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C-NAVY-05-04-1711W

May 10, 2004

Project Number N5152

Mr. Curtis Frye
Remedial Project Manager
EFA Northeast, Naval Facilities Engineering Command
10 Industrial Highway, Mail Stop 82
Lester, Pennsylvania 19113

Reference: CLEAN Contract No. N62467-94-D-0888
Contract Task Order No. 0842

Subject: Summary of Discussions, April 8, 2004
Installation Restoration Program Sediment Sites
Naval Station Newport, Newport Rhode Island

Dear Mr Frye:

Enclosed for your records are the minutes to the meeting held April 8, 2004 for the IR Program marine sediment sites at NAVSTA Newport. Draft minutes were e-mailed to EPA, RIDEM, and NOAA. EPA provided comments which have been incorporated into the final minutes.

If you have any questions regarding this material, please do not hesitate to contact me.

Very truly yours,

Stephen S. Parker
Project Manager

SSP/rp

Enclosure

c: K. Finkelstein, NOAA (1 w/encl.)
K. Keckler, USEPA (4 w/encl.)
P. Kulpa, RIDEM (4 w/encl.)
S McFadden, TAG (1 w/encl.)
M. Montgomery, NRL (1 w/encl.)
C Mueller, NSN (2 w/encl.)
J Stump, Gannett Fleming, (2 w/encl.)
J. Trepanowski/G. Glenn, TtNUS (w/ encl.)
File N5152-3.2 w/o encl, N5152-8.0 (w/encl.)

1230

Attachment A
Meeting Notes, NAVSTA N wport Sediment Sites
April 8, 2004 Building 1, NAVSTA Newport

Attending:
Curt Frye, EFANE
Todd Bober, EFANE
Paul Kulpa, RIDEM
Dave Barclift, EFANE
Lisa Yeuter, EFANE
Dave Smith, URI
Mike Montgomery, NRL
Ken Finkelstein, NOAA
Kymberlee Keckler, USEPA
Bart Hoskins, USEPA
Amanda Cerise, NAVSTA
Stephen Parker, TtNUS
Jennifer Stump, Gannett Fleming (by phone)

Attachments:
- Agenda
- Attendance List
- Slides presented by NRL
- Handout Provided by TtNUS
- Oversize map showing requested sample stations

Convened at 9:00 AM

C. Frye conducted introductions, and stated that the Navy requested the meeting to discuss sediment issues as a whole, with the emphasis that the Navy needs to see progress to maintain funding. Navy needs to be sure that money is spent sensibly as budgets become tighter. Agreed to discuss OFFTA as a primary topic and Derecktor and Gould Island as time allows.

Old Fire Fighting Training Area (OFFTA)

S. Parker summarized the status of the recent activities at the OFFTA site, including FS submitted 2002, PDI data collected 2001 and 2002. TtNUS is currently preparing a sediment monitoring work plan, to be completed pending the outcome of this meeting, NRL collected samples 2002, and EPA collected samples 2003. S. Parker indicated that the soil pre-design investigation was completed and the report was under preparation.

M. Montgomery provided a presentation on the data they collected. NRL is a Navy research organization which has been tasked with evaluating PAH concentrations at different sites, and their relationship to possibilities for intrinsic bioremediation. Studies determine if harbors are sinks or sources of PAHs, determine mineralization rates and biodegradation rates of the PAHs in different locations under different conditions. Their conclusion on the OFFTA site is that it is neither a sink nor a source of PAHs. Concentrations measured are indicative of background level of input and flux to the area.

Bacterial production was unremarkable because PAH concentrations were very low, and there is not an apparent site-specific release into the environment. Earlier reports indicated a source present, but current data does not show this. There is no selective pressure to allow sustained

growth or high populations of biodegrading bacteria because the PAH concentrations are so low. These low PAH concentrations and bacterial populations provide uncertainty in showing a natural selection for the biodegrading species. (Note: CD ROM of the presentation file was mailed from the Navy to EPA, RIDEM, and NOAA under a Navy cover letter dated April 20, 2004).

K. Keckler indicated that for OFFTA, specific information on the contaminants for which PRGs were calculated is required to make decisions on the future of the site. Also, more information would be required to show a trend of decreasing concentrations of PAHs, and other contaminants for which PRGs are established. The Navy indicated that this is another set of information that will support a better understanding of the site. K. Keckler indicated that if future work is done, their interest lies more "landward" and in the intertidal zone than the stations that NRL sampled.

C. Frye clarified that NRL would be doing another round of sampling in the spring of 2004 to continue their evaluations, and TtNUS would do another set of sediment samples in the fall of 2004, to follow up the condition of the sediment after removal of the mounds of soil and fill on site. Current plan is to conduct mound removal in the summer of 2004, another round of sediment sampling data in the fall of 2004, and soil removal from the site in 2005 and 2006. New samples will focus on areas where PAHs were previously high, and where PRGs were exceeded. The Navy requested input from EPA and RIDEM on suggested sampling stations for the upcoming NRL effort – during the meeting, EPA provided six suggested locations (refer to the attached oversize map)

S. Parker provided a handout briefly summarizing the data collected from the sediments from 1998 to 2003 (attached). PAHs that exceed PRGs were summarized from the four major data sets collected in 1998 (URI& SAIC), 2001 (TtNUS), 2002 (TtNUS & Battelle), and 2003 (EPA). The 2002 NRL data was not included because no PRGs were exceeded in their data set. The areas where PRGs were exceeded were discussed and reviewed. S. Parker presented a site map showing shoreline topography, and the area that would likely be excavated for the purposes of installing a permanent shoreline revetment.

Based on the existing topography, the revetment construction would require removal of intertidal and upper beach sediment to a depth of more than 2 feet across an area approximately 0.6 acres. The intertidal area that would remain would be approximately one acre. The Navy pointed out that this intertidal area is mostly identified as actionable because of a residential use scenario used to measure human health risk in this area.

K. Keckler restated EPA's position that if the Navy opted to remove the remaining intertidal sediment to a depth of 2.0 feet below the current grade, the EPA would consider this adequate to reduce the human health and ecological risk at the site to an acceptable level, and continued efforts (long term monitoring, etc) would not be required. P. Kulpa stated that RIDEM does concur that this action would result in an adequate risk reduction.

The Navy representatives collectively requested clarification on the following if they were to pursue sediment removal. These conditions were agreed to by K. Keckler and P. Kulpa:

- RIDEM would not follow up with an enforcement action against the Navy.
- Material removed would be replaced with like materials but such materials would not constitute a "cap" requiring maintenance.
- Backfill materials would have to be similar in grain size and organic carbon.
- Sampling confirming completion of the excavation would not be required, the objective would be simply to remove and replace the horizontal and vertical extent of sediment agreed to (intertidal zone to a depth of 2 feet below ground surface).
- Since the action would be considered an excavation project (as opposed to a dredging project), there would be no requirement to adhere to a seasonal dredging window of time or specific completion date for the work as would normally be required for dredging.
- Paul Kulpa stated that an essential fish habitat evaluation would not be required.

- No requirement to permit or monitor discharged dewatering fluids.
- Track equipment would be allowed to access from shore.
- Dewatering would be allowed on-shore at the site, provided that the sediments are removed before the soil.
- The excavation would not require dewatering – soil/sediment could be excavated through the water, with adequate silt fencing to protect the sub-tidal area.
- The Navy would be closer to final closure on the site (delisting from the NPL).
- EPA believes resources could be spent on getting other operable units to closure instead of monitoring over the long term.
- EPA suggested that the Navy could demonstrate to the community that cleanup progress is under way (Note – Soil removal will begin summer 2004).
- There would be no requirement to conduct long term monitoring of sediment.
- There would be no requirement to monitor or actively restore habitat.
- EPA and RIDEM reserve the right to pursue dispute resolution under the FFA.

Conversely, K. Keckler and P. Kulpa indicated that the following actions might occur if the Navy opted to conduct monitoring efforts in lieu of the suggested sediment removal described above:

- RIDEM would follow up with an enforcement action against the Navy for non-compliance.
- EPA would request extensive monitoring at all stations where intermediate and high probability for risk was measured (11 stations).
- RIDEM would request additional monitoring points, minimum 10 intertidal, and additional off-shore.
- EPA and RIDEM would request sampling for bulk chemistry, biota chemistry, toxicity (Arabacia and amplesca).
- During the discussion of the interim monitoring approach, EPA stated that at least 8 rounds of sampling would be required. However, actual number of sampling rounds would be determined based on findings.

There was some discussion on the clarification of NRD claims filed by different parties. K. Finkelstein clarified that NRD claims are based on injuries to resources. RIDEM did not state their likelihood for pursuing an NRD claim against this site if sediment excavation was conducted or not. Paul Kulpa indicated the NRD claim being prepared for McAllister Point will likely be for less money that it would have been had the Navy not dredged.

The discussion was followed up with position statements from each party.

Navy - Data does not indicate a need for a removal action. Taking this action will be a financial and management decision on the advantage of closing out the site vs. monitoring.

NOAA - Current data does not indicate presence of ecological risk in the area in question. NOAA also stated that dredging is inappropriate for this site, and recommended monitoring as an appropriate action.

RIDEM - RIDEM did not approve the RI report, the Ecological Risk Assessment Report, the PRGs, or the FS report. Therefore RIDEM will pursue an enforcement action against the Navy if the intertidal sediments are not removed, but they will not pursue such an action if these sediments are removed.

USEPA - Requested the Navy review their letter dated October 8, 2002 regarding the draft proposed plan prepared by the Navy in August 2002. This letter lists the major outstanding issues regarding sediment.

C. Frye asked if the Navy should prepare a sediment monitoring work plan at this point, as a measure of moving forward while the Navy is making their decision. K. Keckler indicated that she always encourages moving forward, but did not want to appear to endorse monitoring by reviewing a monitoring work plan. She suggested that the Navy conduct monitoring if they want to outside the IR program at this time. C. Frye stated that EPA/RIDEM would get a copy of the work plan for their information/review, but the Navy understands that any comments received will not be taken as an endorsement from the regulators for monitoring.

- BREAK –

Derecktor Shipyard

S. Parker reviewed the status of the site, as described in the agenda. The FS was submitted in 1998, but RIDEM did not agree to the PRGs described within. Reprioritization of efforts at Newport caused the FS and decision documents for Derecktor to be put on hold.

A. Cerise reviewed the future of the two mothballed aircraft carriers at Pier 1. Plans are in process to possibly move the ships within the next two years. She stated that the Activity would like to reuse Pier 1 for commercial purposes. There is no intention to demolish either of the Piers.

A proposal was cast to allow RIDEM or EPA to make a suggestion on a compromise solution on the PRGs. S. Parker stated that the Navy is obligated to conduct risk assessments and risk-based cleanups. However, the risk based cleanup goals that the Navy develops are repeatedly not agreed to by RIDEM. Rather than the Navy re-evaluating risk and trying to find a risk reduction measure that meets the objectives of RIDEM, The Navy suggested that RIDEM evaluate the data and make a suggestion on which areas they consider actionable, and then the Navy can determine if taking an action on that area will be an adequate risk reduction to meet their policy and CERCLA. There was general agreement on this subject, however, RIDEM indicated that it would be "quite some time" before such an evaluation could be conducted.

K. Keckler suggested using the ERM quotient method. K. Finkelstein provided a brief summary of the quotient method and referred to the description in the SETAC 2002 or 2003 paper provided by Fairey, Long, et. al.

