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TRANSMITTAL LETTER AND ATTACHED COMMENTS REGARDING THE RECORD OF DECISION FOR OPERABLE UNIT 9 (OU 9) SITE 16 NCBC DAVISVILLE RI
01/23/2014
DEPARTMENT OF THE NAVY

CTO 418
19

DEPARTMENT OF THE NAVY
BASE REALIGNMENT AND CLOSURE
PROGRAM MANAGEMENT OFFICE, NORTHEAST
4911 SOUTH BROAD STREET
PHILADELPHIA, PA 19112-1303

5090
Ser BPMOE/14-071
January 23, 2014

Ms. Christine Williams
Mail Code: OSRR07-03
U.S. Environmental Protection Agency, Region I
5 Post Office Square, Suite 100
Boston, MA 02109-3912

Mr. Richard Gottlieb
Office of Waste Management
Rhode Island Department of Environmental Management
235 Promenade Street
Providence, RI 02908-5767

Dear Ms. Williams and Mr. Gottlieb:

The Navy offers the attached Draft Record of Decision (ROD) for Operable Unit 9 (Site 16). The draft ROD is provided in accordance with section 17.3(1) of the NCBC Davisville Federal Facilities Agreement (FFA). Pursuant to section 17.3(2) the Navy anticipates receiving your comments on or before February 24, 2014.

If you have any questions or comments, please contact the undersigned at (617) 753-4656.

Sincerely,

DAVID BARNEY
BRAC Environmental Coordinator
By direction of BRAC PMO

Copy to:
J. Dale, NAVFAC Midlant
L. A. Sinagoga, TtNUS Project Manager
G. Wagner, TtNUS, Admin Record

DEPARTMENT OF THE NAVY
BASE REALIGNMENT AND CLOSURE
PROGRAM MANAGEMENT OFFICE, NORTHEAST
4911 SOUTH BROAD STREET
PHILADELPHIA, PA 19112-1303

L. Sinagoga

5090
Ser BPMOE/14-106
March 26, 2014

Ms. Christine Williams
Remedial Project Manager
Mail Code: OSRR07-03
U.S. Environmental Protection Agency, Region I
5 Post Office Square, Suite 100
Boston, MA 02109-3912

Mr. Richard Gottlieb
Office of Waste Management
Rhode Island Department of Environmental Management
235 Promenade Street
Providence, RI 02908-5767

Dear Ms. Williams and Mr. Gottlieb:

The Navy offers the enclosed Response to Comments document and a revised draft Record of Decision (ROD) for Operable Unit 9 (Site 16). The written responses and a revised draft ROD are provided in accordance with section 17.3(3) of the NCBC Davisville Federal Facilities Agreement (FFA).

If you have any questions or comments, please contact the undersigned at (617) 753-4656 so that we may resolve any outstanding issues and execute a final Record of Decision.

Sincerely,

DAVID BARNEY
BRAC Environmental Coordinator
By direction of BRAC PMO

Enclosure:
Response to Comments Document & Revised Draft ROD for Operable Unit 9 (Site 16)

Copy to:
J. Dale, NAVFAC Midlant
L. A. Sinagoga, TtNUS Project Manager
NIRIS RDM

TETRA TECH

PITT-06-14-012

June 4, 2014

Project No. 112G00822

Mr. David Barney
BRAC Environmental Coordinator
Former NAS South Weymouth
1134 Main Street, Building 11
South Weymouth, MA 02190

Reference: Contract No. N62467-04-D-0055
Contract Task Order (CTO) Number 418

Subject: ***Final Record of Decision for Site 16***
The Former Naval Construction Battalion Center, Davisville
North Kingstown, Rhode Island

Dear Mr. Barney:

Enclosed is the Final Record of Decision (ROD) for Site 16 at the Former Naval Construction Battalion Center, Davisville, Rhode Island, updated per the response-to-comments (RTCs) documents for comments received from the United States Environmental Protection Agency (USEPA) Region I and the State of Rhode Island Department of Environmental Management (RIDEM) on the March 2014 version of the document. The document is "signature ready" and reflects our BRAC Clean-up Team (BCT) discussions during the May 13th, 2014 teleconference. The referenced RTCs are also enclosed.

If RIDEM concurs with this ROD, the Navy respectfully requests a concurrence letter for inclusion as Appendix A-1. Once EPA and the Navy receive the concurrence letter from RIDEM, and with EPA's concurrence, the ROD will be executed and distributed.

Please call me at 412-921-8887 if you have any questions regarding the enclosed document.

Sincerely,

Lee Ann Sinagoga
Contract Task Order (CTO) Manager

LAS/mlg
Enclosures

cc: Mr. Jeff Dale, Remedial Project Manager (1 copy)
Ms. Christine Williams, EPA Region I (1 copy)
Mr. Richard Gottlieb, RIDEM (1 copy)
Project File (1 copy and 1 CD)
NIRIS RDM (1 copy and 1 CD)

Tetra Tech, Inc.
661 Andersen Drive, Pittsburgh, PA 15220-2700
Tel 412.921.7090 Fax 412.921.4040 www.tetratech.com

Navy Response to
USEPA Region I Comments on
The Site 16 Draft Final Record of Decision Dated March 26, 2014
Former Naval Construction Battalion Center (NCBC) Davisville
Davisville, Rhode Island
(USEPA Region I Correspondence Dated May 1, 2014)

Note to reader: Preliminary responses, discussed during the May 13, 2014 BRAC Clean-up Team (BCT) teleconference, are revised as follows and reflect the discussions/agreements made during the BCT teleconference:

EPA Comment No 1: Page 11, 1st bullet Make the following changes: "Implementation of land use controls (LUCs) to ensure that future use of the NCA~~/marina~~ portion of the property is limited to non-residential activities and restricted residential use is permitted in the marina portion of the property, as long as disturbance of soil covers and subsurface soils in both areas is prohibited without prior authorization, soil covers are inspected and maintained, groundwater is not used (except for sampling under the LTM program), and buildings are designed and constructed to minimize the potential for vapor intrusion. A soil management plan will be implemented to address any disturbance to the soils and covers.

Navy Response to EPA Comment No. 1: *Please see RIDEM input in May 5, 2014 email: The term "restricted residential" is not necessary. Section 3.68 of the RIDEM Remediation Regulations, Amended 2011, defines residential activity in part to include a recreational facility for public use. Thus, RIDEM recreational standards are the same as the residential standards by regulation.*

Please note that the referenced text provides a summary of the LUCs which are more completely defined in Section 2.12.2 (page 76). Navy suggests two changes:
Proposed language:
First, modifying the sentence in question to "Implementation of land use controls (LUCs) to ensure that future use of the NCA is limited to non-residential activities (also excluding recreational use as defined by RIDEM), disturbance of soil covers....
And, secondly, switching the order of the first two bullets in Section 2.12.2 "LUCs" and modifying the second bullet as follows:

- *Allow recreational uses within the existing Allen Harbor Boating Association (AHBA) marina that are consistent with marina activities.*
- *Prohibit expansion of residential use (which also excludes recreational use as defined by RIDEM) within the NCA.*

The last bullet of Section 1.4 will also be modified to include mention of the WMA, please see response to RIDEM Comment No 1.

EPA Comment No. 2: p. 11iop, § 1.5 Add at the end of the section the following paragraph:
"The selected remedy will reduce exposure levels to protective ARAR levels or , in the absence of protective ARAR levels, to within EPA's generally acceptable risk range of 10^{-4} to 10^{-6} for carcinogenic risk and below the HI of 1 for non-carcinogens in soil and groundwater, as outlined in Tables 2.4 & 2.5 {Soil and Groundwater Clean-Up Levels}."

Navy Response to EPA Comment No. 2: *Agree, however the EPA proposed text is from the ROD Guidance, Section 6.3.12 (1). Per the guidance, Section 1.5 is intended to be simple and concise. The Navy feels this text should appear in Section 2.13. Please see response to EPA Comment No. 17.*

EPA Comment No 9: p. 63, ¶3 Change "so RIDEM leachability criteria exceedances ~~do not need to be~~ are addressed ~~(i.e., do not have to be met)~~ by monitoring to ensure that contaminated groundwater does not migrate beyond~~. However, groundwater monitoring, conducted at~~ the WMA compliance boundary~~,~~. Monitoring will be used to assess if groundwater migrating beyond the compliance boundary presents an unacceptable risk to human or ecological receptors and, therefore, additional soil remediation may be necessary."

Navy Response to EPA Comment No. 9: *Agree.*

EPA Comment No. 10: p. 64, ¶5 Change "Alternative S-3A would meet the soil industrial cleanup levels and RIDEM I/C DECs in surface soil in the NCA, and ~~exposure to remaining contaminants that may leach from the soil into the groundwater would be addressed by the groundwater LUCs described in Section 2.12.2 which prohibit the use of groundwater for any use~~ meet the RIDEM soil leachability standards through monitoring to ensure soil contaminants do not migrate beyond the compliance boundary of the waste management area. Under Alternatives S-2, S-4, and S-6, COCs would be present in soil at concentrations greater than the cleanup levels in the NCA, but a cover and caps would eliminate the exposure pathways. Alternatives S-2, S-3, S-3A, S-4, S-5, and S-6 would meet ~~recreational~~ restricted residential use requirements in the vicinity of the marina building.

Navy Response to EPA Comment No. 10: *Agree with first part of comment (i.e., leachability issue). The first sentence will be modified as suggested. Disagree with suggested wording in the final sentence (i.e., the restricted residential issue). Please see Navy responses to EPA Comments No. 1 and 9.*

EPA Comment No. 11: p. 65, §2.10.2 Throughout the analysis of the groundwater tables it states that if soil alternative S-5 was chosen and the waste management area established that it would make no difference in any of the groundwater alternatives. It is unclear how this could be so since under the S-5 scenario groundwater cleanup standards need to be achieved throughout the Site and under the other soil alternatives groundwater cleanup standards never need to be achieved inside of the WMA compliance boundary. Please clarify the ROD language.

Navy Response to EPA Comment No. 11: *Should the first sentence of the EPA comment read as follows? "Throughout the analysis of the groundwater tables it states that if soil alternative S-5 was chosen and the waste management area was not established that it would make no difference in any of the groundwater alternatives." In any case, Navy respectfully disagrees with the comment. The presence/absence of the WMA only affects the comparative analysis of "short-term effectiveness" (the duration component) which is discussed on page 68. The "protectiveness" is not changed other than the need for LUCs, which are also discussed. "Compliance with ARARs", "Long-Term effectiveness/permanence", and "Treatment" are not changed. There is no effect on "Implementation".*
Note to reader: During the BCT teleconference, the EPA agreed that the comment could be withdrawn.

EPA Comment No. 12: p. 70, ¶2 Change: "This includes selective excavation and off-site disposal of shallow soil (to a depth of 0-2 feet bgs), maintaining and monitoring the protective cover, establishment of a WMA at the NCA and Marina…"

Navy Response to EPA Comment No. 12: *Agree. But, please note that the subject text is intended to be a general description of the remedy only. Also, subsurface debris was detected primarily in the southern portion of the marina area (Test Pits 1 and 2).*

anticipated to be achieved within approximately 15 months for soil and 100 years for groundwater. Table 2-12 describes how the Selected Remedy mitigates risk and achieves RAOs for Site 16.

