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DEPARTMENT OF THE NAVY
PORTSMOUTH NAVAL SHIPYARD
PORTSMOUTH, N.H. 03804-5000

IN REPLY REFER TO:

May 21, 1997

MEMORANDUM

FOR THE MEMBERS OF THE RESTORATION ADVISORY BOARD (RAB) CERCLA REMEDIAL ACTION PROGRAM, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

The RAB meeting which was scheduled for May 22, 1997 has been rescheduled for Thursday, June 19, 1997 at a location yet to be determined.

Another letter will be sent to you prior to the June RAB meeting with the location and agenda.

Sincerely,

Ken

Ken Plaisted
Navy Co-Chairman
Restoration Advisory Board

Distribution:

Juanita Bell	Doug Bogen	Jeff Clifford
Michele Dionne	Eileen Foley	Mary Marshall
Phil McCarthy	Jack McKenna	Guy Petty
Onil Roy	Peter Vandermark	Carolyn Lepage

EPA Region I (M. Cassidy)
MEDEP (Iver MacLeod)
NOAA (K. Finkelstein)
MEDMR (D. Card)
NHFG (J. Nelson)
USFWS (K. Munney)
North Div (F. Evans)
COMSUBGRU TWO (R. Jones)
Portsmouth Naval Shipyard (Codes 106. 106.3, 106.3R, 100PAO, 105, 105.5, NRRO)

DEPARTMENT OF THE NAVY
PORTSMOUTH NAVAL SHIPYARD
PORTSMOUTH, N.H. 03804-5000

IN REPLY REFER TO:

May 7, 1997

MEMORANDUM

FOR THE MEMBERS OF THE RESTORATION ADVISORY BOARD (RAB) CERCLA REMEDIAL ACTION PROGRAM, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

The RAB meeting which was scheduled for May 22, 1997 is postponed due to a schedule conflict. We will reschedule the meeting in June on a date yet to be determined. As soon as the date for the RAB meeting is established, I will inform you.

Sincerely,

Ken

Ken Plaisted
Navy Co-Chairman
Restoration Advisory Board

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DEPARTMENT OF THE NAVY
PORTSMOUTH NAVAL SHIPYARD
PORTSMOUTH, N.H. 03804-5000

IN REPLY REFER TO:

August 7, 1997

MEMORANDUM

FOR THE MEMBERS OF THE RESTORATION ADVISORY BOARD CERCLA REMEDIAL ACTION PROGRAM, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Enclosed please find the draft minutes from the June 19, 1997, Restoration Advisory Board meeting for your review and comment. Comments are requested by August 26, 1997. You may provide your comments to me at 207-438-3830.

Sincerely,

Ken

Ken Plaisted
Navy Co-Chairman
Restoration Advisory Board

Distribution:
Juanita Bell
Doug Bogen
Jeff Clifford
Michele Dionne
Eileen Foley
Carolyn Lepage
Mary Marshall
Phil McCarthy
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Peter Vandermark
EPA New England Region (M. Cassidy)
NOAA (K. Finkelstein)
MEDMR (D. Card)
USFWS (K. Munney)
NHF&G (J. Nelson)
MEDEP (I. McLeod)
NORTHDIV (F.Evans)
COMSUBGRU TWO (R. Jones)
Brown & Root Environmental (B. Horne, L. Klink)
PNS (Codes 106, 106.3, 106.3R, 100PAO, 105, 105.5, NRRO)

cc: File PNS Meetings
~~Doug Hudson~~
~~John Trepanowski~~

RESTORATION ADVISORY BOARD MEETING
PORTSMOUTH NAVAL SHIPYARD
HOLIDAY INN, PORTSMOUTH, NEW HAMPSHIRE
JUNE 19, 1997

The meeting began at 7:12 pm and ended at 9:30 p. m. Community members attending were: Juanita Bell, Doug Bogen, Jeff Clifford, Michele Dionne, Eileen Foley, Mary Marshall, Phil McCarthy, Jack McCartle for Onil Roy, Jack McKenna, and Peter Vandermark; regulatory members Meghan Cassidy, EPA, and Iver McLeod, MEDEP; Natural Resource Trustee Donald Card, MEDNR; and Navy members Ken Plaisted and Fred Evans. Others attending were: Carolyn Lepage, the Seacoast Anti-Pollution League's technical advisor: Richard Heath, MEDEP; Fred Short, UNH; Simeon Hahn, Northern Division; Bob Johnston, Naval Command, Control, and Ocean Surveillance Center, and Marty Raymond, the IR Program Manager, and Debbie Holton, Public Affairs Officer, from the Shipyard. Guy Petty was absent.