RIDEM stated that their concern was the cutoff used by the Navy for determining toxicity to organisms from sediment to calculate high risk and thus actionable PRGs. The Navy agreed to review the documents (Ecological Risk Assessment, SAIC and URI, May 1997, and the PRG development document – SAIC November 1998) for appropriate use of toxicity data.

T. Bober explained that the Navy would like to conduct another round of grab sampling at up to 16 stations in Coddington Cove to evaluate the current condition of sediment, as the last set of data collected there is dated 1997. A brief work plan would be submitted to describe the effort. K. Keckler requested the same analyses be conducted on these new samples (includes PCB congener analysis). However, she stated that this work plan would not require regulatory approval. J. Stump suggested returning to the stations where PRGs were exceeded. Specifically, sampling near the piers for PAHs, near station 29 for PCBs, and at the high risk areas (27 and 29) was also requested.

RIDEM requested that samples be taken near the end of Pier 2 and between the piers. This is based on their observations of a sheen occurring in this area during the last ship movement.

Gould Island

S. Parker reviewed the status of the Work Plan for Gould Island RI – the work plan submitted as a draft final in July 2003. Comments focused on the number of sediment samples planned, comparison of data to background in the screening step, and use of a residential risk scenario.

The Navy concurred to using the residential screening criteria for the screening analysis.

All parties concurred with collection of multiple sediment samples at each former outfall location associated with Building 32 (5 samples per outfall, up to 8 documented outfalls). If more outfalls are located in the field, then five samples will be taken in the vicinity of each as discussed. The Navy concurred with the request to collect multiple samples near the former PCB removal action areas (2 each near the former Riggers Storage Building, and former Building 54). The Navy concurred with collecting two sediment samples in the depositional area south of Gould Island. K. Keckler requested that a sample be taken at a possible deep water depositional area, however the Navy did not agree on this sample location since a release from the site to the offshore has not yet been established and the deep water area is approximately 2000 feet away from the site. In addition, sufficient justification was not provided by the EPA or RIDEM for collecting sediment samples this distance from the site to determine a site-specific release form Gould Island.

There was a discussion about the use of background and comparison of site data to background. K. Keckler indicated that there is continued disagreement about using background data to screen contaminants of concern. She indicated that the EPA and the Navy have discussed this issue on numerous occasions, and stated that risks from background must be considered in the risk assessment. D. Barclift stated that they would follow their background policy: For ERA, the background screening will be performed in Step 3a of the 8 step ERA process described in USEPA and Navy guidance documents. For HHRA, background screening will be performed after risk-based screening. For those chemicals that are non-site related, concentrations will be compared to risk based benchmarks in the risk characterization section.

Collection of samples at additional structures at Gould Island was discussed briefly (Buildings 33 – power plant, 34 – acetylene generator building, the acid storage shed, and others). RIDEM stated that it is the Navy's option to address all the structures on the Navy held property with the Building 32 RI, or address them separately under the State Remediation program. K. Keckler stated that the USEPA Superfund program is concerned primarily with building 32, the site described in the FFA. Other EPA programs (e.g. TSCA) will deal with the other contaminated sites on the island. The Navy stated that they would discuss RIDEMs concerns with other structures internally, and make a decision at a later time.

Adjourned at 3:00 PM

AGENDA
SEDIMENT MANAGEMENT STRATEGIES AT NAVAL STATION NEWPORT

THURSDAY APRIL 8, 2004, 0900 – 1500

Building 1, NAVSTA Newport

1. Introduction And Objectives of this Meeting – 30 min*

- Navy goals
  - Discuss the current state of agreement on risk and PRG processes for all marine sediment sites
  - Discuss Navy preference for RODs and Remedies in Place and what approaches can be implemented to accomplish this
    - OFFTA
    - Derecktor
    - Discuss Potential Sediment Cleanup approach at OFFTA (Item 2C below)

2. Old Fire Fighting Training Area:

- Status:
  - Final FS submitted to EPA in 2002
  - Work Plan for sediment monitoring on hold
  - Recent Sediment Sampling Efforts
    - NRL (Navy Research Labs) sampled sediment in 2002
    - EPA conducted sediment sampling in 2003
  - Next steps to move though current sediment disagreement

- Issues & Discussion

A. Briefly Review Data - **30 min***
   - Historic data '96-'02
   - NRL data (2002) and
   - EPA data (2003).

B. Discuss what sediment might be considered "actionable" based on PRGs and current data. – **30 min***

C. Discuss OFFTA soil removal with attention to the following – **90 min***
   - Current plan for onshore removal action and revetment construction
   - EPA/RIDEM presentation of proposal to remove additional near shore sediment and eliminate Long Term O&M monitoring requirements

3. Derecktor Shipyard: - 60 min

- Status:
  - FS was submitted 1998
  - Sediment PRGs were not agreed to by RIDEM.

- Discussions

A. Discuss risk reductions associated with alternatives already in the FS

B. Discuss possibility of interim monitoring or hot spot removals

C. Discuss maintenance dredging & Ship Removal Activities

D. Discuss how to reach a sediment PRG that all 3 signatories to the FFA can live with. Everyone should come to the meeting with several options that are allowable under CERCLA.

4. Gould Island: - 60 min

- Status:

  - Remedial Investigation Work Plan is a Draft Final, dated July 2003
  - EPA provided comments to the Draft Final August 27
  - RIDEM provided comments August 7
  - Navy requested extension to respond to comments
  - EPA conducted sampling fall 2003, report available January 2004

- Discussions:

A Discuss findings of EPA Report citing PCBs and traces of Cyanide near Building 32 and at south end of island. Discuss what these implications are.

B. Discuss other sources of contaminants in sediments near Gould Island.

C. Discuss where island - related contaminants should be sought in sediment (Map).

D. Discuss development of Risk Assessment and PRGs

* Times stated are targets, resolution on the issues described is more important than adhering to time slots

Attendees
4/8/04 NAVSTA SEDIMENT MEETING

Name	Representing	Phone
Steve Parker	T+NW	978-658-7899
Amanda Cerise	NAVSTA	401-841-6375
Bart Hoskins	EPA	617-918-8375
Kymberlie Keckler	USCOE	617.918.1385
Mike Montgomery	NRL	202-404-6419
DAVID C SMITH	URI	401-874-6172
Lisa Yeutter	EFANE	610 595 0567 x17
DAVE BARCLIFT	EFANE	610-595-0567 x183
[illegible]	RIDEM	401-222-2797 x714
CURT FRYE	EFANE	610-595-0567 X142
TODD BOBER	EFANE	610-595-0567 x160
Jennifer Stump (via phone)	Gannett Fleming	
Ken Finkelstein		

US NAVAL RESEARCH LABORATORY

Intrinsic PAH Bioremediation of in Narragansett Bay & Coaster's Harbor Sediments

Michael T. Montgomery, Ph.D., Thomas J. Boyd, Ph.D.,

Christopher L. Osburn, Ph.D.

U.S. Naval Research Laboratory, Washington, DC

David C. Smith

Grad. School of Oceanogr., Univ. Rhode Island, Narragansett, RI

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Collaborators

Naval Research Laboratory
Barry J. Spargo, Ph.D.
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University of Delaware
David L. Kirchman, Ph.D.

University of Tennessee
Dawn M. Castle, Ph.D.

Medical Univ. South Carolina
Pamela Morris, Ph.D.

Univ. Hawaii
Qing Li, Ph.D.

University of Rhode Island
David C. Smith, Ph.D.

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Patricia Sobecky, Ph.D.

Rutgers University
Lee Kerkhof, Ph.D.

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James G. Mueller, Ph.D.

University of South Carolina.
Marjorie Aelion, Ph.D.

University of South Carolina.
Hans Paerl, Ph.D.

Office of Naval Research
Linda Chrisey, Ph.D.

This work was funded by Office of Naval Research, Naval Research Laboratory, EPA, NAVFAC, NAVSEA & NOAA.

Background

• Evaluated primarily by quality & # of research papers
• Compete internally for salary money as grants and compete externally for research funds from DoD, EPA, DOE & NOAA

• Where possible try to couple our research interests in contaminant degradation & transport to provide low or no cost info that can form the basis of scientifically defensible watershed management decisions.

• If we can translate the info over to regulators & RPMs, then there is a greater likelihood that our work will be used in the field (tech transfer).

• As research funding becomes more applied, those scientists that can demonstrate an ability to address real world problems & can communicate their work to those in other disciplines, have a selective advantage in competing for research $.

• In return for providing low cost site & tech support, we generally ask for wide access to study site and background info. Also ask to directly interact with regulators & stakeholders to address concerns & explain methods and find out what types of analyses would be more useful and important in the future.

Current Contaminant Source & Degradation Projects

- EPA Region 3, Hazelton gasoline spill site (RPM Steve Jarvela):
  Used $^{13}C::^{12}C$ to delineate spills from 5 PRPs
  Measured intrinsic BTEX attenuation rates

- NAVSEA, Oil spill identification (POC Dave Olsen):
  Used $^{13}C::^{12}C$ to differentiate which vessel is source of oil spill
  Developed software for use by Navy line personnel for source ID

- NOAA, PAH transport & degradation (POC Ed Johnson)
  Compared PAH degradation vs deposition to sediments in St. Lucy Estuary, FL

- NAVFAC EFD LANT, Intrinsic bioremediation of diesel in GW:
  Used $^{14}CO_2$ in vadose zone gas to delineate subsurface areas undergoing intrinsic bioremediation

- SERDP/ONR, Energetics in marine sediments
  Measured TNT biodegradation rates in marine sediments and photodegradation rates in surface waters

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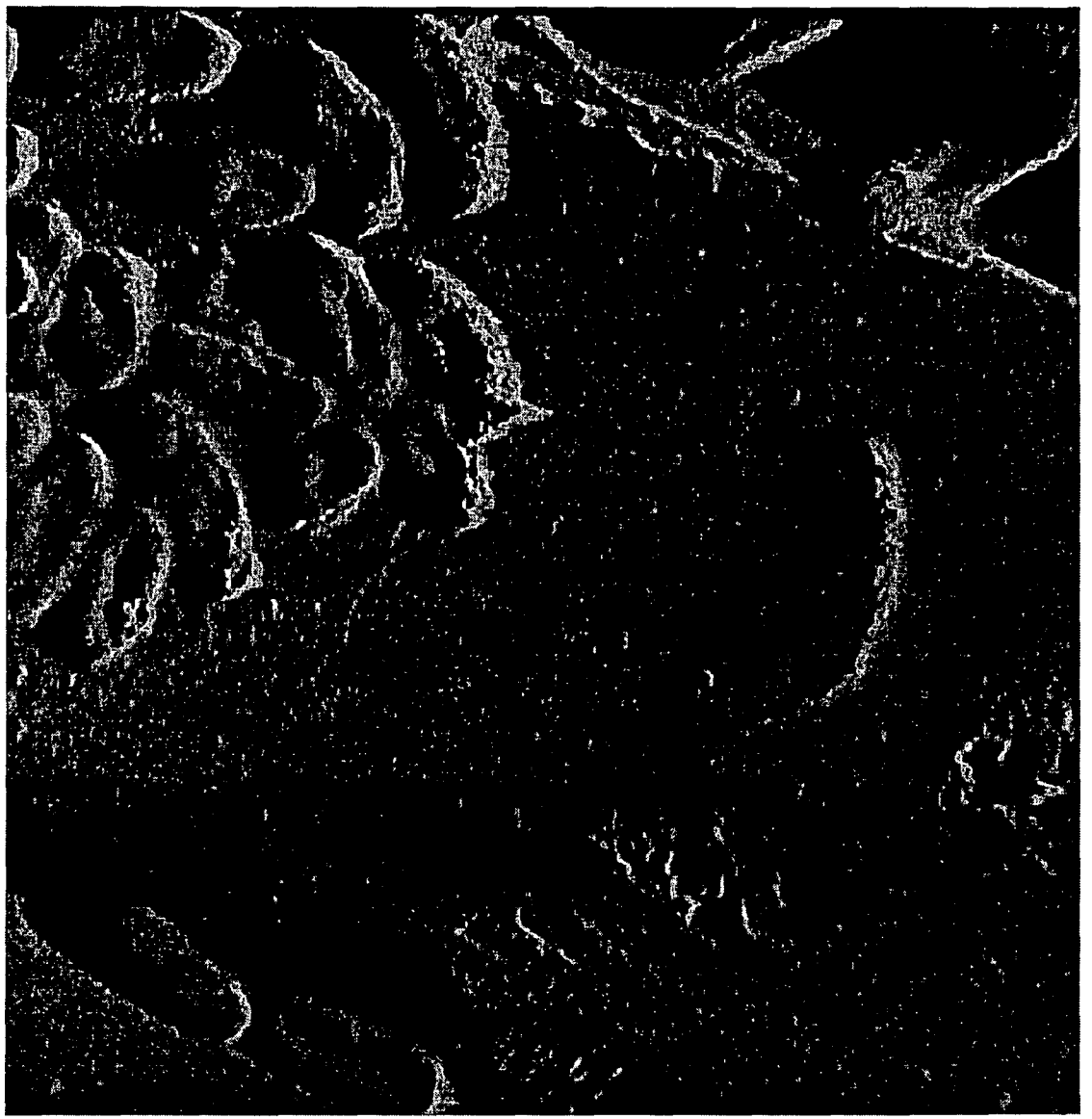
Fluoranthene-degrading bacteria, *Sphingomonas paucimobilis* EPA505, attached to solid fluoranthene crystals.