Navy Response to EPA Comment No. 15: *The current text is appropriate based on the requirements of the current ROD guidance. However, the Navy agrees with the addition of the following text, although the recommended text is not really describing "expected outcomes":*

The primary expected outcome of the selected groundwater portion of the remedy is that the groundwater will be restored to its permissible, beneficial use and will no longer present an unacceptable risk to human health. The effectiveness of the groundwater remedy will be determined based upon attainment of the cleanup levels outlined in Table 2-5 as well as any additional site related Contaminants of Concern (COCs) added through subsequent decision documents. A monitoring program will be implemented in order to evaluate remedy performance and progress towards attainment. The details of the monitoring program will be established during the remedial design phase and will include the preparation of a long-term monitoring plan. Monitoring scope and frequency would change over time based on technical analysis of the remedy, optimization studies, revised conceptual site model, or other information as determined by the Navy with approval from EPA and RIDEM. The determination that all cleanup levels have been met should consider historical and current monitoring data, contaminant distribution, trend analysis, and the appropriateness of the compliance monitoring program. (i.e., locations, frequency of monitoring, sampling parameters.).

EPA Comment No. 16: p. 79, Table 2-12 In the second and fifth rows change: "Groundwater monitoring will be performed to confirm that concentrations of COCs that may leach from the soil do not ~~reach~~ migrate beyond the compliance boundary into groundwater, sediment and surface water at concentrations that cause unacceptable risk.

Navy Response to EPA Comment No. 16: *Agree.*

EPA Comment No. 17: p. 79§2.13 **Statutory Determinations** The selected remedy will reduce exposure levels to protective ARAR levels or, in the absence of protective ARAR levels, to within EPA's generally acceptable risk range of 10^{-4} to 10^{-6} for carcinogenic risk and below the HI of 1 for non-carcinogens in soil and groundwater as outlined in Table 2-4 {Soil Cleanup Levels} and Table 2-5{Groundwater Clean-Up Levels} for the purposes of this CERCLA remediation. It should be noted that the groundwater remediation at this Site addresses contaminants related to the Site only. In accordance with the NCP, the Selected Remedy meets the following statutory determinations:

Navy Response to Comment No. 17: *(First sentence) Agree. The referenced text is derived from the ROD Guidance. However, the last sentence, regarding the site related contaminants, appears out-of-place. This section, Statutory Determinations, covers six subjects; the issue of site/non-site related contaminants is not one of them.*

EPA Comment No. 18: Table E-1, p. 4 For the Remediation Regulation Evaluation/Action to be Taken in the last paragraph change: "permit limited residential use..." In the Synopsis text remove "and leaching" after "direct contact;"

Navy Response to EPA Comment No. 18: *Disagree with language change regarding limited residential use. See response to EPA Comment No. 1. RIDEM does not agree with recommended wording. The text of the Synopsis section will be modified as suggested.*

Navy Response to
RIDEM Comments on
The Site 16 Draft Final Record of Decision Dated March 26, 2014
Former Naval Construction Battalion Center (NCBC) Davisville
Davisville, Rhode Island
(RIDEM Correspondence Dated April 22, 2014)

RIDEM Comment No. 1: Page 8, Section 1.4 Description of Selected Remedy – There is no mention of the Waste Management Area which is a major part of the remedy.

Navy Response to RIDEM Comment No 1: *Agree. This omission will be corrected in Sections 1.4 and 2.12.2.*

Proposed Text, Section 1.4: The last bullet (on page 11) will be modified to "Implementation of land use controls (LUCs), including establishment of a waste management area (WMA) in the NCA/marina to ensure that future use of....
Proposed Text Section 2.12.2: The third bullet (on page 77) will be modified to "Establish a WMA to control excavation/disturbance of contaminated surface and subsurface..."

RIDEM Comment No. 2: Page 70, Section 2.12.2, Description of Selected Remedy, Arrows 2 and 4 – Both these arrows end with "near the marina". Please change to "in the portion of the marina which is within the boundary of Site 16." The proposed excavation is in the marina, not near the marina. This is highlighted by the discussion on page 71 which notes some concerns with excavation operations at Building E-107 which is clearly the marina.
Navy Response to RIDEM Comment No 2: *Agree. The wording in both arrows will be changed as requested.*

RIDEM Comment No. 3: Page 77, Section 2.12.2, Description of Selected Remedy, LUCs, 2nd Bullet- Please change "To prohibit disturbance of the cover on the NCA and in the vicinity of the marina" to "To prohibit disturbance of the cover on the NCA and marina, within Site 16 boundaries, without approval from Navy, USEPA and RIDEM.
Navy Response to RIDEM Comment No 3: *Agree. The wording will be changed as requested.*

NCBC Davisville 9.22.11 PF

Sinagoga, Lee Ann Rough Draft EPA Comments - Revised Draft FS-WE 51

From: Barney, David A CIV OASN (EI&E), BRAC PMO NE [david.a.barney@navy.mil]
Sent: Thursday, September 22, 2011 9:21 AM
To: Sinagoga, Lee Ann; Anderson, Scott
Subject: FW: draft cmts on Davisville site 16 RTC
Attachments: site 16 FS rev 1 RTC CmtLtr.docx

Site 16

fyi

-----Original Message-----
From: williams.christine@epamail.epa.gov [mailto:williams.christine@epamail.epa.gov]
Sent: Wednesday, September 21, 2011 16:18
To: Dale, Jeffrey M CIV NAVFAC MIDLANT, EV; Barney, David A CIV OASN (EI&E), BRAC PMO NE; richard.gottlieb@dem.ri.gov
Cc: Peterson.David@epamail.epa.gov; Brandon.Bill@epamail.epa.gov; rkuhlthau@cox.net; glucksman@mabbett.com; Sugatt.Rick@epamail.epa.gov; Olson.Bryan@epamail.epa.gov
Subject: draft cmts on Davisville site 16 RTC

Hi- in anticipation of our meeting tomorrow we've put together these draft comments. we may be able to address some of them, so I'll change the document either Friday or Monday before I send it out, hence the future date.
Christine

(See attached file: site 16 FS rev 1 RTC CmtLtr.docx)

Christine A.P. Williams
Federal Facility Superfund Section
US EPA New England
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"Sometimes leadership is planting trees under whose shade you'll never sit." Gov. Jennifer M. Granholm

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
NEW ENGLAND - REGION I
5 POST OFFICE SQUARE, SUITE 100 (OSRR 07-03)
BOSTON, MASSACHUSETTS 02109-3912

September 26, 2011

Jeff Dale, Dept of the Navy, BRAC PMO Northeast
Code 5090 BPMO NE/JD, 4911 South Broad St
Philadelphia, PA 19112-1303

Re: *"Navy Response to EPA Region 1Comments on the Revised Draft Feasibility Study for Site 16"*, dated August 2011 at the Former Davisville Naval Construction Battalion Center (NCBC), Rhode Island

Dear Mr. Dale:

Pursuant to ' 7.6 of the Davisville Naval Construction Battalion Center Federal Facility Agreement dated March 23, 1992, as amended (FFA), the Environmental Protection Agency has reviewed the subject documen and comments are enclosed.

We believe there are several outstanding issues that must be resolved soon in light of the newly agreed to schedule.

#1 the requirement for cleanup of groundwater to drinking water standards must, by definition, include risk based health advisories and maximum contaminant level goals (MCLGs).

#2 LUCs under the MARAD transfer that will be relied upon to protect human health must be included into a decision document.

#3 the groundwater alternative s must be clearly and transparently defined and justified. Please schedule a technical meeting for a more thorough technical discussion of the Navy's groundwater alternatives.

#4 while the use of a waste management unit seems to be agreed upon, the proposed changes to the alternatives have not been provided for EPA review. Please provide.

If you have any questions with regard to this letter, please contact me at (617) 918-1384.

Sincerely,

Christine A.P. Williams, RPM
Federal Facilities Superfund Section

Enclosure

cc: Richard Gottlieb, RIDEM
Dave Barney, BEC (via e-mail only)
Johnathan Reiner, ToNK
Steven King, RIEDC
Bill Brandon, EPA (via e-mail only)
Steve DiMattei, EPA (via e-mail only)
Rick Sugatt, EPA (via e-mail only)
Scott Anderson, Tetra Tech NUS, Inc (via e-mail only)

p. 1, N.Resp.Cmt. 2 In the first paragraph regarding the Navy's ARARs comment – solid or hazardous waste landfill standards may be relevant and appropriate for the site, if waste is going to be left in place under a cap/cover. Some, but not all, of the landfill provisions may be relevant and appropriate, particularly if the waste is debris that was buried on site (such as from filling wetlands). However, the waste does not need to be capped/covered under landfill standards to be a "waste management unit," rather the cap/cover could be compliant with the RI Remediation Regulations (if the cap/cover meets the Regulations risk-based standards).

p. 2, N.Resp.Cmt. 2 While the proposed cover design may be compliant with direct contact standards, it also needs to meet leachability standards, if they apply. They would apply if the contaminants in the vadose zone potentially could cause a risk by migration into the harbor in the future. A contingency remedy needs to be included in the ROD to ensure a remedy is agreed to if contaminants in the vadose zone above leachability criteria now then migrate to the harbor in the future and cause a risk to the flora or fauna in the nearshore.

p. 7 and p. 12, Response to Comment No. 7 and to Additional EPA General Comment No. 5: Decisions related to PFOS/PFOA can be made after review of forthcoming data.

p. 4,N Respt Cmt 8 A more transparent approach to adding contingency to remediation estimates (such as adding a contingency percentage to treatment costs due to uncertainty in treatment area extent and concentration) would allow for better transparency and consistency when comparing between alternatives. It is acknowledged that some groundwater treatment alternatives costs are less sensitive to over-estimates of contaminant mass, such as in-situ chemical oxidation which is driven often by total oxidant demand from non-target naturally-occurring compounds and overall size of the treatment area. However, the extent of the treatment area also appears to be overestimated by the Navy, leading to larger than necessary treatment networks (i.e. more extraction wells, injections points, or treatment barriers) under all treatment alternatives. While the RI/FS process is intended to assist with programming of remediation budgets, its primary task in regards to cost is to provide a means for comparison of alternatives. The Navy's approach to building conservatism into each treatment alternative has not allowed for appropriate comparison of the viable alternatives.

p. 15, N.Resp.Cmt. 9 The source of the contamination does not preclude CERCLA liability, so is the PAHs are from asphalt or building debris that has been used as fill at the Site by the Navy historically, the Navy is still responsible for addressing the material under CERCLA. The material does not have to come from a "release from specific units or processes associated with past Navy operations," the filling/disposal of material in the area is a "past Navy operation." Was the asphalt or building debris used as fill in this area?

p. 15, N.Resp.Cmt. 10 A release from "the immediate vicinity of the Sea Freeze building" is still under CERCLA jurisdiction for this Site even though it may not be associated with "the Site 16 CVOC plume." Any releases from within the operable unit that pose a CERCLA risk need to be addressed by the alternatives in this FS. It is understood that this part of the plume is a distal part and that Navy alternatives include MNA to cleanup the distal parts of the plume.

p. 15, N.Resp.Cmt. 13 Although the Navy believes it is premature to make a determination about whether the engineered drainage system affects shallow groundwater, a determination needs to be made as some point in the CERCLA process. If pre-ROD the role of the drainage system in affecting groundwater contamination

needs to be addressed by the proposed alternatives. If the question is left post-ROD to the remedial design stage, then a determination that the drainage system needs to be addressed by the remedy could require the Navy to issue an additional CERCLA decision document to modify the remedy.

p. 16, N Resp Cmt 15 - 19 — The Navy concurred that tighter contours were supported by the data, but that the conservative estimate of potential remediation area was appropriate. However, the Navy's 500 µg/L and 1,000 µg/L isoconcentration contours appear to not accurately depict current VOC concentrations, and therefore overestimate the area of remediation. A clearer approach to adding contingency to remediation estimates (such as a contingency percentage on costs) would allow for better transparency and consistency when comparing between alternatives. Given that conservative estimates were used for both extent and contaminant mass, the degree of conservatism is not always apparent to the reviewer. See also the technical response to General Comment No. 8.