INTRODUCTION

Ken Plaisted, the Navy Co-Chair, welcomed the RAB, and asked everyone to introduce themselves around the room. Doug Bogen, the Community Co-Chair, encouraged RAB members to attend the New England Federal Facilities workshop in Amherst, Massachusetts, the weekend of July 18-20. Doug also encouraged the RAB to contact their congressmen about HR 1778, the Defense Reform Act. The legislation appears to abolish RABs.

STATUS OF WORK

Fred Evans summarized the status of active work.

The treatability work plan for OU2 should be issued next month. The Navy is responding to comments on the draft Site 10 and Site 29 work plan. The EE/CA for Mercury Burial Vault I is undergoing a public comment period from June 20 to July 21; the remedy will be selected in an action memorandum. The off-shore ecological risk assessment has been distributed and comments are due on August 22. The Navy expects to receive comments next week on the draft site screening plan and the draft work plan for Building 184, the West Timber Basin, and Topeka Pier. Marty Raymond indicated a presentation on the Historical Radiological Assessment will be given at the August meeting.

PRESENTATION ON USING THE WEIGHT-OF-EVIDENCE APPROACH TO CHARACTERIZING ECOLOGICAL RISKS

Bob Johnston, from the Naval Command, Control, and Ocean Surveillance Center, who wrote the Shipyard's ecological risk assessment, summarized the highlights of the study he presented to the RAB in October 1995. In studying the estuary, enormous amounts of information were generated to investigate lines of evidence. Sometimes the effects data conflict so the level of confidence in whether risk exists depends on the amount of supporting data that tells the same story. Because data interpretation is often subjective, the

Shipyard needed to apply a scientific methodology to determine the relative reliability of these data points in determining effects and therefore ecological risks.

The weight-of-evidence approach used by the Shipyard to assess ecological risk information was developed by a task group lead by EPA and the Massachusetts Department of Environmental Protection. Members included representatives from the agencies, as well as academics and industrialists. (Both Patty Tyler from EPA and Ken Finkelstein from NOAA, who have been active in Shipyard projects, were members of the task group). Their approach assisted in assigning relative importance among the information developed during the estuary field study. The ecological risk assessment that was recently distributed to the RAB incorporated results of the weight-of-evidence exercise by revising the July 1995 draft.

The key messages of the revised ecological risk assessment are that:

- ecological risks are characterized by the weight of evidence
- ecological risks in the areas of concerns have been determined
- chemicals were identified that may be responsible for the risks and may be linked to solid waste management units (SWMUs)

Factors in using the weight-of-evidence approach to characterize ecological risk include developing a conceptual model, assessing the evidence of risk by assigning endpoint weights, weighing the results, and developing risk conclusions.

A conceptual model of the lower Piscataqua River estuary was developed to identify how the estuary works. It is a well flushed system that contains many coves that are depositional areas, which receive contaminants from all sources, including the Shipyard and the upgradient sewage treatment plants. The ecological risk assessment identifies the areas that are affected by Shipyard contamination.

The ecological risk assessment identified endpoints (plants and animals to protect). These include pelagic species (fish and plankton); epibenthic species (sediment dwellers); benthic community (lobster, mussels, etc. that live on the sediment); the salt marsh community; eelgrass; and predatory birds that feed on these species.

To characterize risk, two types of information are required: data on exposure levels in the river water and sediment, and data that relates the exposure levels to measurable effects.

Since we were unable to directly measure accurate effects on the assessment endpoints, we used such things as tissue samples, and assigned them a weight of high, medium, or low. For each investigation, these designations were based on the quality of data produced, the strength of the association of the assessment endpoint, and a rating of how well the study was carried out. The endpoint weight reflects the measure's ability of inferred harm to the endpoint.

Bob demonstrated how these weights were assigned by using the pelagic endpoint study on estuarine water chemistry as an example. The data quality was weighted high because all

data quality objectives were met. The strength of the relationship was deemed medium because that relationship can be related to water quality but the criteria cannot predict effects on biota. The study design was assigned a medium weight because the only season for which they had information was the fall. These weights were calculated to result in an overall weight of medium for determining the estuarine water chemistry's effect on the pelagic community.

The next step is interpreting effects data. If an outcome is similar to the reference or falls below the benchmark threshold, it is deemed to have no effect. If the outcome is worse than the reference but not statistically significant, it is categorized as having a potential effect.

When an outcome is significantly worse than the reference or control, it is interpreted as a probable effect.