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Problems with Measuring Intrinsic Bioremediation in Harbor Sediments

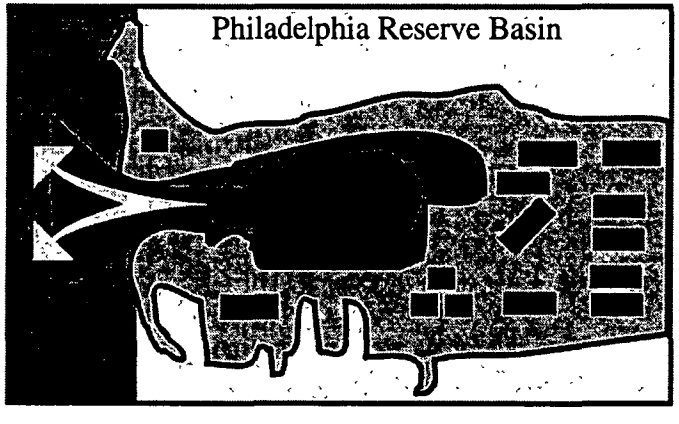
- Engineering models, strategies, and biases are used to study processes dominated by microbial ecology.
- Groundwater models are used to describe riverine and estuarine sites.
- Companies devote few resources to evaluation of intrinsic bioremediation because of cost issues.

Regulators and stakeholders are left to evaluate intrinsic bioremediation using 'messy data sets' of chemical measurements or outdated (1970's) bacteriology methods.

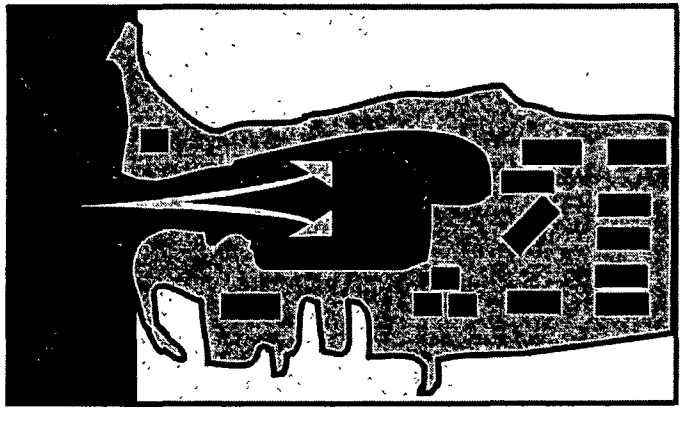
Problem. Source vs. Sink

- Just because you can measure ambient PAH concentrations does not mean you know flux of PAHs to and from the sediments in question.
- Need to determine whether sediments are a contaminant source (historical, episodic event) or sink (biodegradation removing chronic inputs).
- Sediment mismanagement can inadvertently INCREASE risk to the ecosystem health by either not remediating a source or by removing a sink.

Source



Sink



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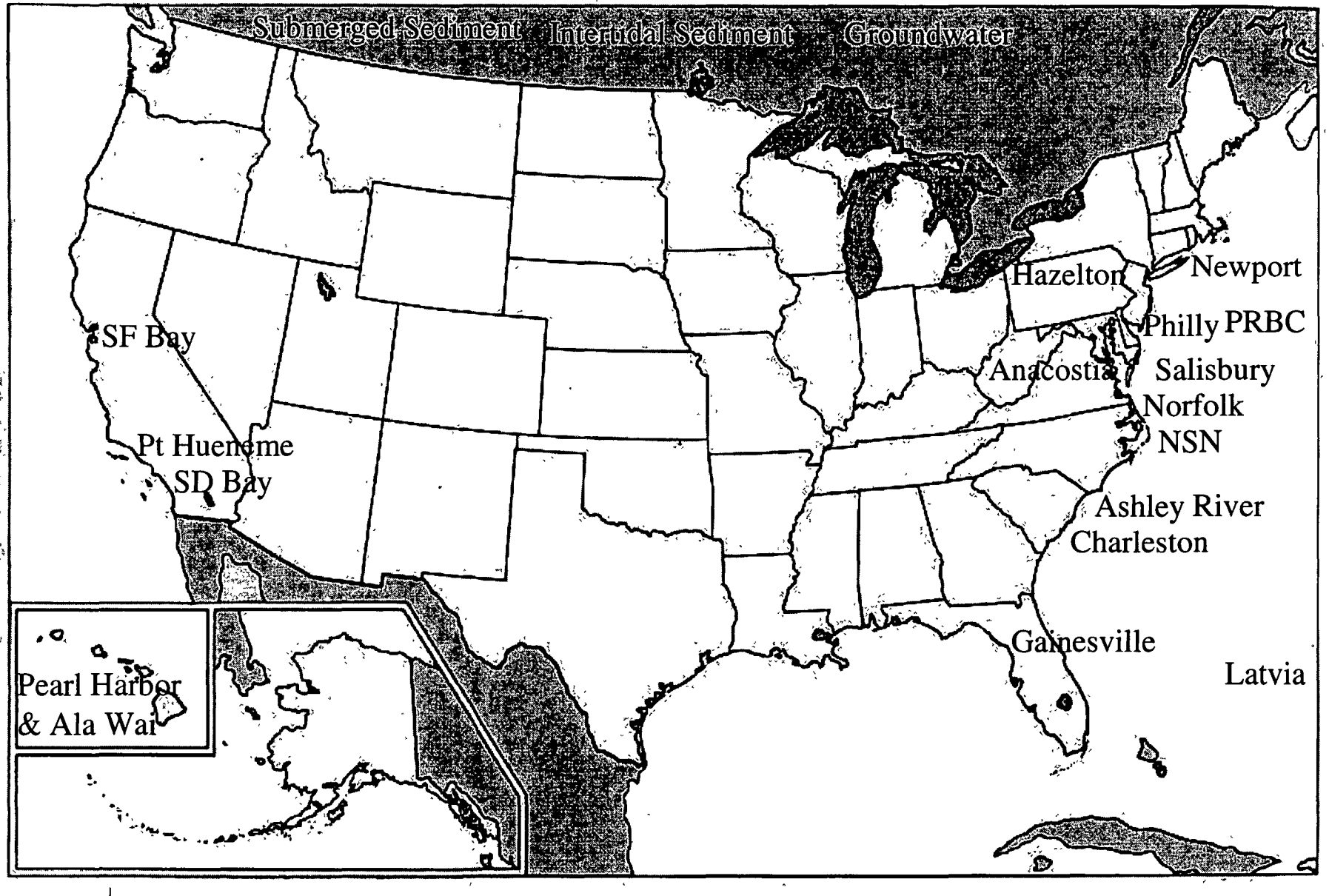
Environmental Sampling Sites 1995-2004



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Field surveys of coastal ecosystems ('97 to present)

Philadelphia (Schuykill & Delaware Rivers, Delaware Bay):

5 cruises, 175 samples

- Anacostia & Potomac Rivers:

4 cruises, 28 samples

- Norfolk (Chesapeake Bay, Elizabeth and James Rivers):

11 cruises, 180 samples

- Charleston Harbor (Cooper, Ashley & Wando Rivers):

12 cruises & 15 intertidal samplings, 440 samples

- San Diego Bay:

4 cruises, 48 samples

- Pearl Harbor & Ala Wai Canal:

6 cruises, 99 samples

- San Francisco Bay:

2 cruise, 39 samples

- Newport:

2 cruises, 26 samples

Total >60 sampling events with >1000 sediment samples.

