shall be utilized to assess ambient sediment quality.

B. RELATIONSHIP TO OTHER NARRATIVE OBJECTIVES

1. Except as provided in 2 below, Part 1 supersedes all applicable narrative water quality objectives and related implementation provisions in water quality control plans (basin plans) to the extent that the objectives and provisions are applied to protect bay or estuarine benthic communities from toxic pollutants in sediments.
2. The supersession provision in 1. above does not apply to existing sediment cleanup activities where a site assessment was completed and submitted to the Regional Water Board by February 19, 2008.

VOLUME II

DRAFT TECHNICAL REPORT FOR TENTATIVE CLEANUP AND ABATEMENT ORDER NO. R9-2011-0001

FOR THE SHIPYARD SEDIMENT SITE · SAN DIEGO BAY, SAN DIEGO, CA

SEPTEMBER 15, 2010

CALIFORNIA
Water Boards

STATE WATER RESOURCES CONTROL BOARD

REGIONAL WATER QUALITY CONTROL BOARDS

SAR382893

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
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Documents are available at: http://www.waterboards.ca.gov/sandiego

Draft Technical Report for

TENTATIVE
CLEANUP AND ABATEMENT
ORDER NO. R9-2011-0001

For the Shipyard Sediment Site
San Diego Bay, San Diego, CA

Volume 2 of 3

Adopted by the
California Regional Water Quality Control Board
San Diego Region
on ___________, 2011

Cover Design by Sharon Norton, Graphic Designer

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STATE OF CALIFORNIA

ARNOLD SCHWARZENEGGER, Governor
Linda S. Adams, Agency Secretary, California Environmental Protection Agency

California Regional Water Quality Control Board
San Diego Region

This report was prepared under the direction of

David T. Barker P.E., Chief, Surface Water Basins Branch
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by

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Cynthia Gorham-Test, *Environmental Scientist*
Lisa Honma, *Environmental Scientist*

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Table 18-8 Comparison of the Toxicity Data from the Shipyard Sediment Site Stations to the Reference Pool 95% Lower Predictive Limit

Site	Station	Amphipod Survival (95% LPL = 73%)[1]	Urchin Fertilization (95% LPL = 42%)	Bivalve Development (95% LPL = 37%)[1]
NASSCO	NA01	80	86	49
	NA03	84	84	94
	NA04	80	88	84
	NA05	89	95	94
	NA06	78	103	74
	NA07	74	102	88
	NA09	88	99	**1**
	NA11	**70**	101	80
	NA12	82	89	**15**
	NA15	97	88	93
	NA16	90	84	**3**
	NA17	95	88	80
	NA19	89	72	**2**
	NA20	90	78	80
	NA22[2]	95	111	**2**
BAE Systems	SW02	88	103	85
	SW03	92	103	88
	SW04	94	108	63
	SW08	91	103	93
	SW09	88	100	85
	SW11	77	89	83
	SW13	92	99	**28**
	SW15	92	103	**9**
	SW17	95	96	**16**
	SW18	74	83	64
	SW21	91	102	67
	SW22	90	104	**1**
	SW23	91	107	**16**
	SW25	86	103	**10**
	SW27	73	91	**22**

1. Toxicity values less than the 95% lower prediction limit values are bold faced and shaded.
2. NA22 was omitted from this analysis because it falls within an area that is being evaluated as part of the TMDLs for Toxic Pollutants in Sediment at the Mouth of Chollas Creek TMDL and is not considered part of the Shipyard Sediment Site for purposes of the CAO.

PROOF OF SERVICE

I am employed in the County of San Diego, State of California. I am over the age of 18 years and not a party to this action. My business address is Latham & Watkins LLP, 600 West Broadway, Suite 1800, San Diego, CA 92101-3375.

On **May 26, 2011**, I served the following document described as:

1. **NATIONAL STEEL AND SHIPBUILDING COMPANY'S MOTION *IN LIMINE* TO EXCLUDE EXPERT TESTIMONY OF DONALD MACDONALD**

by serving a true copy of the above-described document in the following manner:

BY ELECTRONIC MAIL

Upon written agreement by the parties, the above-described document was transmitted via electronic mail to the parties noted below on **May 26, 2011**.

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BY ELECTRONIC MAIL

Upon written agreement by the parties, the above-described document was transmitted via electronic mail to the parties noted below on **May 26, 2011**.

BY HAND DELIVERY

I am familiar with the office practice of Latham & Watkins LLP for collecting and processing documents for hand delivery by a messenger courier service or a registered process server. Under that practice, documents are deposited to the Latham & Watkins LLP personnel responsible for dispatching a messenger courier service or registered process server for the delivery of documents by hand in accordance with the instructions provided to the messenger courier service or registered process server; such documents are delivered to a messenger courier service or registered process server on that same day in the ordinary course of business. I caused a sealed envelope or package containing the above-described document and addressed as set forth below in accordance with the office practice of Latham & Watkins LLP for collecting and processing documents for hand delivery by a messenger courier service or a registered process server.

Frank Melbourn Catherine Hagan California Regional Water Quality Control Board, San Diego Region 9174 Sky Park Court, Suite 100 San Diego, CA 92123-4340 fmelbourn@waterboards.ca.gov chagan@waterboards.ca.gov Telephone: (858) 467-2958 Fax: (858) 571-6972	

I declare that I am employed in the office of a member of the Bar of, or permitted to practice before, this Court at whose direction the service was made and declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Executed on **May 26, 2011**, at San Diego, California.

Andrea Rasco

Andrea Rasco

Certification of Authenticity of Electronic Submittal

I, Kelly E. Richardson, declare:

I am a partner at Latham & Watkins LLP, counsel of record for National Steel and Shipbuilding Company ("NASSCO") in the Matter of Tentative Cleanup and Abatement Order R9-2011-0001 before the San Diego Regional Water Quality Control Board ("Water Board"). I am licensed to practice law in the State of California and make this declaration as an authorized representative for NASSCO. I declare under penalty of perjury under the laws of the State of California that the electronic version of NASSCO's Motion in Limine to Exclude Expert Testimony of Donald MacDonald, submitted to the "Water Board" and served on the Designated Parties by e-mail on May 26, 2011, is a true and accurate copy of the submitted signed original. Executed this 26th day of May 2011, in San Diego, California.

Kelly E. Richardson