Exposure data needs to establish a potential interpretation. If an outcome is less than the reference or below the benchmark concentration, then it is interpreted to result in a negligible exposure. Where an outcome is greater than a qualitative screening level, it is interpreted to have a potential low exposure level. In the case when the statistics are greater than the reference level, the interpretation is of a potentially elevated exposure. When the outcomes are greater than conservative and non-conservative benchmarks, the outcomes are potential high and adverse exposures, respectively.

A table is created to interpret risks from exposure and effects data. Effects evidence is listed in the left hand rows; the evidence of exposure weights are entered into column headings. These pieces of information for each endpoint, for each study, for each location are entered into an effects measurement table and an exposure measurement table to derive an overall risk for that scenario.

An assessment endpoint information summary table is prepared that depicts results for each scenario. That information is summarized in another table that, for each endpoint, indicates the evidence of effect, the evidence of exposure, the magnitude of risk, and the confidence level in each data set. A final table is produced. Each area of concern lists the media studied, the magnitude of risk from each medium, and the confidence level of each conclusion. The more data points that exist with similar levels of confidence, the greater the probability that the conclusions are accurate.

The study also identifies those contaminants that are "potential drivers" (chemicals that pose the greatest risk) for each medium. This information assists in determining if an area at the Shipyard is a current potential continuing source of contamination to the estuary (SWMU). If a pathway exists for the SWMU to release the "driver" chemical into the river, then its link is assumed and therefore it will be evaluated in the feasibility study.

Using the weight-of-evidence approach, the recently released version of the ecological risk assessment concludes that:

- intermediate risk from sediment exposure exists in some areas
- surface water exposure in most areas presents a low risk
- water fowl and birds of prey are subject to negligible exposure
- no area poses a high risk

Comment: Where are the reference locations?
Response: If you are conducting a toxicological test, you need to compare the results of media from a clean area. For instance, you would determine the percentage of a salt marsh covered by salt marsh growth to another salt marsh that could not be impacted by the Shipyard.

Comment: What reference station did you use for sediments?
Response: EPA recommended we use a location in central Long Island Sound. (Post Meeting Note: The reference or control sediments for the toxicity tests come from a location in Long Island Sound. Reference locations were also chosen within the Great Bay estuary and other locations for chemistry and other data as described in the ERA report.)

Comment: What are benchmarks?
Response: Benchmarks are standards that are identified in literature that establish the threshold showing when a potential adverse exposure or potential effect is possible We use either a benchmark or a reference area (clean area) to compare with an area under investigation.

Comment: How did you derive the centroids shown on page 8 of your handout?
Response: After calculating the weighted average of each data point and summing them, the centroid pulls the measurement toward the information about which we are unsure and away from information having a low level of certainty.

Comment: What study data were used?
Response: The ecological risk assessment relied on field information collected from several years ago. The December 1996 seep/sediment data area not included.

Comment: How do you measure effects on mussels?
Response: We look for a change in the rate of their growth. To assess their exposure, we measure the level of contamination in tissue.

Comment: On the chart on page 8 about exposure of mussels to contamination over time in Clark Cove, how can the two mussel deployments produce the same confidence level since they were deployed for different periods of time?

Response: If that was the only difference, the confidence levels might be different. However, both are assigned medium weight because both were studied in the fall only, which is a bigger problem.

Comment: Why is there more confidence in the 3 month test if the levels are elevated?
Response: If deployment occurs over too long a period, other factors would come into play and the contaminants would depurate. We wanted to know if the effects would be significantly different between a 1 month and a 3 month deployment in a depositional area. There was no difference in the outcome in Clark Cove. It is a valid question. Both measure the same thing.

Comment: Why was the Phase I data included since it was only a one-month deployment?
Response: There was no reason to invalidate the data developed in Phase I. Studies have shown that 1 month is long enough for animals to equilibrate in that environment.

Comment: Do the number of samples effect confidence levels?
Response: No. They only bear on that individual measure. The summary table on page 9 shows how each table feeds to the next level of summary information.

Comment: How do you know if you have conducted enough sampling?
Response: We try to maximize the amount of information we can obtain based on the study's overall budget. The number of samples is figured into the weighting process. The more pieces of information produced that indicate different things, the less confidence one can have in that data.

Comment: How do you determine what chemicals are responsible for the risk?
Response: We identify the difference between ambient conditions and effects conditions.