p. 19. N.Resp.Cmt. 24 — EPA asked that the sentence be removed because the State's classification of the groundwater as GB has no relevance to the CERCLA remedy. Instead the Navy can state: "Note that Site 16 is located in an area regulated under the Federal Safe Drinking Water Act as a potable aquifer, except where the groundwater is saline. Safe Drinking Water Act regulatory standards (MCLs and non-zero MCLGs), along with Federal risk-based standards, were used in the selection of COCs."

p. 19, N.Resp.Cmt. 26 — Change the Navy's proposed text to: "and meet the selected PRGs identified in Table 2-4 outside of any waste management area established as part of the soil remedy." Note also that Table 2-4 needs to be relabeled "Preliminary Remediation Goals/Performance Standards – Groundwater" with a footnote explaining that inside any waste management area the values are Performance Standards and outside the waste management area the values are PRGs.

p. 19, N.Resp.Cmt. 27 — The sentence can read: "No RAOs were developed for TPH contamination in soil since CERCLA does not have jurisdiction for TPH. TPH will be addressed separately under State authority."

p.20, N. Resp Cmt 32 — The Navy's clarifications addressed validity of development of lead PRG, but not arsenic PRG. The development of a site-specific arsenic background for the site based on collection of 7 samples is not clearly justified. Goodness of fit statistics for the fit of limited background arsenic soil data to a log-normal distribution were not provided, and alternative probability distributions where not presented for the data (which may fit the data better). As such the validity of the fit of the data to this distribution and subsequent use of the log-normal distribution is not fully supported. The use of the Upper Prediction Limit as a PRG rather than the 95% Upper Confidence Limit of the mean (as is done in RIDEM background development) should also be justified further.

p.21, N Resp Cmt 33 — The Navy's response does not directly address EPA's concern that the naphthalene background value (500 µg/kg) used as the PRG was not developed based on an EPA-approved method or the site-specific SSL of 18 µg/kg based on leachability. Please address.

p. 22, N.Resp.Cmt. 39 Unclear to EPA what the sentences that we requested removed actually mean. What is the significance of the "relatively high mass" of lead being the reason why the lead is at "environmentally acceptable concentrations." Is the Navy attempting to say: "Although the mass of lead relative to other soil contaminants is high, lead levels do not exceed risk-based standards for unlimited use of the area."

p. 22, N.Resp.Cmt. 41 EPA has determined that Federal Drinking Water (MCLs and non-zero MCLGs) and risk-based standards (Health Advisory for manganese) are the ARARs for groundwater at the Site. They need to be included in Table 2-1 for any groundwater treatment alternatives as cleanup standards and in Table 2-5 as monitoring standards for any alternatives requiring monitoring and institutional controls for areas within the compliance boundary for any waste management areas. Note that the text for these standards in Table 2-5 is incorrect in that groundwater throughout the Site (where soil contamination is being managed in place) will not achieve drinking water standards inside the compliance boundary. Instead, the standards are only used to monitor the areas to ensure that groundwater exceeding the standards does not migrate beyond the compliance boundary.

p.23, Table Use Table text for MCLGs as provided by EPA (see previous comment).

p. 24, 1st Table Use Table text for EPA Health Advisory as provide by EPA (see comment for p. 22, N.Resp.Cmt 41).

p. 24, N.Resp.Cmt. 42. Retain text referring to the 500-year floodplain since the regulation include jurisdiction up to the 500-year flood elevation.

p. 25, N.Resp.Cmt. 44 The Navy's response is inconsistent with its response to Comment 43 in that the Navy agreed to add the Endangered Species Act to address potential sea turtle habitat in Allen Harbor, but states the Fish and Wildlife Coordination Act, which also addresses protecting the aquatic habitat in Allen Harbor is not Applicable. Unless the remediation is outside of the coastal flood zone for the Harbor, include both of these statutes as ARARs.

p. 25, N.Resp.Cmt. 45 EPA's reply to this response is consistent with its previous responses to the Navy regarding groundwater performance standards/PRG and background guidance standards within this document.

Response to EPA Specific Comment No. 46 & 48: concur, provided that this language ("The risk must be evaluated at each well after concentrations of all COCs have decreased below their MCLs." is included in the ROD. EPA reiterates that MCLs are not necessarily considered to be protective if the risk associated with the MCL is higher than EPA's risk management criteria of HQ =1 and cancer risk >1E-04. The NCP requires that remedies achieve both ARARs and protection of human health and the environment.

p. 26, N.Resp.Cmt. 49 As previously noted MCLGs should not be deleted from the Table.

p. 27, N.Resp.Cmt. 50 As previously noted Health Advisories should not be deleted from the Table.

p. 27, N.Resp.Cmt. 51 Sediment monitoring may be required to assess the protectiveness of the groundwater alternatives? How will it be possible to assess any potential risk if contaminants in the vadose zone leach into groundwater at high enough concentrations or site groundwater plumes move out into the Harbor and emerge

into the intertidal or subtidal zone (as occurred at Calf Pasture Point). While there is no current risk from either of these issues, the remedy should include monitoring and a contingency remedy to address any future risk from migration from under the soil cover being proposed.

p.27, N.Resp.Cmt. 52 Any cap/cover installed under the soil alternatives will require storm drainage of some sort. Any cap/cover within the coastal flood zone the cap/cover needs to have drainage that will prevent washout, so these standards need to be complied with.

p. 28, N.Resp.Cmt. 54 Section 3.2 only should cover screening for CERCLA technologies and process options so remove any mention of TPH. If a technology or process option that addresses CERCLA contaminants also addresses TPH that is not a problem but the text shouldn't take into account whether a technology or process option is effective or not in addressing TPH.

p. 29, N Resp Cmt 62 It is unclear to EPA how an effective "cover/containment" remedy can be implemented using newly constructed or existing cover without the integral use of LUCs to ensure the maintenance of such structures. As such, it would appear prudent to add reference to use of LUCs under the containment alternative

p. 29, N.Resp.Cmt. 64 If the Navy decided the add on-site treatment to the remedy after the ROD without evaluating on-site treatment in this FS the Navy would be required to issue a ROD amendment. If on-site treatment is evaluated in this FS the Navy likely would only need to issue an ESD.

p. 30, N.Resp.Cmt. 68, 72, 75, 88-90,114-117,121,122,125, 130, Although EPA withdraws its opposition to including an alternative for MNA in this section given that the Conclusion states that MNA will be used in combination with other process options. Note however that the fourth sentence of the response is inaccurate because the EPA MNA guidance documents EPA policy regarding the use of MNA for CERCLA remedies. Furthermore, the fifth sentence is inaccurate because the Guidance does address what a reasonable time period for MNA is – for example in the first paragraph on page 13 of the Guidance it states: "EPA expects that **MNA will be an appropriate remediation method only where its use will be protective of human health and the environment and it will be capable of achieving site-specific remediation objectives within a timeframe that is reasonable compared to other alternatives."**

However, based on the groundwater data, MNA screening results, and BIOCHLOR modeling results presented, it does not appear that the estimate of the timeframe to achieve the PRGs under alternatives G-2 through G-6 has been done with enough accuracy to warrant that discussion at this point.
Based on a review of the MNA modeling results and groundwater monitoring data for the Site 16, it seems the rate of TCE degradation is overstated by the Navy, and the timeline to site closure under a MNA-only and/or groundwater treatment followed by MNA approach is not able to be accurately estimated by the BIOCHLOR model.
Very limited presence of *cis*-1,2-DCE and vinyl chloride provide the strongest evidence that only insignificant biodegradation is occurring.
The use of site data to calibrate the BIOCHLOR model does not appear to be valid. Firstly, although the model is simplistic it does contain a number of parameters which are calibrated to "fit the data", including rates for longitudinal dispersion, biodegradation of VOCs, and at times seepage rate, and even the input source concentration. With increasing numbers of parameters, more data

points are required to effectively calibrate it, increasing the risk of obtaining a great "data fit" or corroboration but from a meaningless model (one which has extra terms which do not actually have any statistical significance or may interfere with proper calibration of the model).
Typically, this is avoided by using larger data sets, and limiting the number of parameters in a model. Although the model has been calibrated to show the shape of the field data, it does not appear possible to prove the varying of the source concentration, seepage rate, and calibration of longitudinal dispersion or biodegradation rate are valid. In other words, the model has too many parameters and/or input assumptions that can be adjusted/calibrated and not enough data to justify those modeling decisions.
Secondly, the calibration of the model's biodegradation rate does not appear to be valid considering the data used and assumptions made. The biodegradation rate was calibrated using an assumed starting source concentration and one set of groundwater data from approximately 50 years (year 2004) after the release. This is not a sound method as it does not use two data sets separated by time (rather one assumption which is varied based on the best fit of the resulting model and one true data set). This procedure is repeated twice, for a second data set (year 2007), with similar results, which does not make the model any more valid.
The closure timeframes estimates provided by the BIOCHLOR model do not appear valid enough to determine the timeliness of MNA based remedies, and therefore, without further justification MNA is not supported as a viable alternative.
Another approach such as developing a 2-D or 3-D advection and dispersion model (without biodegradation or a very conservative biodegradation rate) based on actual groundwater data (rather than assumed source values) and published parameter values may be more representative of the plume and be more defensible at predicting future timelines to achieve the PRG.
We suggest a technical meeting to more thoroughly discuss this issue.

p. 30, N.Resp.Cmt. 71 The comment does correspond to the text, but the point EPA was not as clear as it could have been. What EPA was attempting to represent is that if the storm sewer has permit limitations (particularly if it is a CSO) the Navy would need to meet pretreatment/discharge standards at the point where the Navy was discharging into the storm sewer, not at the Bay.

p. 31, N.Resp.Cmt. 73 On-site consolidation would not necessarily trigger landfill and on-site disposal facility regulations any more than cover/capping the waste in place. For instance, consolidation could be done under risk-based standards under the R.I. Remediation Regulations, if appropriate.

p. 32, N.Resp.Cmt. 85 Unclear what the subject of the last paragraph (transfer of properties) has to do with the section, which describes what the selected alternatives are (not how they apply to different land uses within the operable unit).

p. 32, N.Resp.Cmt. 86 The No Action Alternative only pertains to CERCLA actions, not outside land use controls that are not incorporated into the CERCLA remedy. The purpose of the No Action Alternative is to compare taking no CERCLA remedial action (other than 5-year reviews) compared with other CERCLA remedial alternatives. For instance under a CERCLA No Action Alternative an active petroleum remediation under State authority could be occurring within an operable unit, but that would have no relevance in the FS to comparing the No Action Alternative to other CERLCA remedial alternatives. The assumption that land use controls managed by previous property transfer agreements will stay in place indefinitely does not

appear to be a valid. While the No Action Alternative does not include the elimination of these controls, there is not any requirement under this alternative that they will remain either. Therefore, the statement that the LUCs will "remain in place" does not appear to be appropriate. The text should be clarified to reflect this uncertainty, or reference to the existing LUCs removed.

p. 33, N.Resp.Cmt.88 In this section remove both the second and fourth sentences since neither existing non-CERCLA land use restrictions no natural attenuation have any relevance to the No Action Alternative, since neither is a remedial component of the alternative.

p. 33, N.Resp.Cmt. 89 Remove the sentence – the only subject that should be discussed regarding meeting NCP standards for this criterion is whether the alternative includes active treatment as a component of the CERCLA remedy, which the No Action Alternative does not.

p. 33, N.Resp.Cmt. 93 Where soil exceeds leachability standards a permeable cover does not meet RI Remediation Standards. In those area either all soil exceeding leachability standards needs to be removed or in impermeable cap meeting RI Remediation Regulation standards (or, in the alternative, relevant and appropriate Solid Waste Landfill cap standards) would be the ARARs that would meet the leachability standard.