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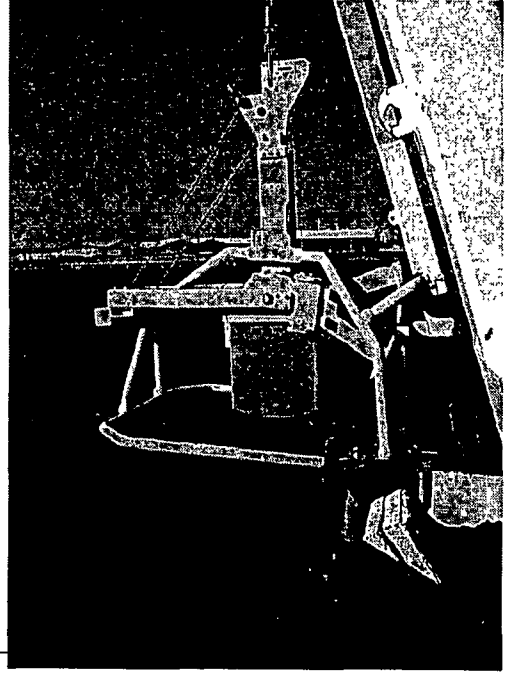
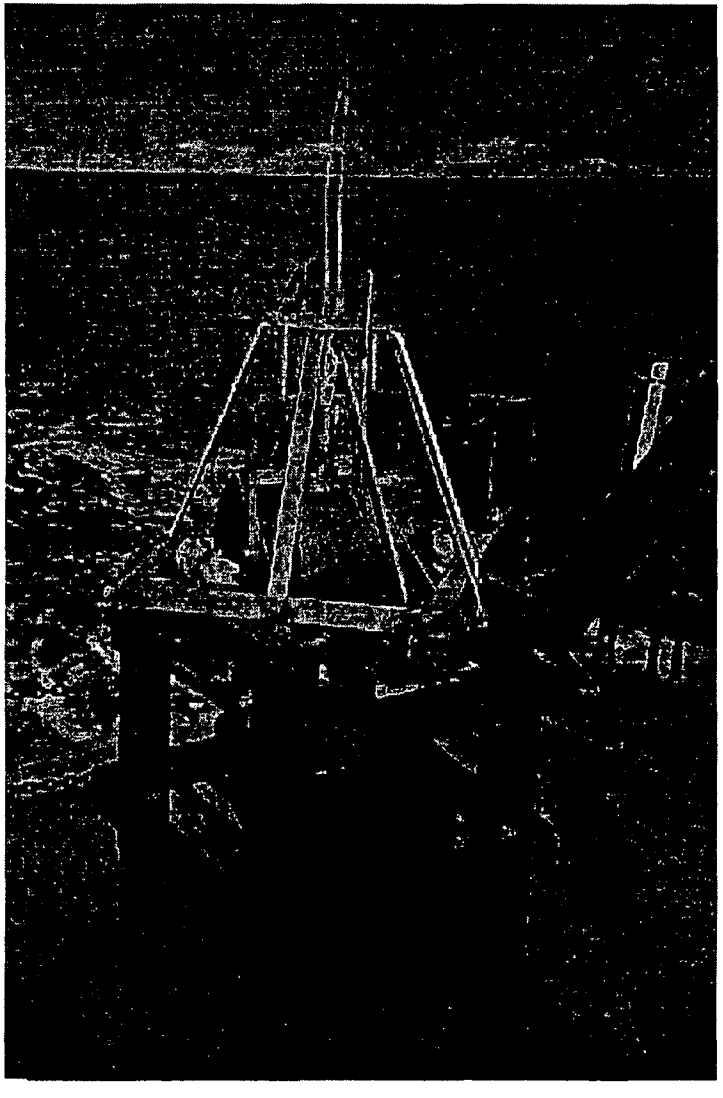
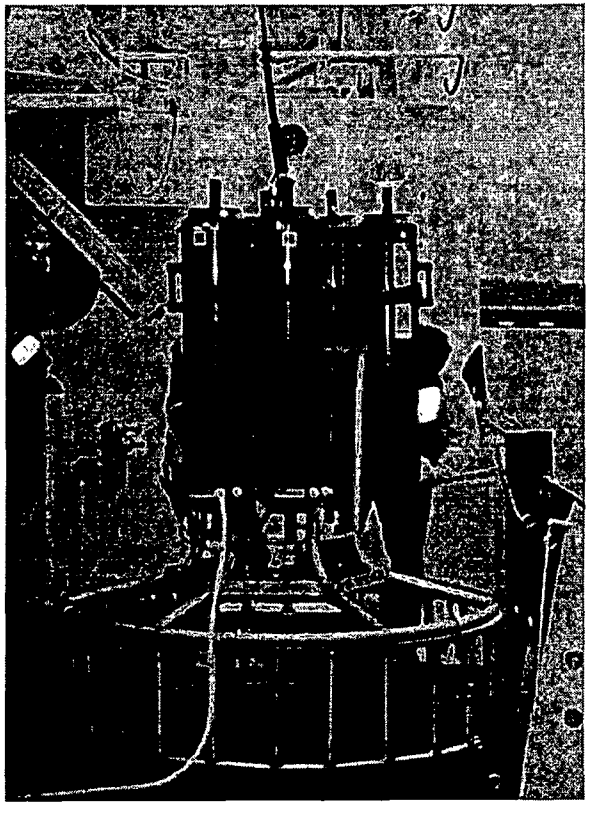
Sediment traps

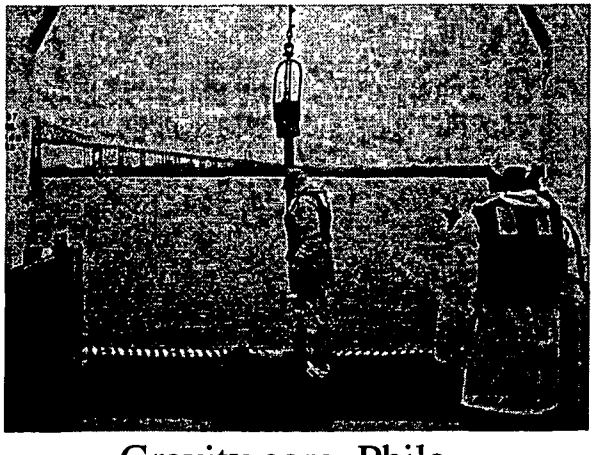




Benthic grab, Norfolk VA

Water sampler (CTD)





Gravity core, Phila.

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Site	Site Conceptual Model	Findings	Contaminant		Ecosystem Qualities				
			Input	Drivers	Part. Load	Organic Load	Climate	Tidal Flow	DO
Charleston, SC	Historical inputs, surface runoff, and outfalls contaminate adjacent sediments which impact ecosystems up/down river.	Organic inputs identified upriver using production and mineralization assays. Surface sediments identical to particles depositing from upriver with much less impact downriver (sed traps). Cooper River widens resulting in deposition from pulp mill. Rapid PAH turnover year round in Navy Yard sediments (=sink).	PAH, metals	PAH, metals	H 3~10 mg/L low cont.	H	Humid Sub-tropical 12~32 °C	H ~7 ft.	M
Philadelphia	Historical inputs, surface runoff, and outfalls contaminate adjacent sediments.	PAH/organics from nearby refineries are brought into Reserve Basin with tide; exported particles have less PAH. Difference in PAH concn accounted for by intrinsic in surface sediments. RB is sink for PAH along the Schuykill River. Industrial input for petroleum identified by organotolerance assay.	PAH, metals, TPH	PAH, metals, TPH	H 2~10 mg/L high cont.	M 180~300 µM DOC	Humid Contin-ental 5~25°C	H ~7 ft.	~30% in warm months
Washington	Historical inputs, surface runoff, and outfalls contaminate adjacent sediments.	Widening of Anacostia slows flow and causes deposition from upriver; active PAH degradation; possible untreated sewage input.	PAH, PCB, metals	PCB, PAH, metals	H w/ high cont.	H 200-1200 µM DOC	Humid Sub-tropical 5~29°C	L ~3 ft.	<10% in warm months
Norfolk, VA	Petroleum-impacted groundwater seeps through bulkhead near piers and into Elizabeth River.	Bacterial assemblages in the groundwater and Pier 5 sediments have very high PAH (esp. phenan-threne degradation rates. Second only to Pearl Harbor. Tidal action enhances intrinsic biodegra-dation in source area by 2 orders of magnitude.	PAHs, TPH	PAHs, TPH	M 3-10 mg/L cont.?	H 200~800 µM DOC	Humid Sub-tropical 9~25°C	M ~4 ft.	~40% in warm months
San Diego, CA	Surface runoff from rain events and municipal outfall at headwaters of Poleta Creek impact sediments.	Did not find organotolerant assemblages characteristic of chronic organic input (Nov 99). Transit nature of PAH hot spots in ONR sampling and other findings suggests high intrinsic capacity in some areas.	PAH, Pest., metals	Pest., metals	L 1~2 mg/L low cont.	L Episod. 100~150 µM DOC	Sub-tropical Dry	M ~5 ft.	~80% in warm months
Pearl Harbor, HI	Current and historical input from refueling facility at Bishop's Point.	Highest PAH concentrations of all harbors investigated. PAH mineralization rates two orders of magnitude higher than seen in any other system.	PAH		L N.D.	L N.D.	Tropical	L ~2 ft.	M

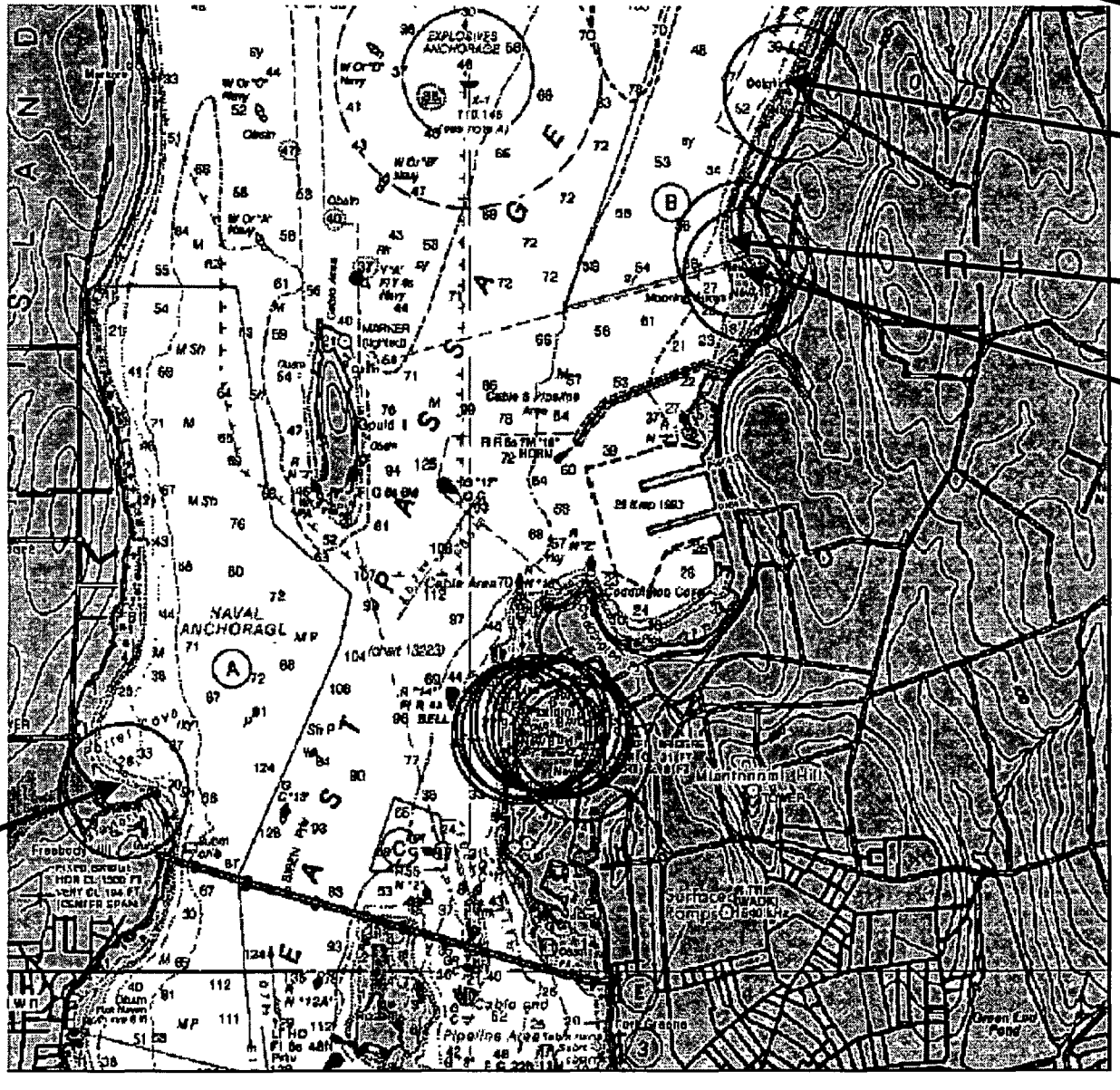
Bacterial Metabolism (Production)

- Measure heterotrophic production by converting rate of ^{3}H-Leucine incorporation into protein into μg C produced kg^{-1} d^{-1}.
- Rapid (1 h incubations), sensitive field assay for how fast bacterial assemblage is growing.