Comment: The earlier studies indicated that worms were stressed in Clark Cove. Shouldn't the current study tell us that there is a problem in Clark Cove?
Response: The weight-of-evidence approach requires that we look at all the evidence. If we just study one indicator, like worms, you would perceive a different picture than if you reviewed several types of information about Clark Cove. Before the weight-of-evidence approach was available, most conclusions were made by "gut instinct". The worms' distress could be caused by lots of other factors, including low oxygen levels.

Comment: Several RAB members asked the same question in several ways: by using the weight-of-confidence approach you have just described, aren't you effectively weighing the same information twice? Wouldn't this bias the outcome of the exercise?
Response: We assign a weight to measure the information's usefulness. Then we look at all the individual levels of confidence.

Comment: Meghan Cassidy indicated there was a significant amount of conversation on the part of work group members about this issue and offered to present issues raised by the RAB to the work group. Iver McLeod also stated that he expressed this concern when the topic of adopting the weight-of-evidence approach was first raised.

Comment: How does the sample size figure in establishing the weight of evidence?
Response: This concern of sample representativeness was always raised during the work group meetings in evaluating the "representativeness of samples" factor. In areas like Clark Cove, we had a larger than usual sample size.

Comment: You indicated you measured mercury. In what form?

Response: Both elemental mercury and methyl mercury were measured. As expected, most was in the form of methyl mercury in lobsters. Fish and lobsters are mobile so they can pick up contamination from lots of areas. We came to no conclusions about its source in biota; mercury was not really found in sediments.

Comment: Are the levels high enough to issue a health advisory?
Response: An advisory was issued on March 30 by the State of Maine for coastal freshwater fish. It is not in effect in New Hampshire.

Comment: Was a human health risk assessment conducted?
Response: Yes. No advisory was deemed necessary by the State of Maine

Comment: As I see it, there are three problem areas. The fate and transport model is underway to determine if the Shipyard is still a contributing source of contamination. There are many possible contributors to off-shore areas. The seeps exceeded the ambient water quality standards. Although they may be a route of release, when the seep water enters the estuary, it mixes with and is diluted by surface water. And sediments may already contain contamination that may be causing local effects whether or not the seeps are present.
Response: Sediments reflect accumulation from all sources, which include storm water runoff, sewage treatment plants, etc.

Comment: How many more steps are necessary before some decisions are made?
Response: Once the ecological risk assessment is finalized, we can produce a feasibility study and a proposed plan, and establish a public comment period.

Comment: Will you review the data that has been gathered since December?
Response: We hope to include it in the groundwater fate and transport model to see if the Shipyard is currently contributing to off-shore contamination and whether we need to conduct some on-shore remediation. Seep/sediment data from December 1996 has been evaluated. NOAA has commented that it sees no significant difference between this data and data gathered earlier. Although no

change in levels is evident, the seeps are still a possible source of contamination. We have not received Fish and Wildlife Service comments yet. The new seep sampling program is more extensive, so we will continue to look at seep/sediment data.

Comment: Is there consensus among your peer marine biologists about the usefulness and accuracy of the weight-of-evidence approach?

Response: I spent last weekend in Portland at a scientific meeting. There was lots of interest and support expressed.

Comment: Can we get copies of the outline of the weight-of-evidence approach?

Response: Yes. The position paper will be distributed to the RAB. This approach has been used in a couple of other Region I sites. However, the Shipyard is on the cutting edge of these types of studies.

Comment: I would focus on what I feel are real effects. This approach dilutes the information.

Response: If this approach had been available to us before the work plan was prepared, we would have chosen all high confidence level categories to study. We have to remember that this is an ecological study and that negative results also must be accounted for. In addition, the focus of the exercise is to determine what part of the contamination exists at the Shipyard. This is not a study to determine all sources of contamination to the overall ecosystem.

Comment: Perhaps we are misusing the word "confidence". Can we say we cannot assess effects directly so we need create some basis on which to make decisions about many different pieces of information. Or you could establish the worst case and use that? We cannot be afraid to say we do not know something.

Response: The Navy, EPA, and the DEP will make risk management decisions based on the
weight-of-evidence approach. Using this method unstuck a 2-year log jam surrounding the ecological risk assessment.

Comment: So much information is boiled down in this process. How can we avoid turning this exercise into a one sentence sound bite 3 years from now.

Response: The report itself is based on a good deal of information for each endpoint. At the proposed plan public meeting we have to summarize what we are doing and how we got there. Risk communication is a very important, skilled field that avoids oversimplifying but frames the issue in a nutshell that conveys the breadth of the exercise. In addition, the ecological risk assessment will be available to the public to review.