p. 33, N.Resp.Cmt. 94 Remove the second sentence since capping is not "treatment" under this criterion. The statement regarding generation of investigation derived waste does not seem pertinent to the section. EPA's request for removing this sentence appears to be appropriate.

p. 34, N.Resp.Cmt. 95 Based on the Navy's response, change the first sentence to: "Overall, the sustainability impact of Alternative S-2 is low to moderate based on sustainability analysis using SiteWise™ (see Appendix H)."

new comment 95A Appendix H, Sustainable Evaluation of Remedial Alternatives: EPA did not complete a detailed technical evaluation of the analysis presented in Appendix H. In general, EPA supports Navy's efforts to evaluate the sustainability of planned remediation efforts and identify opportunities to mitigate environmental impacts of the remediation. EPA agrees that these considerations can be evaluated under the short-term effectiveness criteria. In addition, EPA agrees with Navy's statements to others that "(t)he results presented ...are provided with the intention of giving more information in order to make a more intelligent decision on which treatment to use". Further, EPA suggests that a valuable use of the results presented here will be in the design of the selected remedy to ensure that the drivers of any significant impacts are considered and that those environmental impacts are mitigated to the extent practicable. The Navy's efforts should be consistent with EPA Region 1's Clean and Green Policy issued on February 18, 2010 (http://www.clu-in.org/greenremediation/docs/R1GRPolicy.pdf). In addition, EPA has developed a number of Green Remediation Fact Sheets that provide best management practices (BMPs) for a number of common remediation processes. Navy should consider these as they move forward with the remediation of the NUSC site: excavation and surface restoration (http://www.clu-in.org/greenremediation/docs/GR_Quick_Ref_FS_exc_rest.pdf), bio-remediation (http://www.clu-in.org/greenremediation/docs/GR_factsheet_biorem_32410.pdf), and clean fuel and emission technology (http://www.clu-

in.org/greenremediation/docs/Clean_FuelEmis_GR_fact_sheet_8-31-10.pdf). Review of these BMP fact sheets may provide additional recommendations for reducing the environmental footprint of the remedies that could be added to the Recommendations Section of this analysis.

p. 34, N.Resp.Cmt. 96 The backfill is a cover in all locations where the subsurface soil under the cover poses a CERCLA risk to unlimited use. Note that groundwater monitoring of any area where waste is left in place would be required under waste management ARARs standards even if there was no current groundwater risk requiring a CERCLA groundwater remedy.

p. 34, N.Resp.Cmt. 97 Lead at this site is not naturally occurring. The comment refers to the statement in the sentence that the lead does not pose a CERCLA risk – this is only true if the lead does not pose a risk to unlimited use. Only the pounds of lead that pose a risk should be included in the calculation of contaminants removed under the alternative.

p. 35, N.Resp.Cmt. 100 See EPA's response to N.Resp.Cmt. 93.

p. 35, N.Resp.Cmt. 101 See EPA's response to N.Resp.Cmt. 95.

p. 35, N.Resp.Cmt. 103 If the presence of co-mingled TPH with the CERCLA waste results in higher remedial costs, that added cost for addressing the TPH should not be included in the analysis.

p. 35, N.Resp.Cmt. 104 See EPA's response to N.Resp.Cmt. 96.

p. 35, N.Resp.Cmt. 105 See EPA's response to N.Resp.Cmt. 97.

p. 35, N.Resp.Cmt. 107 See EPA's response to N.Resp.Cmt. 93.

p. 36, N.Resp.Cmt. 108 See EPA's response to N.Resp.Cmt. 95.

p. 36, N.Resp.Cmt. 110 See EPA's response to N.Resp.Cmt. 103.

p. 36, N.Resp.Cmt. 112 See EPA's response to N.Resp.Cmt. 95.

p. 36, N.Resp.Cmt. 113 See EPA's response to N.Resp.Cmt. 103.

p. 37, N.Resp.Cmt. 114, 116, 117, 121,122, 125 See EPA's response to N.Resp.Cmt. 68. A reasonable time for an MNA needs to be compared to active remedies. Outside of any waste management area compliance zone established under the soil alternatives groundwater needs to meet drinking water standards through MNA within a time period comparable to active treatment alternatives. It does not matter that groundwater is currently not being used as a potable water supply (see EPA groundwater remediation guidance).

p. 37, N.Resp.Cmt. 115 See EPA's response to N.Resp.Cmts. 86, 88, and 89.

p. 38, N.Resp.Cmt. 118 See EPA's response to N.Resp.Cmt. regarding the Table 2 ARARs. The revised alternative-specific ARARs tables needs to be provided for EPA to fully comment on.

p. 38, N.Resp.Cmt. 119 The text for the TBC risk guidances Action to Be Taken should state that the No Action Alternative will not meet risks calculated using the guidances. Based on

standards for other CERCLA sites in the Region, if PCBs exceed 1 ppm they require remedial action under TSCA's risk-based standards.

p. 38, N.Resp.Cmt. 120 See EPA's response to N.Resp.Cmts. 41 (regarding both MCLGs and EPA's Health Advisory) and 119.

p. 39, N.Resp.Cmt. 123 EPA will need to review the revised Section 5.0 to determine if the Navy has incorporated all of the issues raised in EPA's responses to the Navy's Response to Comments. The compliance zone around the potential waste management area needs to be delineated to determine where groundwater (outside of the compliance zone and outside of areas with saline groundwater) requires treatment.

p. 39, N.Resp.Cmt. 124 EPA will need to review the revised Tables to determine if the Navy has incorporated all of the issues raised in EPA's responses to the Navy's Response to Comments.

p. 40, N.Resp.Cmt. 126 Note from previous EPA responses that groundwater treatment to federal drinking water standards is only required for groundwater outside of the compliance zone for any waste management area established and outside of any area with saline groundwater (if the groundwater poses a risk to ecological receptors in Allen Harbor, then some additional remediation in saline areas might be required).

p.45, N Resp Cmt 131 It was not EPA's intent to propose a two well approach to capture the contaminant plume down gradient of the former Building 41 area, but rather to question the rationale behind a remedy that requires 45 extraction wells. The equation used by EPA can be sourced from Figure 14 on page 21 of EPA publication 600/R-08/003 (rather than Figure 13 on page 20). As the written and diagrammatic definitions of the variables provided on Figure 14 indicate, Y is the capture zone width from central line of the plume, or half the full width of the capture zone. Thus, the full width (w) of the capture zone will equal 2 x Y. Figure 14 provides formulae for the capture width in terms of Y for both the maximum upgradient capture zone and the capture zone at the extraction well. It is correct that EPA's previous calculation provided the value of the capture width Y for the maximum capture zone rather than at the extraction well itself. If the capture zone immediately adjacent to the extraction well were considered, the total width of the capture zone would be 100.6 feet. It is correct that if the overburden aquifer were homogeneous with no impediments to vertical flow, it would be appropriate to use the full saturated thickness of the aquifer when computing capture zone widths. However, the stratigraphy observed at the site suggests significant hydraulic conductivity contrasts in the overburden that will likely influence the width of a capture zone created by an extraction well, particularly in the area immediately adjacent to the extraction well. While the hydraulic rationale underlying the design of the extraction system considered as a remedial alternative has not been clearly established in the FS, it appears that this design also relies on the screening of extraction wells over discrete depths in an apparent attempt to capture the contaminant plume at isolated depths in the overburden. Thus, the Navy also appears to intend to focus capture on discrete depths rather than the entire saturated overburden. Additional discussion and hydraulic analysis are necessary to justify the assumption that 45 extraction wells are necessary to contain the plume in Site 16 Area. Please schedule a technical meeting to discuss this issue.

email

C10418

Sinagoga, Lee Ann Site 16- FS Comments -12-21-11 WEST File

From: Christine Williams <williams.christine@epamail.epa.gov>
Sent: Wednesday, December 21, 2011 3:02 PM
Cc: Bill Brandon; David Peterson; Rick Sugatt; Steve Dimattei; david.a.barney@navy.mil; Andrew Glucksman; jeffrey.m.dale@navy.mil; jreiner@northkingstown.org; Rich Gottlieb; Anderson, Scott; Sinagoga, Lee Ann; sking@qdcri.com; Licardi; Paul Steinberg
Subject: Re: Davisville, OU9, Site 16, FS Comment Responses
Attachments: Attachment A.docx; Attachment A- ProUCL Results-Nobis-Dec-7-2011.pdf

Folks- it seems I neglected to add the appendix to both the electronic version and the hardcopy yesterday. I apologize for the inconvenience, but since I will not be back into the office until the 27th, the hard copy will have to wait. I have attached the document which is in two parts.
Again- sorry
Christine

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"Sometimes leadership is planting trees under whose shade you'll never sit."
Gov. Jennifer M. Granholm

-----Christine Williams/R1/USEPA/US wrote: -----

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From: Christine Williams/R1/USEPA/US
Date: 12/20/2011 01:45PM
Cc: Rick Sugatt/R1/USEPA/US@EPA, David Peterson/R1/USEPA/US@EPA
Subject: Davisville, OU9, Site 16, FS Comment Responses

hard copy to follow
please call with any questions

(See attached file: NCBC.Site16FS.RespNavyRCT Nov 2011.pdf)

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"Sometimes leadership is planting trees under whose shade you'll never sit." Gov. Jennifer M. Granholm

[attachment "NCBC.Site16FS.RespNavyRCT Nov 2011.pdf" removed by Christine Williams/R1/USEPA/US]

Attachment A

Technical Review Comments for

ProUCL Results for Soil Background Arsenic

Site 16, Former Naval Construction Battalion Center (NCBC) Davisville

North Kingstown, Rhode Island

This review focuses on EPA Comment p 20/N.Resp.Cmt. 32. Specifically, EPA has questioned the adequacy of the number of samples used in Navy's calculations, the proposed use of the Upper Prediction Limit (UPL) for comparison of individual site samples instead of two-sample hypothesis testing, the absence of goodness-of-fit statistics, and the possible presence of statistical outliers in the data set Navy used.

Overview:

At issue is Navy's determination of an Upper Prediction Limit (UPL) as an upper-bound estimate for background arsenic against which to compare site data. The UPL value proposed by Navy is 13.0 milligrams per kilogram (mg/kg) and is based on soil background data from NCBC Davisville. This UPL was determined using ProUCL (v. 4.00.05; US EPA, 2010a); those results are presented in Appendix D.2 of the Feasibility Study Report for IRP Site 16 (Tetra Tech, 2011). The Mabbett Team has used the most recent version of ProUCL (v. 4.1; US EPA 2010b) to review these results and to address EPA's concerns regarding Navy's proposed screening value for soil arsenic.

Definition of Terms:

A number of possible background threshold or "not-to-exceed" values are recommended by the ProUCL Technical Guidance (US EPA, 2010b). These include the following, for which brief definitions are provided for clarity (US ACE, 2008):

95th percentile: This is the value at or below which 95% of the data lie; 5% of the data are at or above this value. Quantiles are alternative names for percentiles when speaking of fractions of the data (e.g., 0.05) and not percentages (e.g., 95%).

95% Upper Prediction Limit (95% UPL): The 95% UPL based on a sample population of N measurements is the value below which a randomly drawn N+1 sample will lie, with 95% confidence. As the size of the sample population increases, the 95% UPL approaches the 95th percentile.

95% Upper Confidence Limit (95% UCL): The 95% UCL of the arithmetic mean is the concentration that is equal to, or exceeds, the arithmetic mean of randomly drawn samples 95% of the time. As the size of the sample population increases, the 95% UCL approaches the arithmetic mean.