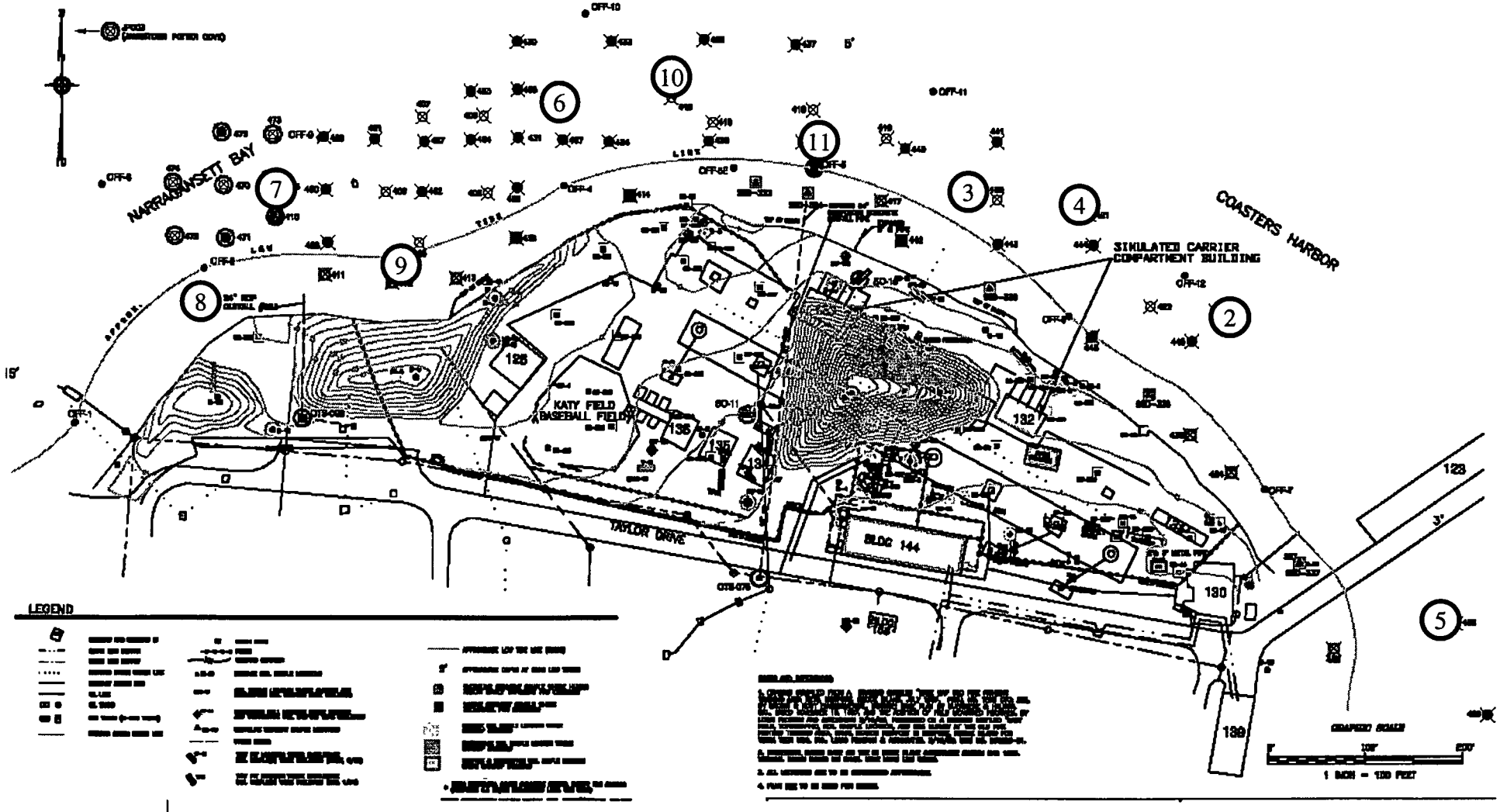
PAH Mineralization (Degradation)

- Use tracer additions (<10% of ambient) mineralization of ^{14}C-naphthalene, -phenanthrene, and -fluoranthene to $^{14}CO_2$ to estimate instantaneous degradation rates.
- Rapid (24 h incubations), sensitive field assay using 1 g slurries of surface sediment.

US NAVAL RESEARCH LABORATORY



US NAVAL RESEARCH LABORATORY



US NAVAL RESEARCH LABORATORY

NRL First Sampling (July 2002) – PAH Concentrations

Date	Station				Total PAH (ppm)	LMW	HMW
	NRL	TT	Latitude (41° N)	Longitude (71° W)			
25-Jul-02	1	SD-JPC03	30.64744	21.7280	0.2	0.2	0.0
25-Jul-02	2	SD-423	30.85180	19.50881	3.2	1.6	1.5
25-Jul-02	3	SD-419	30.87775	19.57174	2.0	1.2	0.8
25-Jul-02	4	SD-421	30.87236	19.53866	0.3	0.2	0.1
25-Jul-02	5	SD-468	30.78719	19.4491	0.6	0.4	0.3
25-Jul-02	6	SD-467	30.89490	19.67683	0.1	0.0	0.1
25-Jul-02	7	SD-476	30.87485	19.74752	0.2	0.2	0.0
25-Jul-02	8	OFF-2	30.85039	19.76956	0.1	0.1	0.0
25-Jul-02	9	SD-412	30.86114	19.72027	0.1	0.1	0.0
25-Jul-02	10	SD-415	30.89734	19.64829	0.1	0.1	0.0
25-Jul-02	11	OFF-5	30.89048	19.60288	0.2	0.1	0.1
25-Jul-02	12	Landfill	32.54721	18.62169	0.3	0.3	0.0
25-Jul-02	13	Landfill	32.64068	18.66195	0.1	0.0	0.0
25-Jul-02	14	Creek	33.22345	18.41382	0.0	0.0	0.0
25-Jul-02	15	Boat launch	34.47007	17.31049	1.1	0.4	0.7

NRL First Sampling (July 2002) – Comparison with other estuaries

Estuary	Total PAH (ppm)					
	Low	Median	Average	High	Samples	Sampling Events
Narragansett Bay	0.1	0.4	1.4	10	28	2[1]
San Diego Bay	0.1	1.0	2.1	11	44	3
Charleston Harbor	0.0	3.5	6.6	58	187	12
Delaware & Schuylkill Rivers	0.4	15.2	16.8	89	169	5
Lower Chesapeake & Elizabeth River	0.0	6.4	35.6	636	58	6

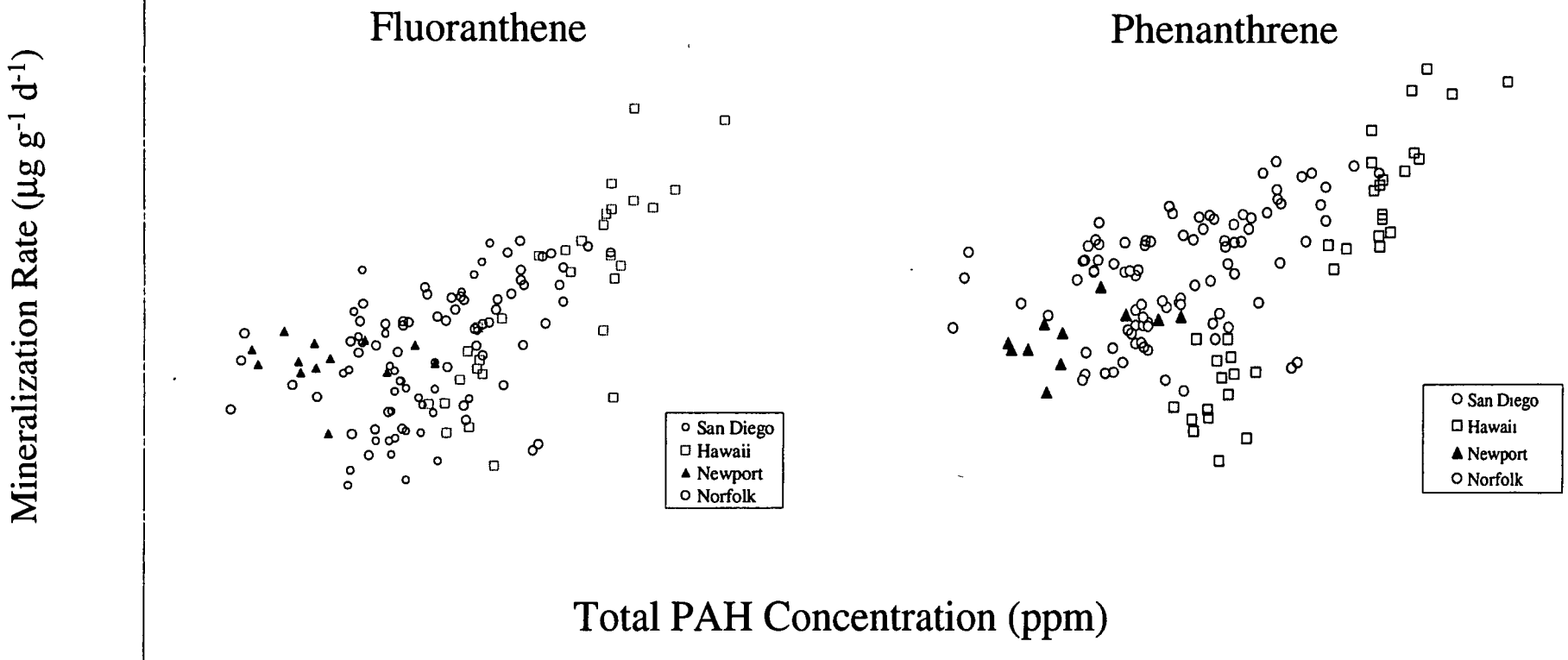
[1] One sampling by NRL and one by Tetratech.

US NAVAL RESEARCH LABORATORY

NRL First Sampling (July 2002) – PAH Mineralization

Station	Mineralization Rate (μg g^{-1} d^{-1})							
	Naphthalene		Phenanthrene		Fluoranthene		Catechol	
	AVG	SD	AVG	SD	AVG	SD	AVG	SD
1	1.28E-04	3.83E-05	0.00E+00		7.93E-04	8.22E-04	8.56E-03	4.07E-04
2	1.85E-03	4.22E-04	3.69E-04	2.19E-04	1.08E-03	1.53E-04	1.13E-02	2.78E-03
3	6.56E-04	1.15E-03	3.40E-04	3.24E-04	1.89E-03	1.17E-03	1.45E-02	9.44E-03
4	5.87E-04	2.17E-04	8.71E-05	2.43E-04	1.23E-04	9.53E-05	1.31E-02	2.72E-03
5	2.20E-03	5.59E-04	9.18E-04	2.17E-03	2.21E-03	7.48E-04	1.76E-02	1.51E-02
6	1.08E-03	8.96E-04	1.34E-04	3.87E-04	2.87E-03	1.98E-03	1.46E-02	1.90E-03
7	3.69E-04	1.06E-04	3.51E-05	2.29E-05	9.21E-04	7.59E-04	5.05E-03	1.73E-03
8	1.63E-03	3.98E-04	1.36E-04	7.82E-05	1.13E-03	1.13E-03	9.89E-03	7.23E-03
9	4.63E-04	2.72E-04	0.00E+00		1.04E-03	1.30E-03	4.68E-03	3.18E-03
10	1.89E-03	1.00E-03	1.62E-04	2.25E-04	0.00E+00		0.00E+00	
11	4.80E-03	9.56E-04	2.95E-04	2.26E-04	1.97E-03	1.39E-03	7.49E-03	6.56E-03
12	1.54E-03	3.34E-04	2.21E-04	2.17E-04	1.25E-03	1.65E-03	1.78E-02	6.71E-03
13	4.36E-04	4.13E-04	0.00E+00		1.61E-03	6.01E-04	2.75E-03	5.91E-03
14	2.31E-03	1.58E-04	5.86E-04	3.53E-04	0.00E+00		2.41E-02	8.80E-03
15	2.68E-03	1.28E-03	3.87E-04	1.14E-04	8.33E-04	1.75E-03	1.71E-02	3.70E-03

PAH mineralization rates increased with PAH concentration in 4 recently studied estuaries but were generally most rapid above 10 ppm.