Comment: I know this question has been asked before. Why were no samples collected along Spruce Creek at the junction of Jamaica and Clark Coves? The Kittery Conservation Commission found mercury and lead in sediment there.

Response: The Navy collected samples in Spruce Creek, conducted toxicity tests and tidal exchange studies, and evaluated salt marshes. We looked at sediment distribution and evaluated chemistry data. The concentrations in Spruce Creek were lower than levels found in the lower estuary. In fact, Spruce Creek was used as a reference area because it displays different tidal exchange classification than the harbor. It's an estuary within an estuary.

Comment: Have you determined that Spruce Creek contamination did not come from the Shipyard?

Response: We do not know, but the creek contains lower levels than other estuary locations.

Comment: You've indicated that the ecological risk assessment found there was an negligible effect on birds of prey. Is that because these contaminants do not bioaccumulate?

Response: Yes. Risks were evaluated by assuming that the birds of prey ingest the

maximum highest contaminant values for their entire life span. The results are below the no effect threshold.

Comment: Is everything averaged out so there is no explanation for why eagles are dying?

Response: [note: there is no information which suggests eagles are being negatively impacted from this study] My colleagues do not understand why we are spending so much time and money studying this estuary when there are so many other estuaries that are so much more contaminated. If you apply the weight-of-evidence approach to New Bedford Harbor, for instance, you will find high risk effects.

DISCUSSION ABOUT THE RAB CHARTER

Ken reviewed charter highlights. As discussed at the last meeting, RAB membership terms are for 2 years; terms can be consecutive. Doug has expressed an interest in continuing as Community Co-Chair. Since no one else indicated their interest in the position, a motion was made, seconded, and carried to re-elect Doug Bogen as Community Co-Chair.

Ken asked community members if they wished to renew their 2-year commitment. Members were asked to contact either Doug or Ken within the week only if they wish not to continue as a RAB member or if they want to shorten their term to 1 year. If anyone does indicate a desire to resign, the charter provides that the Shipyard must advertise and accept applications for replacement members. Mary and Peter joined the RAB later than the other members so their term expiration dates satisfy the charter's requirement for staggered terms.

Iver McLeod discussed a May 22, 1997 letter the DEP wrote concerning the Shipyard's RAB process. It indicated that MEDEP was not comfortable in raising issues at meetings, such as

the fate and transport of contaminants. It is the MEDEP's opinion that other RABs have a freer flow of information, although there was no indication of shyness in tonight's discussion.

A suggestion was made have recommendations for improving RAB meetings as the first item on the agenda for the next RAB meeting.

FUTURE MEETINGS

Marty Raymond announced the dates and topics for upcoming RAB meetings:

August 21, 1997	RAB process
Ho-Jo's, Portsmouth	Historical Radiological Assessment
October 23, 1997	To be determined
Days Inn, Kittery	

DEPARTMENT OF THE NAVY
PORTSMOUTH NAVAL SHIPYARD
PORTSMOUTH, N.H. 03804-5000

IN REPLY REFER TO:

June 10, 1997

MEMORANDUM

FOR THE MEMBERS OF THE RESTORATION ADVISORY BOARD (RAB) CERCLA REMEDIAL ACTION PROGRAM, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

The next RAB meeting will be held on Thursday, June 19, 1997 at 7 p.m. at the Holiday Inn in Portsmouth. We will present the Weight of Evidence process used in the revised draft final Offshore Ecological Risk Assessment and discuss community membership and community co-chair elections.

Your participation is greatly appreciated. If you are unable to attend the meeting, please call me at 207-438-3830. I look forward to seeing you again.