95% Upper Tolerance Limit (95% UTL): The UTL is a confidence limit (usually 95%) on a percentile (e.g., 95%) of the data. For example, UTLs are often used in site-to-background comparisons. Where site data are the same as the background data set, the 95% UTL with 95% coverage (this example) is the value below which 95% of the data are expected to lie, with 95% confidence; 5% of the site values may lie above this UTL.

Commonly, these upper-bound estimates follow this order (US EPA 2010b):

- Sample mean ≤ 95% UCL of mean ≤ 95th percentile ≤ 95% UPL ≤ 95% UTL

Data Review:

Navy used 7 of 18 samples that comprised the soil background data set in the NCBC Phase II Remedial Investigation (TRC, 1994). Six of these 18 background samples apparently contained other contaminants, and the possibility that the additional contamination may have biased the arsenic concentrations was also considered by the Mabbett Team. For this review, "n = 7" will refer to the data set used by Navy for the UPL calculation; "n = 12" will refer to a data set with the 6 contaminated samples excluded; and "n = 18" will refer to a data set with the original 18 background samples. The rationale for using these data sets is:

- for n = 7, to duplicate Navy's results;
- for n = 12, to examine effects of excluding only those samples containing other contaminants; and
- for n = 18, to obtain statistical results on the complete background data set (including non-detects and contaminated samples)

Table 1. Soil arsenic data from the Phase II Remedial Investigation (TRC, 1994).

Soil Background Sample ID	Arsenic Concentration (mg/kg)	Data Qualifier	Contaminant	Samples for n=7	Samples for n=12
BK-SS01	0.9	J		X	X
BK-SS02	0.59	J		X	X
BK-SS03	3.4	J	PCB		
BK-SS04	2.4	J	PCB		
BK-SS05	1.3		PCB		
BK-SS06	1.3			X	X
BK-SS07	0.95		Pesticides, PCB	X	
BK-SS08	1.5		PCB		
BK-SS09	1.1	J		X	X
BK-SS10	1.6		PCB		
BK-SS11	5.5			X	X
Soil Background Sample ID	**Arsenic Concentration (mg/kg)**	**Data Qualifier**	**Contaminant**	**Samples for n=7**	**Samples for n=12**
BK-SS12	7.6				X
BK-SS15	4.4	U			X
BK-SS16	4.3	U			X
BK-SS17	8.1			X	X
BK-SS18	2.1	U			X
BK-SS21	1.7				X
BK-SS22	1.1				X

J = estimated
U = non-detect

ProUCL Results:

The Mabbett Team performed outlier testing using ProUCL to address EPA's question regarding possible statistical outliers. No lower- or upper-tail outliers were identified by Dixon's Outlier Test at the 10%, 5%, and 1% significance levels in any of the 3 data sets.

Table 1 of Appendix D.2 of the Revised Draft Feasibility Study provides background descriptive statistics for the background data set Navy used (n = 7). For arsenic, these include a mean of 2.6 mg/kg, median of 1.1, and standard deviation of 3.0. Table 2 of Appendix D.2 states that the background soil arsenic data are lognormally distributed and the UPL is 13.0 mg/kg. Mabbett Team has duplicated these results using the n = 7 data set. The ProUCL-calculated mean is 2.634, the median is 1.1, and the standard deviation is 2.951. The data are lognormally distributed according to the goodness-of-fit analysis in ProUCL, and the 95% UPL is 12.95 mg/kg. These results duplicate the values obtained by Navy.

The ProUCL output warns explicitly that a sample size of n = 7 may not be adequate to compute meaningful results and suggests collection of at least 8 to 10 observations. For the n = 7 data set, no non-detects are included but 3 of the values used are estimates (qualified as "J"). The ProUCL Technical Guidance (US EPA, 2010b; p. 17 and elsewhere) specifically recommends collection of at least 8 to 10 *detected* observations. For example, page 22 of the Technical Guidance states:

When BTVs [Background Threshold Values] are not known, it is suggested that at least 8 to 10 (more are preferable) detected representative background observations be made available to compute reasonably reliable estimates of BTVs and other not-to-exceed values.

In addition to replicating Navy's ProUCL results for n = 7, the Mabbett Team also determined the 95% UPL and other upper-bound values for the n = 12 data set. The 95% UPL for this data set is 9.6 mg/kg. For this data set, 3 of the values are estimates and 3 are non-detects (qualified as "U"). These results also carry the ProUCL warning regarding a potentially inadequate number of detected results. In summary, the Mabbett Team suggests that neither of these data sets is sufficiently robust to yield a Background Threshold Value (BTV) that can be used with confidence.

For comparison, the Mabbett Team also examined the n = 18 data set in order to maximize the number of detected arsenic values for ProUCL analysis, regardless of the presence of other contaminants. The range of arsenic values in the contaminated samples (0.95 mg/kg to 3.4 mg/kg) is within the range of values (0.59 mg/kg to 8.1 mg/kg) in the uncontaminated samples, as shown on Figure 1 (below). This observation suggests that the presence of PCBs, pesticides, and other contaminants has not biased the distribution of arsenic concentrations in the compromised samples.

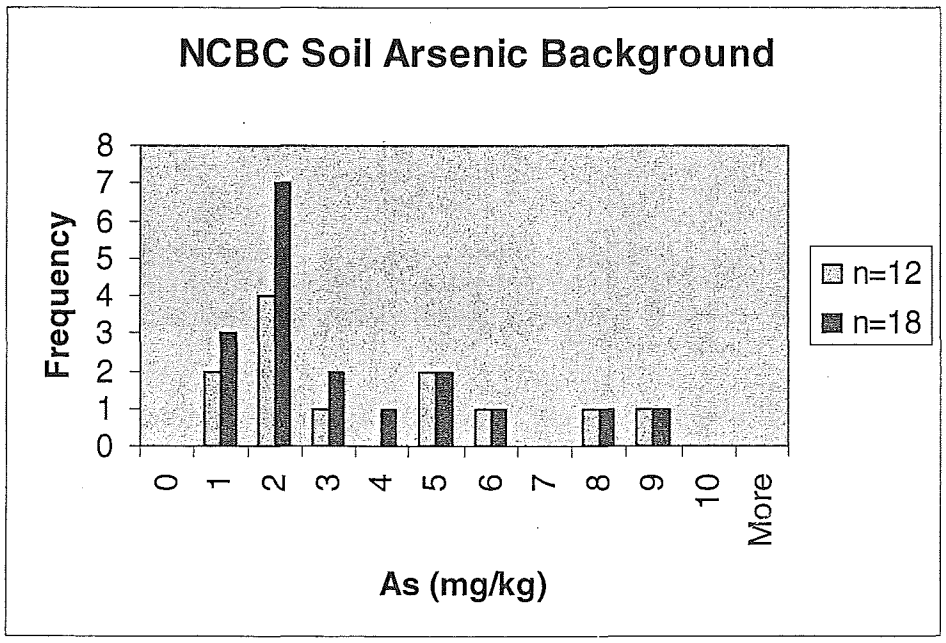

Figure 1. Histogram of NCBC soil arsenic background values with (n = 18) and without (n = 12) 6 samples containing PCBs and other contamination.

The 95% UPL calculated for the n = 18 data set is 6.9 mg/kg. As the number of samples used to calculate upper-bound estimates increases, the UPLs decrease. This observation is consistent with the definition of UPL given above. As the UPL decreases, the number of site samples that will be identified as potentially contaminated, requiring further scrutiny, may increase.

The ProUCL guidance states (for example, on p. xi and elsewhere) that UPLs based on defensible background data can be used as estimates of BTVs, not-to-exceed values, or compliance limits for comparison to site data on a point-by-point basis. However, this document also states (on p. 7 and elsewhere) that two-sample hypothesis testing is preferred for site-to-background comparison and that each of the two populations should have at least 8 to 10 detected observations. The ProUCL guidance states (p. 23):

If a larger number of detected samples (e.g., greater than 8 to10) are available from the site locations representing the site area under investigation (e.g., RU, AOC, EA), then the use of hypothesis testing approaches (both single sample and two-sample) is preferred. The use of a hypothesis testing approach will control the error rates more tightly and efficiently than the individual point-by-point site observations versus BTV comparisons, especially when many site observations are compared with a BTV or a not-to-exceed value.

Navy's background guidance document (Battelle, 2002; Sec. 4.1) also discusses the limitations of comparing site data to a BTV or not-to-exceed value. This document recommends (p. 66-68) that soil background data sets be comparable in size (n = at least 10 and ideally more than 20; p. 66) and from geochemically and anthropogenically similar domains.

In conclusion, Mabbett Team concurs with EPA comments regarding the adequacy of the data set used to compute a soil arsenic background value for NCBC Davisville and the recommendation for two-sample hypothesis testing for site-to-background comparisons. EPA may wish to consider recommending the n = 18 data set for soil arsenic background for the two-sample hypothesis testing approach.

For completeness, this review provides the ProUCL output for background statistics (including UPLs, UTLs, and 95th percentiles), summary statistics, UCLs, goodness-of-fit statistics, and results of outlier testing for n = 7, n = 12, and n = 18. The input file, also provided, contains the data in Table 1 (above). Please refer to data analysis sheets attached to this discussion.

References:

Battelle et al., 2002. Guidance for Environmental Background Analysis, Volume 1. Soil. NFESC User's Guide, UG-2049-ENV. Prepared by Battelle Memorial Institute, Earth Tech, Inc., and NewFields, Inc. for US Navy, April 2002.

Tetra Tech NUS, 2011. Feasibility Study Report for Installation Restoration Program Site 16, Former Naval Construction Battalion Center Davisville, North Kingstown, Rhode Island. February 2011.

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US ACE, 2008. Environmental Statistics. EM-1110-1-4014. Produced by Army Corps of Engineers for US Army. 31 January 2008.

US EPA, 2010a. ProUCL Version 4.00.05 Technical Guide (draft). EPA/600/R-07/041. Produced by Singh, A., Armbya, N., and Singh, A. K., Lockheed Martin Environmental Services for US EPA. May 2010.

US EPA, 2010b. ProUCL Version 4.1 User Guide (draft), Statistical Software for Environmental Applications for Data Sets with and without Nondetect Observations. EPA/600/R-07/041. Produced by Singh, A., Maichle, R., and Armbya, N., Lockheed Martin Environmental Services for US EPA. May 2010.