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NRL First Sampling (July 2002) – PAH Turnover Time

Station	PAH Turnover Time (days)			
	Naphthalene	Phenanthrene	Fluoranthene	Catechol
1	ND	ND	5	ND
2	ND	756	412	ND
3	ND	387	140	ND
4	ND	234	412	ND
5	ND	55	64	ND
6	ND	80	5	ND
7	ND	533	41	ND
8	ND	185	34	ND
9	ND	ND	21	ND
10	ND	61	ND	ND
11	ND	90	21	ND
12	ND	192	45	ND
13	ND	ND	6	ND
14	ND	5	ND	ND
15	ND	122	122	ND

US NAVAL RESEARCH LABORATORY

NRL First Sampling (July 2002) Bacterial Production ($\mu g\ kg^{-1}\ d^{-1}$)

Station		Sample Type	Bacterial Production	
NRL	TT		AVG	SD
1	SD-JPC03	sediment	19.6	5.2
2	SD-423	sediment	12.9	2.0
3	SD-419	sediment	12.7	2.1
4	SD-421	sediment	4.9	0.4
5	SD-468	sediment	34.2	3.2
6	SD-467	sediment	17.3	0.5
7	SD-476	sediment	3.2	0.4
8	OFF-2	sediment	9.1	0.6
9	SD-412	sediment	4.1	0.2
10	SD-415	sediment	27.8	17.7
11	OFF-5	sediment	26.6	3.6
12	Landfill	sediment	14.6	4.5
13	Landfill	sediment	6.4	0.8
14	Creek	sediment	17.6	4.4
15	Boat launch	sediment	17.3	4.2
1	SD-JPC03	water	11.1	0.3
3	SD-419	water	11.1	2.0
6	SD-467	water	13.7	1.6
13	Landfill	water	8.1	0.7
14	Creek	water	12.9	1.0
15	Boat launch	water	12.5	3.7

NRL Second Sampling (October 2002) – PAH Concentrations Ranged from 0.08 – 1.33 ppm

Tetratech	NRL	Total PAH (ppm)
OFF-3	1	0.96
OFF-2	2	0.24
SSD-337	3	0.98
424	4	1.33
444	5	0.41
417	6	0.15
434	7	0.08
462	8	0.11
Reference	9	0.03
MacAllister	10	0.08
dock	11	0.22

NRL Second Sampling (October 2002) – PAH Degradation

Station	Mineralization Rate (μg g^{-1} d^{-1})					
	Naphthalene		Phenanthrene		Fluoranthene	
	AVG	SD	AVG	SD	AVG	SD
1	1.09E-05	7.76E-05			2.11E-04	7.26E-04
2			3.50E-03	7.98E-03	1.94E-05	3.36E-05
3	4.67E-04	2.41E-04	2.91E-03	3.24E-03		
4	1.79E-05	6.11E-05				
6	9.67E-04	2.35E-04	3.98E-03	2.55E-03	1.89E-03	2.13E-03
7			5.09E-04	1.11E-02		
8	8.52E-05	1.29E-04				
9	1.38E-04	4.36E-05				
10	3.26E-04	2.20E-04	3.75E-03	1.02E-03		

NRL Second Sampling (October 2002) – PAH Turnover Times

Station	PAH Turnover Time (days)	
	Phenanthrene	Fluoranthene
1		939
2	11	3257
3	62	
4		
6	9	18
7	18	
8		
9		
10	4	

NRL Second Sampling (October 2002) – Bacterial Production

Station	Sample Type	Bacterial Production ($\mu g\ C\ kg^{-1}\ d^{-1}$)	
		AVG	SD
1	sediment	7.9	2.3
2	sediment	6.7	1.0
3	sediment	20.3	7.5
4	sediment	10.0	3.9
5	sediment	8.7	1.3
6	sediment	11.8	0.9
7	sediment	5.8	1.7
8	sediment	9.7	5.4
9	sediment	9.9	1.5
10	sediment	4.5	0.0
11	sediment	12.4	1.9

Summary

- Ambient PAH concentration was low (< 12 ppm) for three samplings in '02 compared to 6-132 ppm in '94 (Battelle), 47 ppm in '97 (Brown & Root), and to >4 ppm (7 stations), >44 ppm (4 stations) and >132 ppm (1 station) in '98 (Quinn et al, URI).

- PAH mineralization rates were consistent with those found in other estuarine sediment sites with low PAH concentration and flux

- PAH turnover was rapid enough to metabolize current PAH flux through sediment in days to months to two years. This is consistent with the attenuation of ambient PAH concn at the site since '94.

- Bacterial production was within the range typically found for sediments in urbanized estuaries

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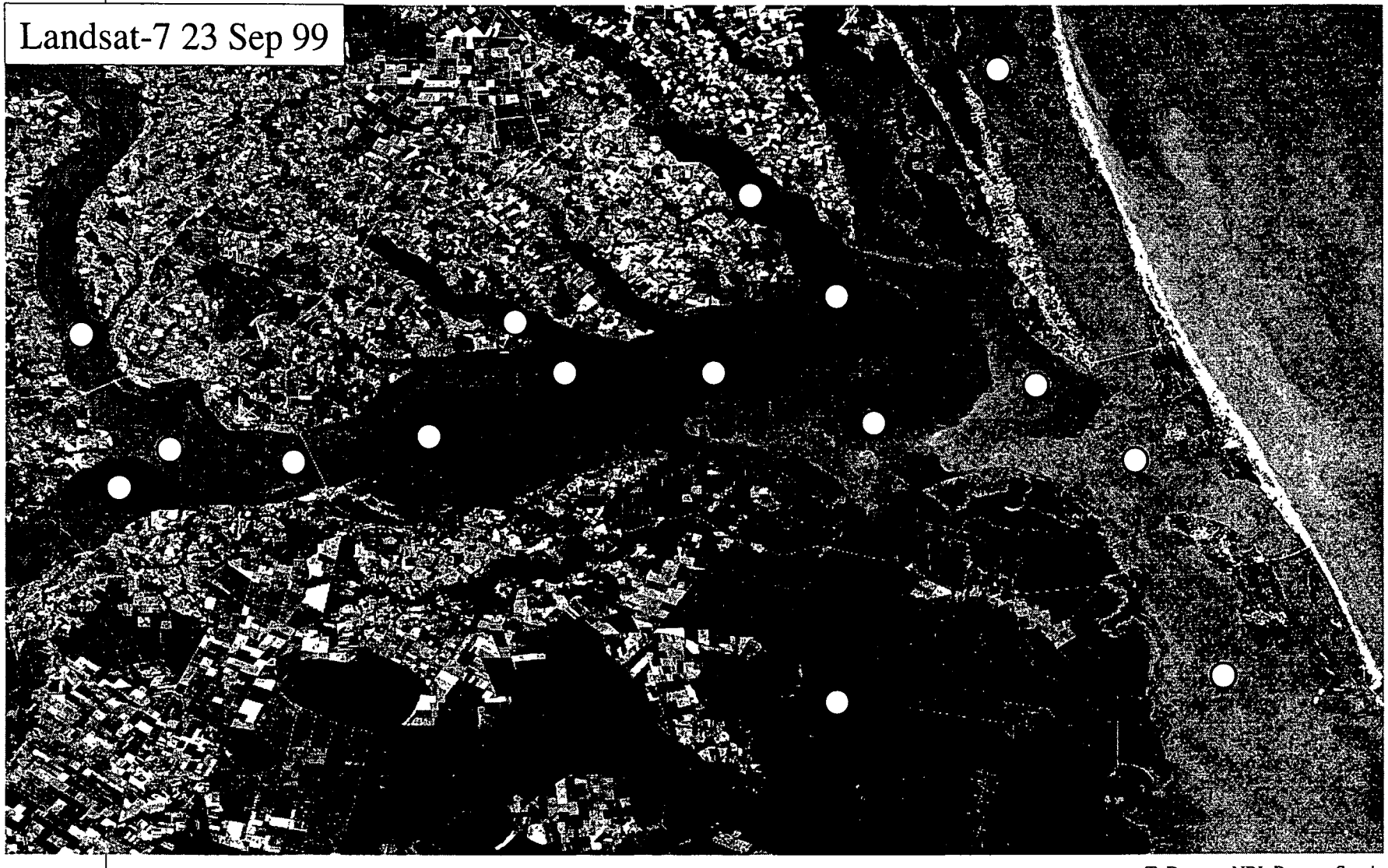
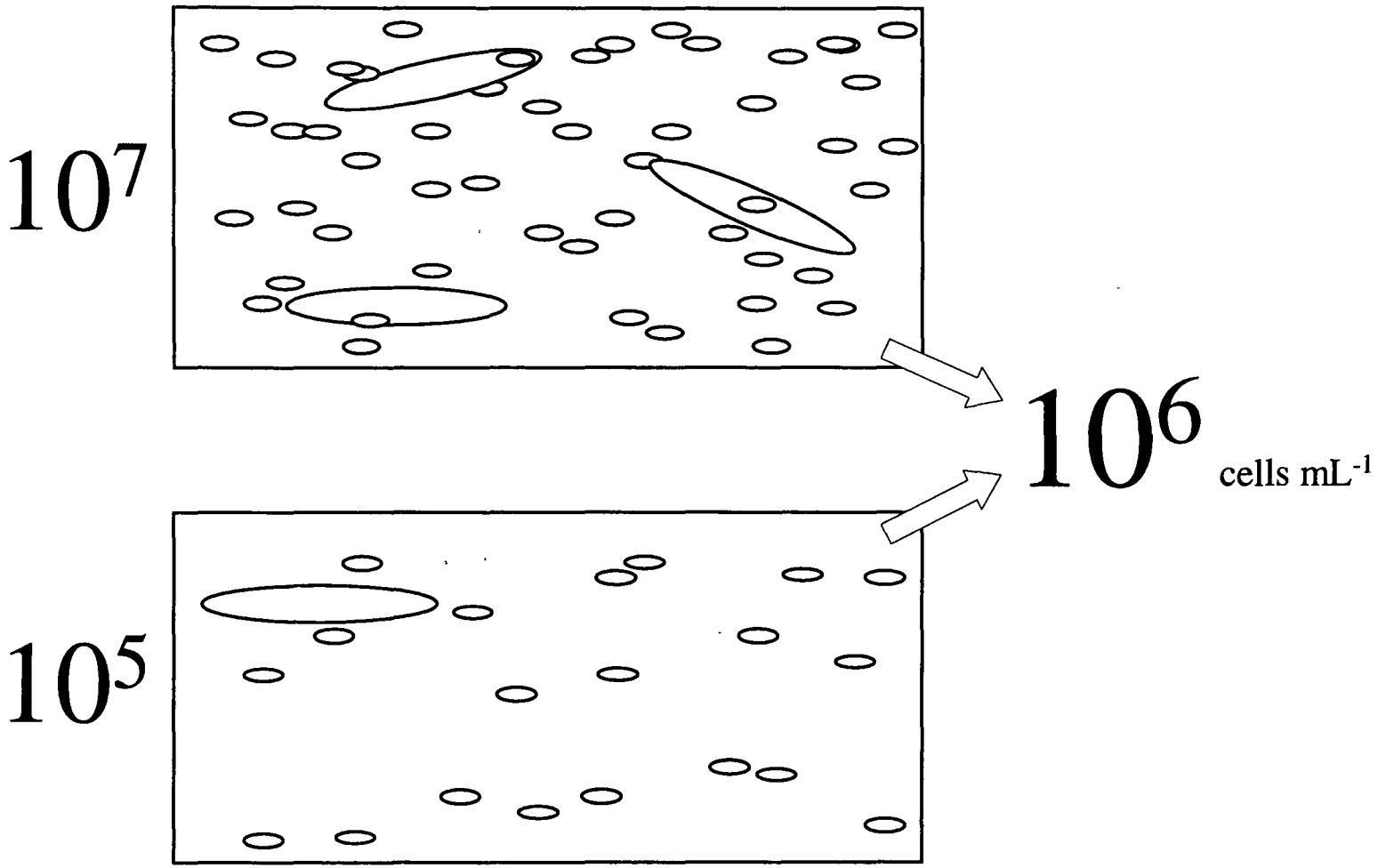
Estuaries are dynamic and complex

- Impacts biology & chemistry of the surface sediment



T. Donato, NRL Remote Sensing

Protozoan grazers EFFECTIVELY reduce bacterial abundance.