Sincerely,

Ken

Ken Plaisted
Navy Co-Chairman
Restoration Advisory Board

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Juanita Bell	Doug Bogen	Jeff Clifford
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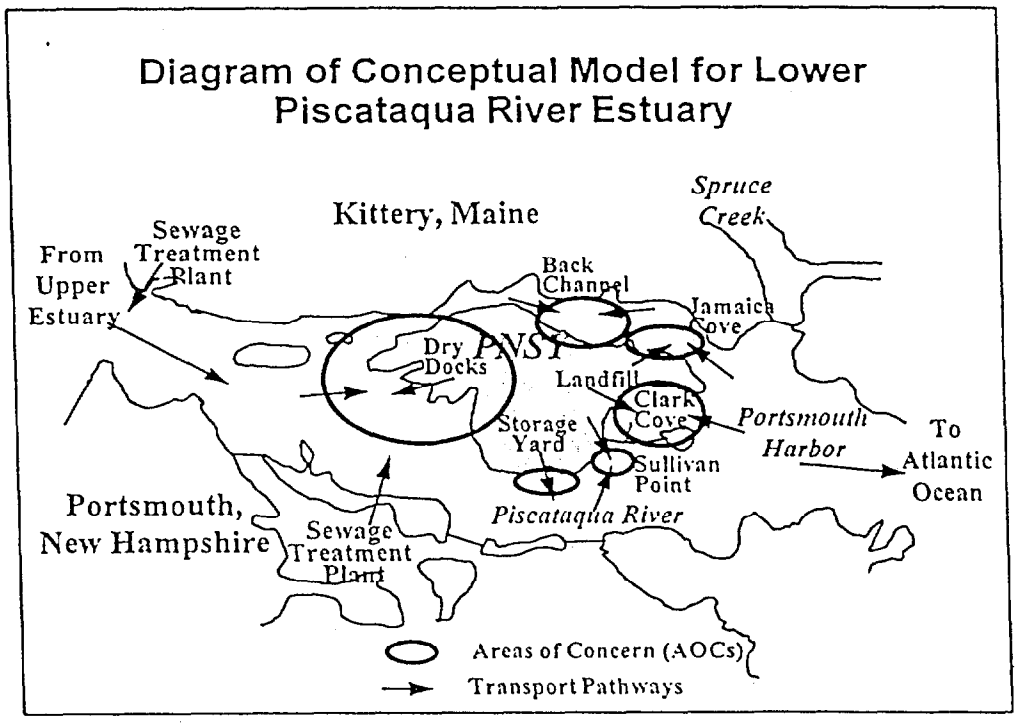
North Div (F. Evans)
COMSUBGRU TWO (R. Jones)
Portsmouth Naval Shipyard (Codes 106, 106.3, 106.3R, 100PAO, 105, 105, 105.5, NRRO)

cc: File PNS Mtgs

Using the Weight of Evidence to Characterize Ecological Risks

Presentation for the
Restoration Advisory Board
Portsmouth Naval Shipyard, Kittery Maine

by
Robert K. Johnston
Marine Environmental Support Office
Naval Command, Control, and Ocean Surveillance Center
June 19, 1997



This diagram shows the conceptual model that was used to guide the risk assessment. It represents our understanding of how the estuary works.

- Well flushed estuarine system.
- Major inputs in lower estuary from Shipyard and Sewage Treatment. Plants
- Up-Estuary sources for some contaminants as well

So depostional areas, especially areas around the shipyard - like Clark Cove, will accumulate contaminants from all sources.

Goals of the Ecological Risk Assessment were:

Determine if there are ecological risks in the areas of concern

If risks are present, determine what may be causing the risk

If contaminants of concern (COCs) from the shipyard are risk drivers, determine if there is a linkage back to the Solid Waste Management Units (SWMUs) on the shipyard.

Weight-of-Evidence Approach

Weight-of-Evidence Approach Was Used
(Applied from Menzie et al. 1996)

- Measures Were Assigned An Endpoint Weight
  - (High, Medium, Low)
  - Evaluates measures' ability to assess effects to the assessment endpoint
- Terms and Interpretations Were Defined
- Scatter Plots Were Used to Summarize WOE results
- The ecological risks associated with environmental media in each AOC were identified.

Menzie, C., M.H. Henning, J. Cura, K. Finkelstein, J. Gentile, J. Maughan, D. Mitchell, S. Petron, B. Potocki, S. Svirsky, and P. Tyler, 1996. Special report of the Massachusetts Weight-of-Evidence Workgroup: A weight-of-evidence approach for evaluating ecological risks. Human and Ecological Risk Assessment, Vol 2:2, pp 277-304

Weight-of-Evidence Approach Cont.

Endpoint Weight (High, Medium, Low) was based on:

- Data Quality
- Strength of Association to the Assessment Endpoint
- Study Design

The Endpoint Weight Reflects the Measures' Ability to Infer Harm to the Assessment Endpoint

Interpretation of Effects Data

OUTCOME	INTERPRETATION
Similar to Reference or Below Threshold	No Effect
Worse than Reference But Not Statistically Significant	Potential Effect
Signigicantly Worse Than Reference or Control	Probable Effect

Interpretation of Exposure Data

OUTCOME	INTERPRETATION
≤ Reference or Below Benchmark Concentration	Negligible Exposure
> Qualitative Screening Level	Low Exposure
Statistically > Reference	Elevated Exposure
> Conservative Benchmark (ER-L)	High Exposure
> Nonconservative Benchmark (ER-M)	Adverse Exposure