US Navy, 2011. RTCs Document for Follow-up Comments Received from EPA Region 1 on the Revised Draft FS for IRP Site 16 at the Former NCBC Davisville, Rhode Island. Prepared by D. Barney, BRAC Coordinator, for US EPA Region 1 and RIDEM.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options
From File C:\Users\owner\Documents\Carol\Gannett Fleming\Codes\ProUCL\CLS\Davisville\bg As.wst
Full Precision OFF
Confidence Coefficient 95%
Number of Bootstrap Operations 2000

n=7

General Statistics

Number of Valid Observations	7	Number of Distinct Observations	7
Raw Statistics		Log-transformed Statistics	
Minimum	0.59	Minimum of Log Data	-0.528
Maximum	8.1	Maximum of Log Data	2.092
Mean	2.634	Mean of log Data	0.496
Geometric Mean	1.642	SD of log Data	0.994
Median	1.1		
SD	2.951		
Std. Error of Mean	1.115		
Coefficient of Variation	1.12		
Skewness	1.474		

Warning: A sample size of 'n' = 7 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 7 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.718	Shapiro Wilk Test Statistic	0.835
Shapiro Wilk Critical Value	0.803	Shapiro Wilk Critical Value	0.803
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	4.802	95% H-UCL	12
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	6.5
95% Adjusted-CLT UCL (Chen-1995)	5.133	97.5% Chebyshev (MVUE) UCL	8.249
95% Modified-t UCL (Johnson-1978)	4.905	99% Chebyshev (MVUE) UCL	11.68
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.779	Data appear Lognormal at 5% Significance Level	
Theta Star	3.382		
MLE of Mean	2.634		
MLE of Standard Deviation	2.985		
nu star	10.91		
Approximate Chi Square Value (.05)	4.515	Nonparametric Statistics	
Adjusted Level of Significance	0.0158	95% CLT UCL	4.469
Adjusted Chi Square Value	3.36	95% Jackknife UCL	4.802
		95% Standard Bootstrap UCL	4.29
Anderson-Darling Test Statistic	0.837	95% Bootstrap-t UCL	22.31
Anderson-Darling 5% Critical Value	0.725	95% Hall's Bootstrap UCL	23.4
Kolmogorov-Smirnov Test Statistic	0.359	95% Percentile Bootstrap UCL	4.386
Kolmogorov-Smirnov 5% Critical Value	0.319	95% BCA Bootstrap UCL	4.764
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	7.496
		97.5% Chebyshev(Mean, Sd) UCL	9.599
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	13.73
95% Approximate Gamma UCL (Use when n >= 40)	6.363		
95% Adjusted Gamma UCL (Use when n < 40)	8.551		

Potential UCL to Use Use 95% H-UCL 12
Recommended UCL exceeds the maximum observation

ProUCL computes and outputs H-statistic based UCLs for historical reasons only.
H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.
It is therefore recommended to avoid the use of H-statistic based 95% UCLs.
Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

n=12

General Statistics

Number of Valid Data	12	Number of Detected Data	9
Number of Distinct Detected Data	8	Number of Non-Detect Data	3

		Percent Non-Detects	25.00%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.59	Minimum Detected	-0.528
Maximum Detected	8.1	Maximum Detected	2.092
Mean of Detected	3.099	Mean of Detected	0.686
SD of Detected	3.069	SD of Detected	0.988
Minimum Non-Detect	2.1	Minimum Non-Detect	0.742
Maximum Non-Detect	4.4	Maximum Non-Detect	1.482
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	9
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	3
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	75.00%

Warning: There are only 9 Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.751	Shapiro Wilk Test Statistic	0.861
5% Shapiro Wilk Critical Value	0.829	5% Shapiro Wilk Critical Value	0.829
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	2.774	Mean	0.648
SD	2.697	SD	0.865
95% DL/2 (t) UCL	4.172	95% H-Stat (DL/2) UCL	5.583
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	0.565
		SD in Log Scale	0.871
		Mean in Original Scale	2.631
		SD in Original Scale	2.751
		95% t UCL	4.057
		95% Percentile Bootstrap UCL	3.938
		95% BCA Bootstrap UCL	4.31
		95% H-UCL	5.208
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.917	Data appear Lognormal at 5% Significance Level	
Theta Star	3.379		
nu star	16.51		
A-D Test Statistic	0.837	Nonparametric Statistics	
5% A-D Critical Value	0.739	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.739	Mean	2.603
5% K-S Critical Value	0.285	SD	2.654
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.815
		95% KM (t) UCL	4.067
Assuming Gamma Distribution		95% KM (z) UCL	3.944
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	4.047
Minimum	0.59	95% KM (bootstrap t) UCL	4.981
Maximum	8.1	95% KM (BCA) UCL	4.158
Mean	2.695	95% KM (Percentile Bootstrap) UCL	3.949
Median	1.483	95% KM (Chebyshev) UCL	6.157
SD	2.717	97.5% KM (Chebyshev) UCL	7.694
k star	1.155	99% KM (Chebyshev) UCL	10.71
Theta star	2.333		
Nu star	27.73	**Potential UCLs to Use**	
AppChi2	16.72	95% KM (BCA) UCL	4.158
95% Gamma Approximate UCL (Use when n >= 40)	4.47		
95% Adjusted Gamma UCL (Use when n < 40)	4.845		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). For additional insight, the user may want to consult a statistician.

n=18

General Statistics			
Number of Valid Data	18	Number of Detected Data	15
Number of Distinct Detected Data	13	Number of Non-Detect Data	3
		Percent Non-Detects	16.67%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.59	Minimum Detected	-0.528
Maximum Detected	8.1	Maximum Detected	2.092
Mean of Detected	2.603	Mean of Detected	0.624
SD of Detected	2.462	SD of Detected	0.799
Minimum Non-Detect	2.1	Minimum Non-Detect	0.742

Maximum Non-Detect	4.4	Maximum Non-Detect	1.482
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	15
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	3
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	83.33%
UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.73	Shapiro Wilk Test Statistic	0.905
5% Shapiro Wilk Critical Value	0.881	5% Shapiro Wilk Critical Value	0.881
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	2.469	Mean	0.609
SD	2.267	SD	0.74
95% DL/2 (t) UCL	3.398	95% H-Stat (DL/2) UCL	3.644
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.241	Mean in Log Scale	0.576
SD	4.413	SD in Log Scale	0.734
95% MLE (t) UCL	2.05	Mean in Original Scale	2.403
95% MLE (Tiku) UCL	5.232	SD in Original Scale	2.282
		95% t UCL	3.339
		95% Percentile Bootstrap UCL	3.309
		95% BCA Bootstrap UCL	3.5
		95% H UCL	3.493
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	1.365	Data appear Lognormal at 5% Significance Level	
Theta Star	1.906		
nu star	40.96		
A-D Test Statistic	1.026	Nonparametric Statistics	
5% A-D Critical Value	0.752	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.752	Mean	2.399
5% K-S Critical Value	0.225	SD	2.234
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.549
		95% KM (t) UCL	3.353
Assuming Gamma Distribution		95% KM (z) UCL	3.301
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	3.349
Minimum	0.59	95% KM (bootstrap t) UCL	4.066
Maximum	8.1	95% KM (BCA) UCL	3.412
Mean	2.484	95% KM (Percentile Bootstrap) UCL	3.391
Median	1.596	95% KM (Chebyshev) UCL	4.791
SD	2.253	97.5% KM (Chebyshev) UCL	5.827
k star	1.625	99% KM (Chebyshev) UCL	7.86
Theta star	1.528		
Nu star	58.5	Potential UCLs to Use	
AppChi2	41.92	95% KM (Chebyshev) UCL	4.791
95% Gamma Approximate UCL (Use when n >= 40)	3.467		
95% Adjusted Gamma UCL (Use when n < 40)	3.582		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006). For additional insight, the user may want to consult a statistician.

From File: C:\Users\owner\Documents\Carol\Gannett Fleming\Codes\ProUCL\CLS\Davisville\bg As.wst

Summary Statistics for Raw Data Sets with NDs using Detected Data Only

Raw Statistics using Detected Observations

Variable	Num Ds	NumNDs	% NDs	Minimum	Maximum	Mean	Median	SD	MAD/0.675	Skewness	CV
n=7	7	0	0.00%	0.59	8.1	2.634	1.1	2.951	0.297	1.474	1.12
n=12	9	3	25.00%	0.59	8.1	3.099	1.3	3.069	0.593	0.996	0.99
n=18	15	3	16.67%	0.59	8.1	2.603	1.5	2.462	0.815	1.567	0.946

Outlier Tests for Selected Variables

User Selected Options
From File C:\Users\owner\Documents\Carol\Gannett Fleming\Codes\ProUCL\CLS\Davisville\bg As.wst
Full Precision OFF
Test for Suspected Outliers with Dixon test 1
Test for Suspected Outliers for Rosner test 1

Dixon's Outlier Test for n=7

Number of data = 7
10% critical value: 0.434
5% critical value: 0.507
1% critical value: 0.637

1. Data Value 8.1 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.346

For 10% significance level, 8.1 is not an outlier.
For 5% significance level, 8.1 is not an outlier.
For 1% significance level, 8.1 is not an outlier.

2. Data Value 0.59 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.041

For 10% significance level, 0.59 is not an outlier.
For 5% significance level, 0.59 is not an outlier.
For 1% significance level, 0.59 is not an outlier.

Dixon's Outlier Test for n=12

Number of data = 12
10% critical value: 0.49
5% critical value: 0.546
1% critical value: 0.642

1. Data Value 8.1 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.361

For 10% significance level, 8.1 is not an outlier.
For 5% significance level, 8.1 is not an outlier.
For 1% significance level, 8.1 is not an outlier.

2. Data Value 0.59 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.066

For 10% significance level, 0.59 is not an outlier.
For 5% significance level, 0.59 is not an outlier.
For 1% significance level, 0.59 is not an outlier.

Dixon's Outlier Test for n=18

Number of data = 18
10% critical value: 0.424
5% critical value: 0.475
1% critical value: 0.561

1. Data Value 8.1 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.364

For 10% significance level, 8.1 is not an outlier.
For 5% significance level, 8.1 is not an outlier.
For 1% significance level, 8.1 is not an outlier.

2. Data Value 0.59 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.073

For 10% significance level, 0.59 is not an outlier.
For 5% significance level, 0.59 is not an outlier.
For 1% significance level, 0.59 is not an outlier.

Goodness-of-Fit Test Statistics for Full Data Sets without Non-Detects

User Selected Options	
From File	C:\Users\owner\Documents\Carol\Gannett Fleming\Codes\ProUCL\CLS\Davisville\bg As.wst
Full Precision	OFF
Confidence Coefficient	0.95

n=7

Raw Statistics	
Number of Valid Observations	7
Number of Distinct Observations	7
Minimum	0.59
Maximum	8.1
Mean of Raw Data	2.634
Standard Deviation of Raw Data	2.951
Kstar	0.779
Mean of Log Transformed Data	0.496
Standard Deviation of Log Transformed Data	0.994

Normal Distribution Test Results

Correlation Coefficient R	0.847
Shapiro Wilk Test Statistic	0.718
Shapiro Wilk Critical (0.95) Value	0.803
Approximate Shapiro Wilk P Value	0.00562
Lilliefors Test Statistic	0.389
Lilliefors Critical (0.95) Value	0.335

Data not Normal at (0.05) Significance Level

Gamma Distribution Test Results

Correlation Coefficient R	0.959
A-D Test Statistic	0.837
A-D Critical (0.95) Value	0.725
K-S Test Statistic	0.359
K-S Critical(0.95) Value	0.319

Data not Gamma Distributed at (0.05) Significance Level

Lognormal Distribution Test Results

Correlation Coefficient R	0.917
Shapiro Wilk Test Statistic	0.835
Shapiro Wilk Critical (0.95) Value	0.803
Approximate Shapiro Wilk P Value	0.105
Lilliefors Test Statistic	0.307
Lilliefors Critical (0.95) Value	0.335

Data appear Lognormal at (0.05) Significance Level

Goodness-of-Fit Test Statistics for Data Sets with Non-Detects

User Selected Options
From File C:\Users\owner\Documents\Carol\Gannett Fleming\Codes\ProUCL\CLS\Davisville\bg As.wst
Full Precision OFF
Confidence Coefficient 0.95

n=12

	Num Obs	Num Miss	Num Valid	Detects	NDs	% NDs
Raw Statistics	12	0	12	9	3	25.00%

	Number	Minimum	Maximum	Mean	Median	SD
Statistics (Non-Detects Only)	3	2.1	4.4	3.6	4.3	1.3
Statistics (Detects Only)	9	0.59	8.1	3.099	1.3	3.069
Statistics (All: NDs treated as DL value)	12	0.59	8.1	3.224	1.9	2.685
Statistics (All: NDs treated as DL/2 value)	12	0.59	8.1	2.774	1.5	2.697
Statistics (Normal ROS Estimated Data)	12	0.59	8.1	2.748	1.694	2.693
Statistics (Gamma ROS Estimated Data)	12	0.59	8.1	2.695	1.483	2.717
Statistics (Lognormal ROS Estimated Data)	12	0.59	8.1	2.631	1.226	2.751