Protozoan grazers are INEFFECTIVE at reducing bacterial abundance.

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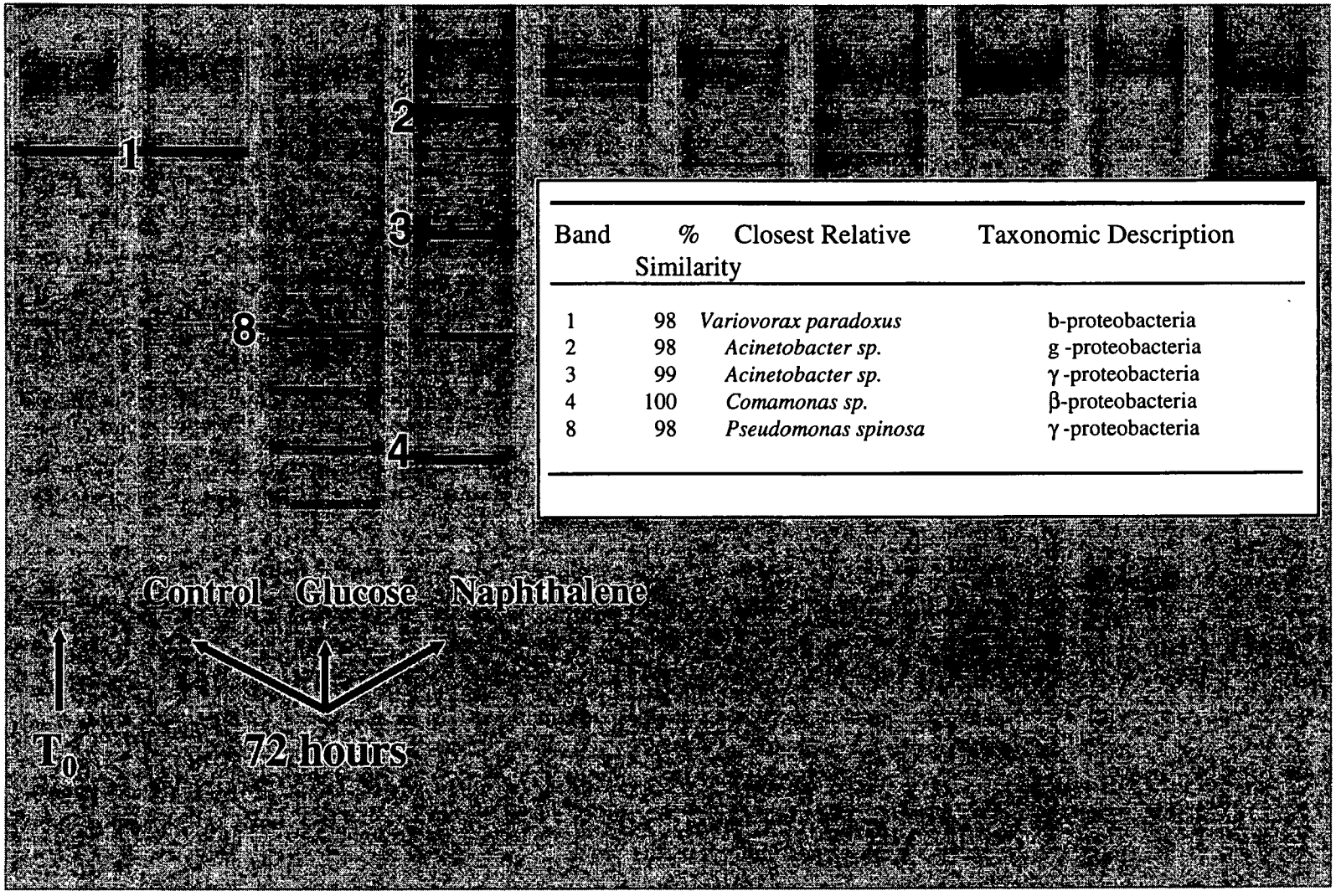
Within 72 h of naphthalene addition, the assemblage changed.



Band	% Similarity	Closest Relative	Taxonomic Description
1	98	*Variovorax paradoxus*	b-proteobacteria
2	98	*Acinetobacter sp.*	g -proteobacteria
3	99	*Acinetobacter sp.*	γ -proteobacteria
4	100	*Comamonas sp.*	β-proteobacteria
8	98	*Pseudomonas spinosa*	γ -proteobacteria

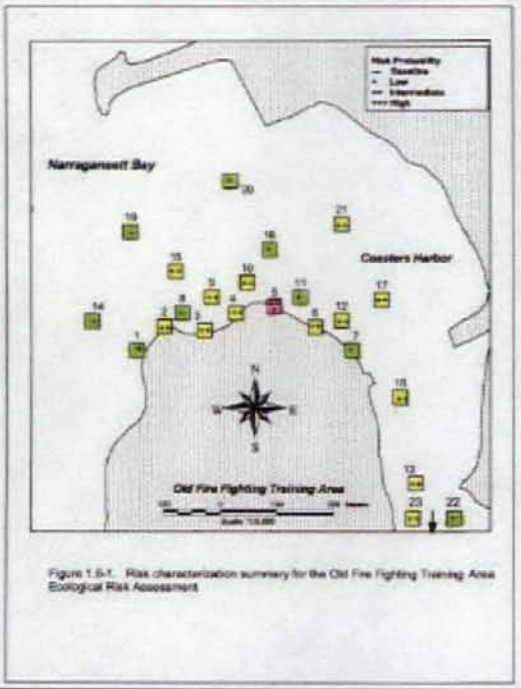
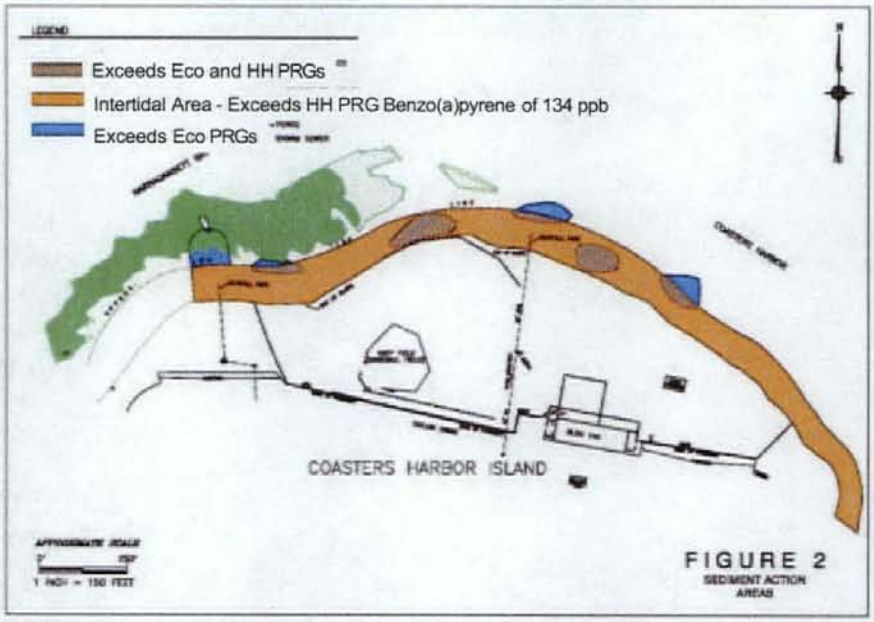


Figure 1.5-1. Risk characterization summary for the Old Fire Fighting Training Area Ecological Risk Assessment

- Risk summary
  - **Green – Low probability of risk**
  - **Yellow – Intermediate probability of risk**
  - **Pink – High probability of risk**
  - **Definitions**
  - **DBA – Dibenzo(a,h)anthracene**
  - **IND – Indeno(1,2,3-cd)pyrene**
  - **2MN – 2-Methylnaphthalene**

OFFTA
Intertidal Zone

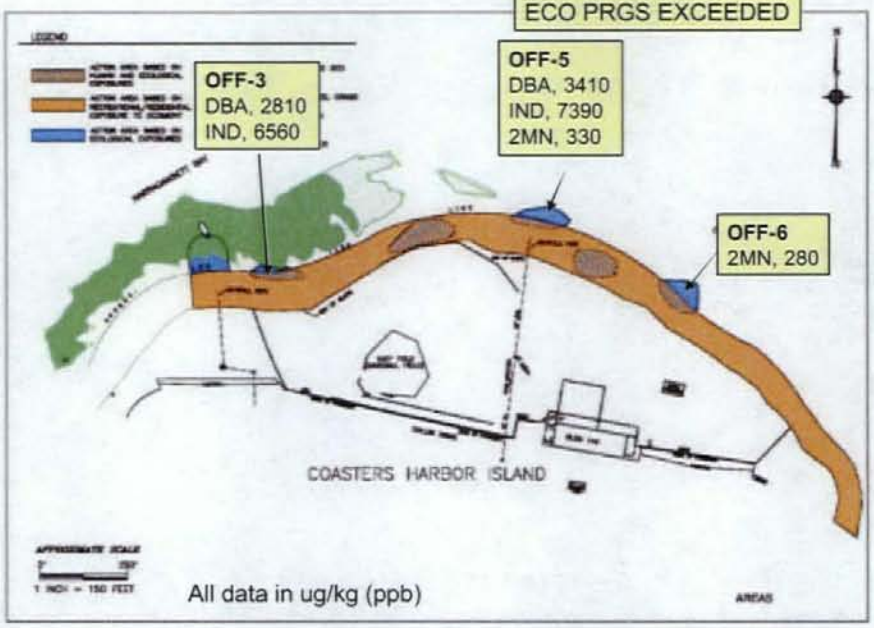


Feasibility Study
Remedial Action Objectives - Sediment

- **Human exposure driver is benzo(a)pyrene at 0.134 mg/kg.**
  - **Based on residential exposure ingestion rate of 100 g/day child and 50 g/day adult for 240 d/yr, 30 yrs**
  - **Region IX PRG for soil B(a)P = 0.062**
  - **RIDEM Residential DEC = 0.4**
  - **Too low to be considered actionable**
- **Eco drivers are 2-methylnaphthalene (0.185 mg/kg and acenaphthalene (0.697 mg/kg).**