Outcome Summary Table

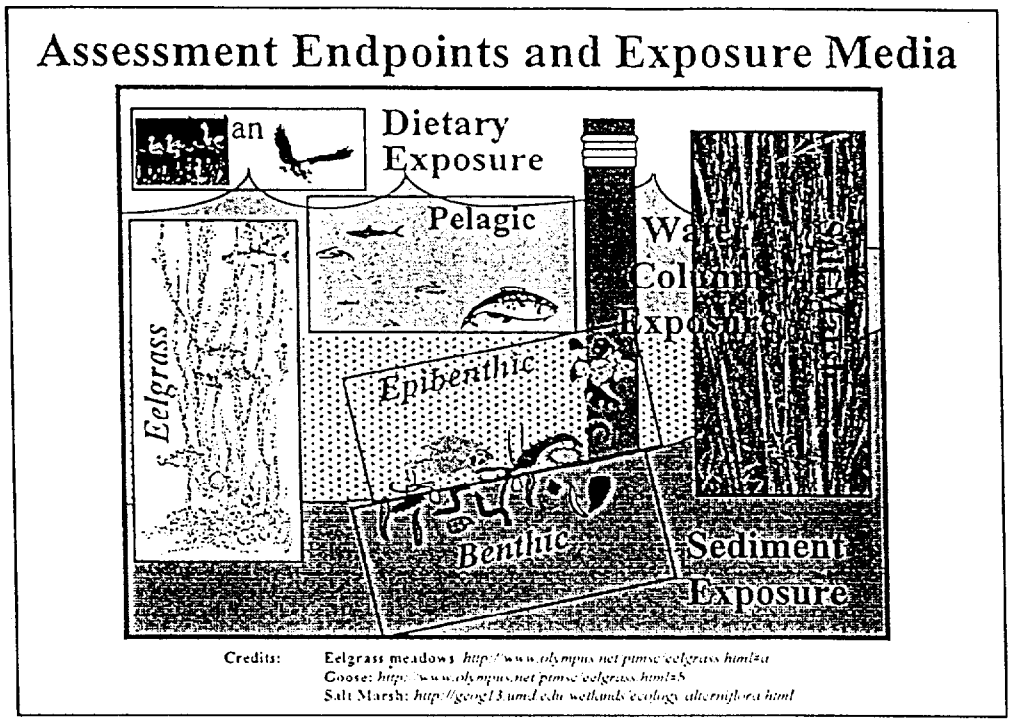
Portsmouth Naval Shipyard
Assessment Endpoint Information Summary

Table Prepared by Ken Finkelstein, NOAA

Assessment Endpoint/Location Pelagic/Clark Cove (includes seeps)

	Measurement Endpoint	DATA QUALITY	STRENGTH OF ASSOCIATION	STUDY DESIGN	ENDPOINT WEIGHT	OUTCOME	INTERPRETATION	ISSUES
Effects	Phytoplankton Biomass	H	L	L	L	No difference from reference	No effect	Very low endpoint weight. Monthly sampling 9/91-6/92.
Expos	Water Benchmark E S	H H	M L	M L	M L	Well below AWQC Cu, Ni, and Zn exceed AWQC	Negligible exposure High exposure at seep locations	Phase 1 data quality is poor, thus it is not considered. Only 1 seep sampled. Dilution of seep water. Correlates with mussel exposure
Effects	Arbacia Tox. Test	M	H	M	M	Statistically different from control	Probable effect	Holding time exceeded. Response low but several stations.
Effects	Deployed Mussel Condition - SFG	H	M	L	M	No difference from reference	No effect	Sta. 15 shows excellent SFG but no mussels

E=Estuarine Surface Water; S=Seep Water



Because different assessment endpoints relate more information about exposures from surface water or sediment, weights were assigned to each assessment endpoint to assist in relating evidence of risk back to the exposure media.

For example, the Benthic Assessment Endpoint provides more information about sediment exposure than does the Pelagic Assessment Endpoint;

The Eelgrass, Epibenthic, and Salt Marsh Assessment Endpoints provide information on both sediment and surface water exposure.

The Risk from Media (Surface Water and Sediment) was calculated as a weighted average of the risks to the assessment endpoints.