	K Hat	K Star	Theta Hat	Log Mean	Log Stdv	Log CV
Statistics (Detects Only)	1.265	1.004	2.451	0.686	0.988	1.441
Statistics (NDs = DL)	1.578	1.239	2.043	0.821	0.896	1.091
Statistics (NDs = DL/2)	1.488	1.172	1.864	0.648	0.865	1.334
Statistics (Gamma ROS Estimates)	1.466	1.155	1.838	--	--	--
Statistics (Lognormal ROS Estimates)	--	--	--	0.565	0.871	1.54

Normal Distribution Test Results

	No NDs	NDs = DL	NDs = DL/2	Normal ROS
Correlation Coefficient R	0.877	0.928	0.862	0.843

	Test value	Crit. (0.05)	Conclusion with Alpha(0.05)
Shapiro-Wilks (Detects Only)	0.751	0.829	Data Not Normal
Lilliefors (Detects Only)	0.342	0.295	Data Not Normal
Shapiro-Wilks (NDs = DL)	0.845	0.859	Data Not Normal
Lilliefors (NDs = DL)	0.246	0.256	Data Appear Normal
Shapiro-Wilks (NDs = DL/2)	0.735	0.859	Data Not Normal
Lilliefors (NDs = DL/2)	0.334	0.256	Data Not Normal
Shapiro-Wilks (Normal ROS Estimates)	0.706	0.859	Data Not Normal
Lilliefors (Normal ROS Estimates)	0.401	0.256	Data Not Normal

Gamma Distribution Test Results

	No NDs	NDs = DL	NDs = DL/2	Gamma ROS
Correlation Coefficient R	0.932	0.965	0.947	0.928

	Test value	Crit. (0.05)	Conclusion with Alpha(0.05)
Anderson-Darling (Detects Only)	0.837	0.739	
Kolmogorov-Smirnov (Detects Only)	0.286	0.285	Data Not Gamma Distributed
Anderson-Darling (NDs = DL)	0.526	0.745	
Kolmogorov-Smirnov (NDs = DL)	0.177	0.249	Data Appear Gamma Distributed
Anderson-Darling (NDs = DL/2)	0.896	0.746	
Kolmogorov-Smirnov (NDs = DL/2)	0.247	0.25	Data appear Approximate Gamma Distribution
Anderson-Darling (Gamma ROS Estimates)	1.295	0.746	
Kolmogorov-Smirnov (Gamma ROS Est.)	0.341	0.25	Data Not Gamma Distributed

Lognormal Distribution Test Results

	No NDs	NDs = DL	NDs = DL/2	Log ROS
Correlation Coefficient R	0.938	0.972	0.952	0.902

	Test value	Crit. (0.05)	Conclusion with Alpha(0.05)
Shapiro-Wilks (Detects Only)	0.861	0.829	Data Appear Lognormal
Lilliefors (Detects Only)	0.229	0.295	Data Appear Lognormal
Shapiro-Wilks (NDs = DL)	0.925	0.859	Data Appear Lognormal
Lilliefors (NDs = DL)	0.178	0.256	Data Appear Lognormal
Shapiro-Wilks (NDs = DL/2)	0.895	0.859	Data Appear Lognormal
Lilliefors (NDs = DL/2)	0.186	0.256	Data Appear Lognormal
Shapiro-Wilks (Lognormal ROS Estimates)	0.808	0.859	Data Not Lognormal
Lilliefors (Lognormal ROS Estimates)	0.303	0.256	Data Not Lognormal

Note: Substitution methods such as DL or DL/2 are not recommended.

n=7

	Num Obs	Num Miss	Num Valid	Detects	NDs	% NDs
Raw Statistics	7	0	7	7	0	0.00%

	Number	Minimum	Maximum	Mean	Median	SD
Statistics (Full: no NDs)	7	0.59	8.1	2.634	1.1	2.951

	K Hat	K Star	Theta Hat	Log Mean	Log Stdv	Log CV
Statistics (Full: no NDs)	1.196	0.779	2.202	0.496	0.994	2.006

Normal Distribution Test Results

	No NDs	NDs = DL	NDs = DL/2	Normal ROS
Correlation Coefficient R	0.847	0.847	0.847	0.847

	Test value	Crit. (0.05)	Conclusion with Alpha(0.05)
Shapiro-Wilks (Full: no NDs)	0.718	0.803	Data Not Normal
Lilliefors (Full: no NDs)	0.389	0.335	Data Not Normal

Gamma Distribution Test Results

	No NDs	NDs = DL	NDs = DL/2	Gamma ROS
Correlation Coefficient R	0.959	0.959	0.959	0.959

	Test value	Crit. (0.05)	Conclusion with Alpha(0.05)
Anderson-Darling (Full: no NDs)	0.837	0.725	
Kolmogorov-Smirnov (Full: no NDs)	0.359	0.319	Data Not Gamma Distributed

Lognormal Distribution Test Results

	No NDs	NDs = DL	NDs = DL/2	Log ROS
Correlation Coefficient R	0.917	0.917	0.917	0.917

	Test value	Crit. (0.05)	Conclusion with Alpha(0.05)
Shapiro-Wilks (Full: no NDs)	0.835	0.803	Data Appear Lognormal
Lilliefors (Full: no NDs)	0.307	0.335	Data Appear Lognormal

Note: Substitution methods such as DL or DL/2 are not recommended.

n=18

	Num Obs	Num Miss	Num Valid	Detects	NDs	% NDs
Raw Statistics	18	0	18	15	3	16.67%

	Number	Minimum	Maximum	Mean	Median	SD
Statistics (Non-Detects Only)	3	2.1	4.4	3.6	4.3	1.3
Statistics (Detects Only)	15	0.59	8.1	2.603	1.5	2.462
Statistics (All: NDs treated as DL value)	18	0.59	8.1	2.769	1.65	2.311
Statistics (All: NDs treated as DL/2 value)	18	0.59	8.1	2.469	1.55	2.267
Statistics (Normal ROS Estimated Data)	18	0.59	8.1	2.47	1.577	2.257
Statistics (Gamma ROS Estimated Data)	18	0.59	8.1	2.484	1.596	2.253
Statistics (Lognormal ROS Estimated Data)	18	0.59	8.1	2.403	1.467	2.282

	K Hat	K Star	Theta Hat	Log Mean	Log Stdv	Log CV
Statistics (Detects Only)	1.651	1.413	1.576	0.624	0.799	1.28
Statistics (NDs = DL)	1.851	1.58	1.496	0.725	0.774	1.069
Statistics (NDs = DL/2)	1.846	1.575	1.337	0.609	0.74	1.215
Statistics (Gamma ROS Estimates)	1.906	1.625	1.303	--	--	--
Statistics (Lognormal ROS Estimates)	--	--	--	0.576	0.734	1.273

Normal Distribution Test Results

	No NDs	NDs = DL	NDs = DL/2	Normal ROS
Correlation Coefficient R	0.857	0.902	0.847	0.84

	Test value	Crit. (0.05)	Conclusion with Alpha(0.05)
Shapiro-Wilks (Detects Only)	0.73	0.881	Data Not Normal
Lilliefors (Detects Only)	0.31	0.229	Data Not Normal
Shapiro-Wilks (NDs = DL)	0.808	0.897	Data Not Normal
Lilliefors (NDs = DL)	0.234	0.209	Data Not Normal
Shapiro-Wilks (NDs = DL/2)	0.718	0.897	Data Not Normal
Lilliefors (NDs = DL/2)	0.29	0.209	Data Not Normal
Shapiro-Wilks (Normal ROS Estimates)	0.707	0.897	Data Not Normal
Lilliefors (Normal ROS Estimates)	0.316	0.209	Data Not Normal

Gamma Distribution Test Results

	No NDs	NDs = DL	NDs = DL/2	Gamma ROS
Correlation Coefficient R	0.953	0.976	0.949	0.945

	Test value	Crit. (0.05)	Conclusion with Alpha(0.05)
Anderson-Darling (Detects Only)	1.026	0.752	
Kolmogorov-Smirnov (Detects Only)	0.262	0.225	Data Not Gamma Distributed
Anderson-Darling (NDs = DL)	0.696	0.754	
Kolmogorov-Smirnov (NDs = DL)	0.195	0.207	Data Appear Gamma Distributed
Anderson-Darling (NDs = DL/2)	1.08	0.754	
Kolmogorov-Smirnov (NDs = DL/2)	0.199	0.207	Data appear Approximate Gamma Distribution
Anderson-Darling (Gamma ROS Estimates)	1.118	0.753	
Kolmogorov-Smirnov (Gamma ROS Est.)	0.229	0.206	Data Not Gamma Distributed

Lognormal Distribution Test Results

	No NDs	NDs = DL	NDs = DL/2	Log ROS
Correlation Coefficient R	0.956	0.978	0.961	0.938

	Test value	Crit. (0.05)	Conclusion with Alpha(0.05)
Shapiro-Wilks (Detects Only)	0.905	0.881	Data Appear Lognormal
Lilliefors (Detects Only)	0.213	0.229	Data Appear Lognormal
Shapiro-Wilks (NDs = DL)	0.945	0.897	Data Appear Lognormal

Lilliefors (NDs = DL)	0.154	0.209	Data Appear Lognormal
Shapiro-Wilks (NDs = DL/2)	0.918	0.897	Data Appear Lognormal
Lilliefors (NDs = DL/2)	0.153	0.209	Data Appear Lognormal
Shapiro-Wilks (Lognormal ROS Estimates)	0.877	0.897	Data Not Lognormal
Lilliefors (Lognormal ROS Estimates)	0.247	0.209	Data Not Lognormal

Note: Substitution methods such as DL or DL/2 are not recommended.

General Background Statistics for Data Sets with Non-Detects

User Selected Options	
From File	C:\Users\owner\Documents\Carol\Gannett Fleming\Codes\ProUCL\CLS\Davisville\bg As.wst
Full Precision	OFF
Confidence Coefficient	95%
Coverage	90%
Different or Future K Values	1
Number of Bootstrap Operations	2000

n=7

General Statistics			
Total Number of Observations	7	Number of Distinct Observations	7
Tolerance Factor	2.755		
Raw Statistics		**Log-Transformed Statistics**	
Minimum	0.59	Minimum	-0.528
Maximum	8.1	Maximum	2.092
Second Largest	5.5	Second Largest	1.705
First Quartile	0.925	First Quartile	-0.0783
Median	1.1	Median	0.0953
Third Quartile	3.4	Third Quartile	0.984
Mean	2.634	Mean	0.496
Geometric Mean	1.642	SD	0.994
SD	2.951		
Coefficient of Variation	1.12		
Skewness	1.474		

Warning: A sample size of 'n' = 7 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 7 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Background Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.718	Shapiro Wilk Test Statistic	0.835
Shapiro Wilk Critical Value	0.803	Shapiro Wilk Critical Value	0.803
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% UTL with 90% Coverage	10.76	95% UTL with 90% Coverage	25.41
95% UPL (t)	8.764	95% UPL (t)	12.95
90% Percentile (z)	6.416	90% Percentile (z)	5.871
95% Percentile (z)	7.488	95% Percentile (z)	8.425
99% Percentile (z)	9.499	99% Percentile (z)	16.59
Gamma Distribution Test		Data Distribution Test	
k star	0.779	Data appear Lognormal at 5% Significance Level	
Theta Star	3.382		
MLE of Mean	2.634		
MLE of Standard Deviation	2.985		
nu star	10.91		
A-D Test Statistic	0.837	Nonparametric Statistics	
5% A-D Critical Value	0.725	90% Percentile	6.54
K-S Test Statistic	0.359	95% Percentile	7.32
5% K-S Critical Value	0.319	99% Percentile	7.944
Data not Gamma Distributed at 5% Significance Level			
Assuming Gamma Distribution		95% UTL with 90% Coverage	8.1
90% Percentile	6.447	95% Percentile Bootstrap UTL with 90% Coverage	8.1
95% Percentile	8.628	95% BCA Bootstrap UTL with 90% Coverage	8.1
99% Percentile	13.79	95% UPL	8.1
		95% Chebyshev UPL	16.38
95% WH Approx. Gamma UPL	10.4	Upper Threshold Limit Based upon IQR	7.113
95% HW Approx. Gamma UPL	10.83		
95% WH Approx. Gamma UTL with 90% Coverage	15.44		
95% HW Approx. Gamma UTL with 90% Coverage	16.85		