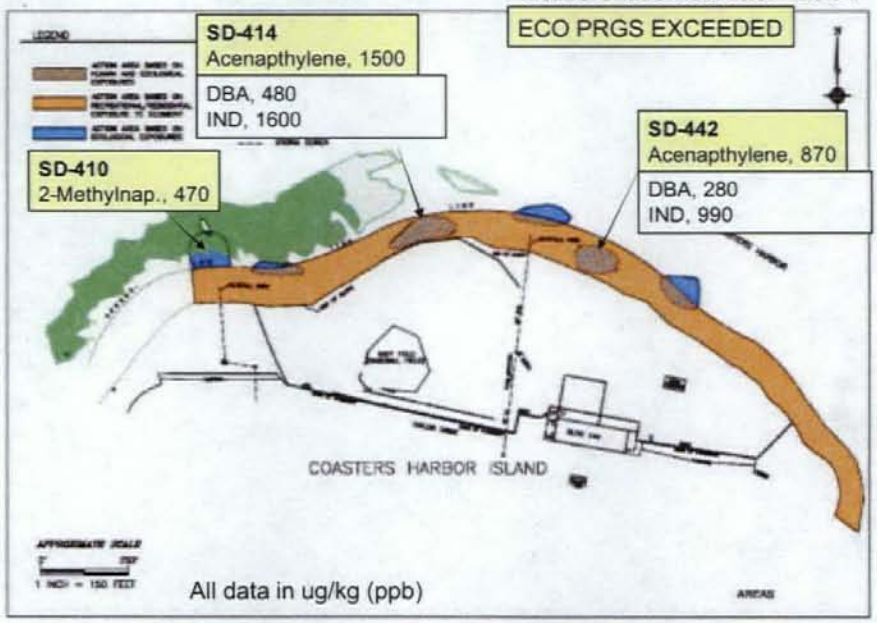
URI/SAIC April 1998

ECO PRGS EXCEEDED



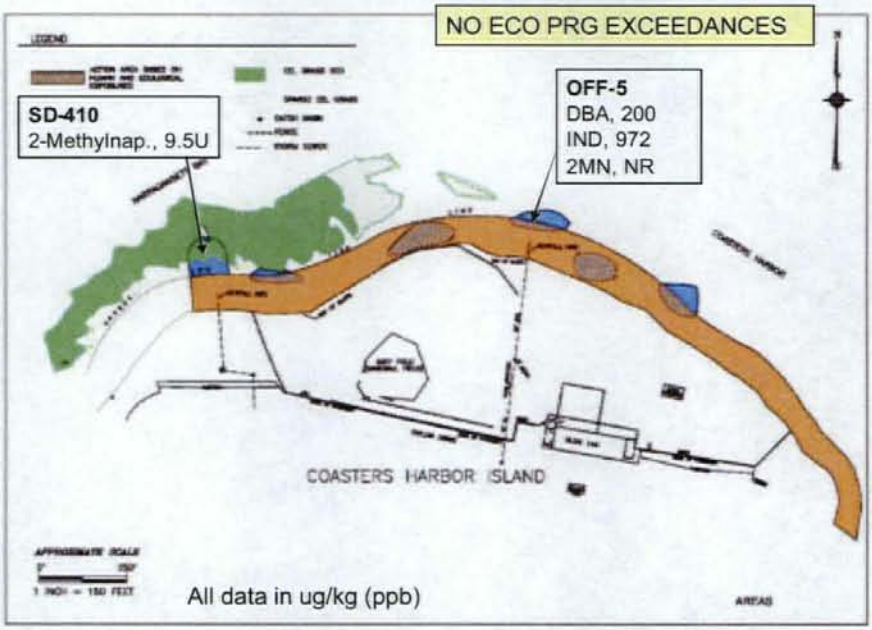
TtNUS November 2001

ECO PRGS EXCEEDED



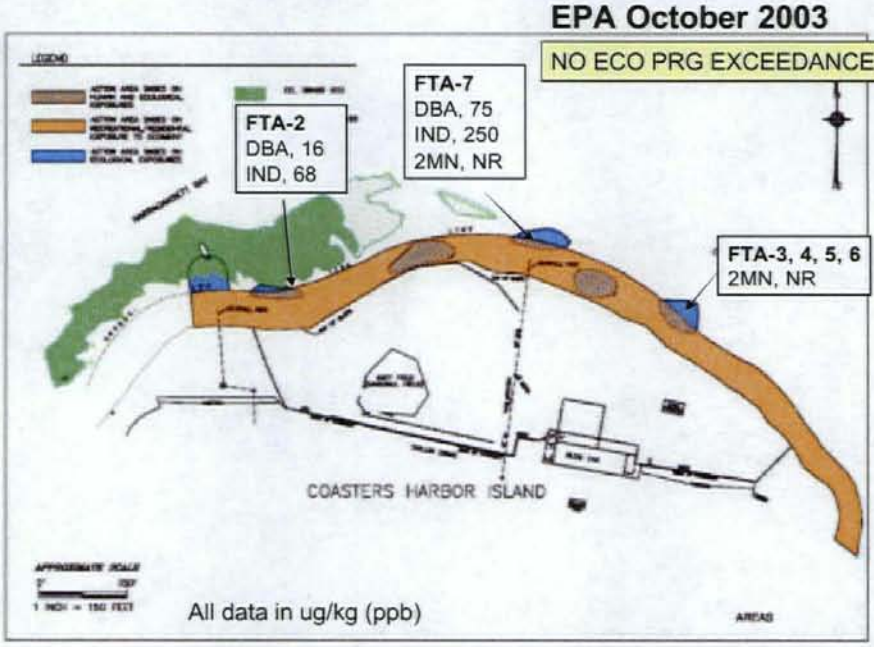
Battelle, TtNUS July 2002

NO ECO PRG EXCEEDANCES



EPA October 2003

NO ECO PRG EXCEEDANCES



Phase 2 Predesign
Sediment Forensic Analysis 2002

- **Soil at site contained weathered oil and heavy molecular weight hydrocarbons**
- **Parking lot drains contained PAHs typical of urban runoff**
- **Marine sediment at the shoreline matched that of the urban runoff**

Summary

- Data indicates sediment PAHs are not all site related.
- Human health PRGs are too conservative to be considered actionable.
- PAH concentrations in marine sediment are decreasing over time.

LFA PT. NO.	TETRA TECH I.D.	NORTHING	EASTING	ORIGINAL GRADE
2000	SB-421	156808.8	547238.1	10.8
2001	SB-420	156797.8	547156.9	10.0
2002	SB-419	156842.2	547045.4	8.4
2003	SB-408	156940.5	547056.3	8.0
2004	SB-409	156924.9	547155.3	9.1
2005	SB-410	156914.9	547253.2	9.4
2006	SB-402	157010.9	547266.9	8.4
2007	SB-432	156869.9	547196.4	9.8
2008	SB-401	157023.8	547170.7	7.9
2009	SB-400	157035.5	547083.5	7.3
2010	SB-428	157054.9	547304.0	8.0
2011	SB-403	156996.3	547367.7	9.4
2012	SB-429	157023.5	547385.1	8.6
2013	SB-404	156982.7	547465.7	8.9
2014	SB-430	156918.5	547570.9	9.8
2016	SB-427	157072.7	547203.9	8.3
2162	SB-415	156885.5	546668.1	13.3
2167	SB-416	156875.4	546740.5	11.5
2232	SB-426	156745.3	547737.1	11.5
2233	SB-425	156763.1	547633.3	12.1
2234	SB-424	156787.1	547568.9	12.0
2235	SB-413	156872.0	547552.2	10.6
2238	SB-412	156893.2	547454.9	24.5
2239	SB-411	156901.8	547375.0	31.0
2240	SB-434	156815.2	547484.7	11.5
2245	SB-423	156786.8	547428.2	11.9
2247	SB-422	156807.2	547325.4	11.8
2248	SB-414	156855.1	547647.6	10.7
2249	SB-431	156809.4	547712.1	11.1
2277	SB-433	156900.7	546881.8	17.3
2278	SB-406	156951.9	546862.3	11.4
2279	SB-407	156959.5	546952.7	12.9
2280	SB-418	156871.9	546934.3	10.0
2285	SB-417	156864.9	546846.1	8.5
2292	SB-405	156961.0	546759.8	7.0

42887 SF 1 Acre — INTERTIDAL SEDIMENT

27386 0.6 Ac — SOIL TO BE REMOVED WITH REVETMENT CONSTRUCTION

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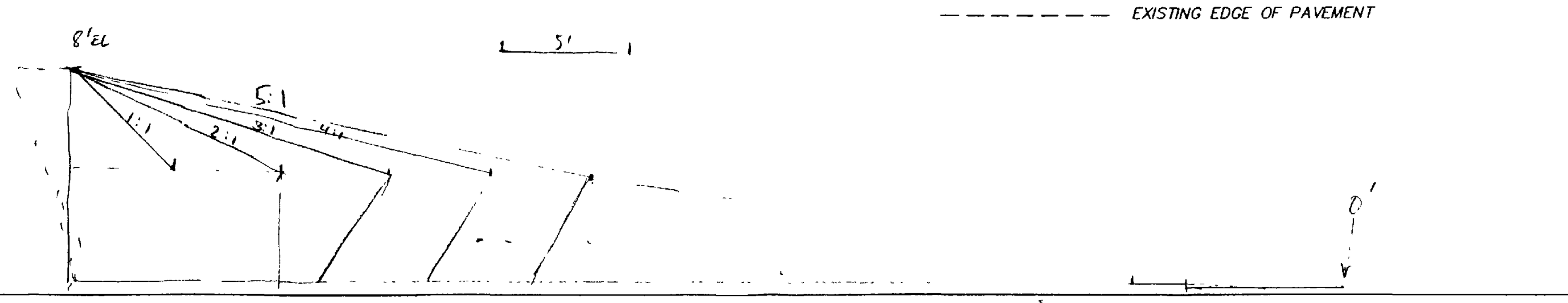
3.76

LEGEND

XX	EXISTING CONTOUR
XXX.Y	SPOT-GRADE
● SB-XXX	SOIL BORINGS
△	EXISTING STAKES AT BASE OF MOUND
— — —	EXISTING BASE OF MOUND
- - - -	EXISTING EDGE OF PAVEMENT



THIS SURVEY AND PLAN CONFORM TO A CLASS III VERTICAL STANDARD AS ADOPTED BY THE RHODE ISLAND BOARD OF REGISTRATION FOR PROFESSIONAL LAND SURVEYORS.

REGISTRATION SEAL VALID ONLY WHEN EMBOSSED

BY: 1/19/04
PLS RI Registration No. 1646

GRAPHIC SCALE 40 0 40

"SITE 09"
2004-TOPOGRAPHIC SURVEY AND SOIL BORING LOCATION
AT THE OLD FIRE FIGHTING TRAINING AREA, NAVAL STATION NEWPORT
IN NEWPORT, RHODE ISLAND
FOR TETRA TECH NUS, INC.

REVISIONS	No.
DRAWN BY:	LFA
CHECKED BY:	RC
APPROVED BY:	LF

PLAN DATE:	1/16/04
SURVEY DATE:	1/2/04
SCALE:	1" = 40'
SHEET:	1 OF 1
DWG. NO.:	19990205-02

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