Credits:
Eelgrass meadows: *http://www.olympus.net/ptmsc/eelgrass.html#a*
Goose: *http://www.olympus.net/ptmsc/eelgrass.html#b*
Salt Marsh: *http://geog13.umd.edu/wetlands/ecology/alterniflora.html*

Identifying Potential Risk Drivers

- A Qualitative Analysis Was Performed to Determine The Level of Risk (Weight of Evidence)

- An Analysis Was Performed to Identify Chemicals Potentially Causing Risk
  - Identify Chemicals That Are Most Likely to Be Above Benchmark Concentrations
  - Determine Whether Exposure Levels Above Benchmarks Are Greater in Areas of Concern Than in Reference Areas (Ambient Conditions)

Potential Risk Drivers

- Chemicals that Probably Would Exceed Effects Thresholds
  - A greater chance of exceeding benchmarks within the AOCs than for Reference Areas (Ambient)
- Incremental Risk Used
  - Assumptions apply for both reference and AOCs
  - Means that there is a higher chance of an effect than expected from ambient conditions
  - Not possible to attain cleanup below ambient levels

Summary of Risk and Potential Risk Drivers With Link to SWMUs

AOC	Media	Magnitude of Risk	Confidence in Conclusion	Potential Risk Drivers with link to SWMUs
Clark Cove	Surface Water	Low	Medium	seeps[1],Cr, Ni, tPCB
	Sediment	Low	High	
Sullivan Point	Surface Water	Low	Medium	seeps[2], Cu, Hg, Ni, PHEN
	Sediment	Intermediate	High	
Dry Dock	Surface Water	Low	Medium	Cu, Hg, Ni, Zn, tPCB, PHEN, PYRENE
	Sediment	Intermediate	High	
Back Channel	Surface Water	Low	Medium	Hg, PHEN, FLUOR, ANTH
	Sediment	Intermediate	High	
Jamaica Cove	Surface Water	Low	Medium	seeps[3], Pb
	Sediment	Low	High	

1. Chemicals exceeding water quality criteria in the seep sampled in Clark Cove were Cu, Ni, Hg, and Zn.

2. Chemicals exceeding water quality criteria in seeps sampled from Sullivan Point were Cu, Hg, and Zn.

3. Chemicals exceeding water quality in seeps sampled in Jamaica Cove were Cu, Ni, Pb, and Zn.

GLOSSARY OF TERMS

(ANTH) Anthracene, a PAH compound.

Area of Concern (AOC): A specific contiguous area consisting of nearshore, intertidal, and subtidal habitats defined to evaluate whether ecological impacts are present.

The Areas of Concern defined around the Shipyard are:

Clark Cove: The embayment formed by Seavey Island, Jamaica Island, Clark's Island, and the Clark's Island causeway and connecting to Portsmouth Harbor.

Sullivan Point: The area located directly offshore of Sullivan Point and along the Piscataqua River side of the Clark's Island causeway.

The Defense Reutilitzation and Marketing Office (DRMO) Storage Yard: The area directly offshore of the DRMO Storage Yard.

Dry Docks: The nearshore areas surrounding the dry docks and industrial areas on the western side of Seavey Island.

Back Channel: Nearshore and bottom sediment areas of the Back Channel adjacent to Seavey Island and extending from the back gate to the entrance of Jamaica Cove.

Jamaica Cove: The embayment formed by Seavey Island and Jamaica Island and connecting to the Back Channel.

Assessment Endpoint: A component of the ecosystem which can be protected. Since the Assessment Endpoints could not be measured directly, impacts were evaluated by measures of exposure and effects.

Avian Consumers: Birds of prey and water fowl which feed on prey from the estuary (ducks, geese, gulls, and osprey).

Benthic Community: Community of organisms which spends the majority of their life living within the bottom sediments (worm, clam).

Contaminants of Concern (COC): Chemicals that were identified as having the potential to cause ecological impacts.

Conceptual Model: A picture of understanding.

(Cu) Copper

Risk Definitions:

Negligible Risk: Very little evidence of exposure and effects. No impacts were suggested.

Low Risk: Evidence of exposure and effects but no correlation between exposure and effects measures. Limited impacts were suggested.

Intermediate Risk: Evidence of localized impacts but weak correlation between exposure and effects measures. Potential impacts were suggested.

High Risk: Evidence of large and persistent impacts with a high degree of correlation between exposure and effects. Probable impacts were suggested.

Risk Drivers: Chemicals that may be responsible for causing elevated risk.

Salt Marsh Community: Community of organisms living within a salt marsh (cord grass - Spartina, snails)

Solid Waste Management Unit (SWMU): an area designated in the Shipyard's Hazardous Waste Permit where hazardous materials may have been stored, treated, or released.

(tPCB). Total polychlorinated biphenyls

Trophic Transfer: The process by which contaminants are accumulated in the food chain.

(Zn) Zinc