General Background Statistics for Data Sets with Non-Detects

User Selected Options	
From File	C:\Users\owner\Documents\Carol\Gannett Fleming\Codes\ProUCL\CLS\Davisville\bg As.wst
Full Precision	OFF
Confidence Coefficient	95%
Coverage	90%
Different or Future K Values	1
Number of Bootstrap Operations	2000

n=9

General Statistics			
Number of Valid Data	12	Number of Detected Data	9
Number of Distinct Detected Data	8	Number of Non-Detect Data	3
Tolerance Factor	2.21	Percent Non-Detects	25.00%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.59	Minimum Detected	-0.528
Maximum Detected	8.1	Maximum Detected	2.092
Mean of Detected	3.099	Mean of Detected	0.686
SD of Detected	3.069	SD of Detected	0.988
Minimum Non-Detect	2.1	Minimum Non-Detect	0.742
Maximum Non-Detect	4.4	Maximum Non-Detect	1.482

Data with Multiple Detection Limits	Single Detection Limit Scenario	
Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect with Single DL	9
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected with Single DL	3
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	75.00%

Warning: There are only 9 Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

Background Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.751	Shapiro Wilk Test Statistic	0.861
5% Shapiro Wilk Critical Value	0.829	5% Shapiro Wilk Critical Value	0.829
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	2.774	Mean (Log Scale)	0.648
SD	2.697	SD (Log Scale)	0.865
95% UTL 90% Coverage	8.734	95% UTL 90% Coverage	12.92
95% UPL (t)	7.815	95% UPL (t)	9.623
90% Percentile (z)	6.23	90% Percentile (z)	5.79
95% Percentile (z)	7.21	95% Percentile (z)	7.927
99% Percentile (z)	9.048	99% Percentile (z)	14.29
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	N/A	Mean in Original Scale	2.631
SD	N/A	SD in Original Scale	2.751
95% UTL with 90% Coverage	N/A	95% UTL with 90% Coverage	12.06
		95% BCA UTL with 90% Coverage	8.05
		95% Bootstrap (%) UTL with 90% Coverage	8.1
95% UPL (t)	N/A	95% UPL (t)	8.963
90% Percentile (z)	N/A	90% Percentile (z)	5.373
95% Percentile (z)	N/A	95% Percentile (z)	7.373
99% Percentile (z)	N/A	99% Percentile (z)	13.35
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.917	Data appear Lognormal at 5% Significance Level	
Theta Star	3.379		
nu star	16.51		
A-D Test Statistic	0.837	Nonparametric Statistics	
5% A-D Critical Value	0.739	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.286	Mean	2.603
5% K-S Critical Value	0.285	SD	2.654
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.815
		95% KM UTL with 90% Coverage	8.469
Assuming Gamma Distribution		95% KM Chebyshev UPL	14.65
Gamma ROS Statistics with Extrapolated Data		95% KM UPL (t)	7.565
Mean	2.695	90% Percentile (z)	6.005
Median	1.483	95% Percentile (z)	6.969
SD	2.717	99% Percentile (z)	8.778
k star	1.155		
Theta star	2.333	Gamma ROS Limits with Extrapolated Data	
Nu star	27.73	95% Wilson Hilferty (WH) Approx. Gamma UPL	8.275
95% Percentile of Chisquare (2k)	6.58	95% Hawkins Wixley (HW) Approx. Gamma UPL	8.416
		95% WH Approx. Gamma UTL with 90% Coverage	10.06
90% Percentile	5.988	95% HW Approx. Gamma UTL with 90% Coverage	10.42
95% Percentile	7.675		
99% Percentile	11.55		

Note: DL/2 is not a recommended method.

General Background Statistics for Data Sets with Non-Detects

User Selected Options	
From File	C:\Users\owner\Documents\Carol\Gannett Fleming\Codes\ProUCL\CLS\Davisville\bg As.wst
Full Precision	OFF
Confidence Coefficient	95%
Coverage	90%
Different or Future K Values	1
Number of Bootstrap Operations	2000

n=18

General Statistics			
Number of Valid Data	18	Number of Detected Data	15
Number of Distinct Detected Data	13	Number of Non-Detect Data	3
Tolerance Factor	1.974	Percent Non-Detects	16.67%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.59	Minimum Detected	-0.528
Maximum Detected	8.1	Maximum Detected	2.092
Mean of Detected	2.603	Mean of Detected	0.624
SD of Detected	2.462	SD of Detected	0.799
Minimum Non-Detect	2.1	Minimum Non-Detect	0.742
Maximum Non-Detect	4.4	Maximum Non-Detect	1.482

Data with Multiple Detection Limits		Single Detection Limit Scenario	
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect with Single DL	15
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected with Single DL	3
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	83.33%

Background Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.73	Shapiro Wilk Test Statistic	0.905
5% Shapiro Wilk Critical Value	0.881	5% Shapiro Wilk Critical Value	0.881
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	2.469	Mean (Log Scale)	0.609
SD	2.267	SD (Log Scale)	0.74
95% UTL 90% Coverage	6.943	95% UTL 90% Coverage	7.922
95% UPL (t)	6.52	95% UPL (t)	6.9
90% Percentile (z)	5.374	90% Percentile (z)	4.746
95% Percentile (z)	6.197	95% Percentile (z)	6.21
99% Percentile (z)	7.742	99% Percentile (z)	10.28

Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.241	Mean in Original Scale	2.403
SD	4.413	SD in Original Scale	2.282
95% UTL with 90% Coverage	8.951	95% UTL with 90% Coverage	7.573
		95% BCA UTL with 90% Coverage	8.1
		95% Bootstrap (%) UTL with 90% Coverage	8.1
95% UPL (t)	8.128	95% UPL (t)	6.603
90% Percentile (z)	5.896	90% Percentile (z)	4.556
95% Percentile (z)	7.499	95% Percentile (z)	5.948
99% Percentile (z)	10.51	99% Percentile (z)	9.807

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	1.365	Data appear Lognormal at 5% Significance Level	
Theta Star	1.906		
nu star	40.96		
A-D Test Statistic	1.026	Nonparametric Statistics	
5% A-D Critical Value	0.752	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.262	Mean	2.399
5% K-S Critical Value	0.225	SD	2.234
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.549
		95% KM UTL with 90% Coverage	6.808
Assuming Gamma Distribution		95% KM Chebyshev UPL	12.4
Gamma ROS Statistics with Extrapolated Data		95% KM UPL (t)	6.391
Mean	2.484	90% Percentile (z)	5.261
Median	1.596	95% Percentile (z)	6.072
SD	2.253	99% Percentile (z)	7.595
k star	1.625		
Theta star	1.528	Gamma ROS Limits with Extrapolated Data	
Nu star	58.5	95% Wilson Hilferty (WH) Approx. Gamma UPL	6.518
95% Percentile of Chisquare (2k)	8.244	95% Hawkins Wixley (HW) Approx. Gamma UPL	6.564
		95% WH Approx. Gamma UTL with 90% Coverage	7.196
90% Percentile	5.076	95% HW Approx. Gamma UTL with 90% Coverage	7.3
95% Percentile	6.3		
99% Percentile	9.051		

Note: DL/2 is not a recommended method.

bg As	D_bg As	Navy As	D_Navy As	bg As all	D_bg As all
0.9	1	0.9	1	0.9	1
0.59	1	0.59	1	0.59	1
1.3	1	1.3	1	3.4	1
1.1	1	0.95	1	2.4	1
5.5	1	1.1	1	1.3	1
7.6	1	5.5	1	1.3	1
4.4	0	8.1	1	0.95	1
4.3	0			1.5	1
8.1	1			1.1	1
2.1	0			1.6	1
1.7	1			5.5	1
1.1	1			7.6	1
				4.4	0
				4.3	0
				8.1	1
				2.1	0
				1.7	1
				1.1	1

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
NEW ENGLAND - REGION I
5 POST OFFICE SQUARE, SUITE 100 (OSRR 07-03)
BOSTON, MASSACHUSETTS 02109-3912

September 26, 2011

Jeff Dale, Dept of the Navy, BRAC PMO Northeast
Code 5090 BPMO NE/JD, 4911 South Broad St
Philadelphia, PA 19112-1303

Re: *"Navy Response to EPA Region 1Comments on the Revised Draft Feasibility Study for Site 16"*, dated August 2011 at the Former Davisville Naval Construction Battalion Center (NCBC), Rhode Island

Dear Mr. Dale:

Pursuant to ' 7.6 of the Davisville Naval Construction Battalion Center Federal Facility Agreement dated March 23, 1992, as amended (FFA), the Environmental Protection Agency has reviewed the subject documen and comments are enclosed.

We believe there are several outstanding issues that must be resolved soon in light of the newly agreed to schedule.

#1 the requirement for cleanup of groundwater to drinking water standards must, by definition, include risk based health advisories and maximum contaminant level goals (MCLGs).

#2 LUCs under the MARAD transfer that will be relied upon to protect human health must be included into a decision document.

#3 the groundwater alternative s must be clearly and transparently defined and justified. Please schedule a technical meeting for a more thorough technical discussion of the Navy's groundwater alternatives.

#4 while the use of a waste management unit seems to be agreed upon, the proposed changes to the alternatives have not been provided for EPA review. Please provide.

If you have any questions with regard to this letter, please contact me at (617) 918-1384.

Sincerely,

Christine A.P. Williams, RPM
Federal Facilities Superfund Section

Enclosure

cc: Richard Gottlieb, RIDEM
Dave Barney, BEC (via e-mail only)
Johnathan Reiner, ToNK
Steven King, RIEDC
Bill Brandon, EPA (via e-mail only)
Steve DiMattei, EPA (via e-mail only)
Rick Sugatt, EPA (via e-mail only)
Scott Anderson, Tetra Tech NUS, Inc (via e-mail only)

p. 1, N.Resp.Cmt. 2 In the first paragraph regarding the Navy's ARARs comment – solid or hazardous waste landfill standards may be relevant and appropriate for the site, if waste is going to be left in place under a cap/cover. Some, but not all, of the landfill provisions may be relevant and appropriate, particularly if the waste is debris that was buried on site (such as from filling wetlands). However, the waste does not need to be capped/covered under landfill standards to be a "waste management unit," rather the cap/cover could be compliant with the RI Remediation Regulations (if the cap/cover meets the Regulations risk-based standards).

p. 2, N.Resp.Cmt. 2 While the proposed cover design may be compliant with direct contact standards, it also needs to meet leachability standards, if they apply. They would apply if the contaminants in the vadose zone potentially could cause a risk by migration into the harbor in the future. A contingency remedy needs to be included in the ROD to ensure a remedy is agreed to if contaminants in the vadose zone above leachability criteria now then migrate to the harbor in the future and cause a risk to the flora or fauna in the nearshore.

p. 7 and p. 12, Response to Comment No. 7 and to Additional EPA General Comment No. 5: Decisions related to PFOS/PFOA can be made after review of forthcoming data.

p. 4,N Respt Cmt 8 A more transparent approach to adding contingency to remediation estimates (such as adding a contingency percentage to treatment costs due to uncertainty in treatment area extent and concentration) would allow for better transparency and consistency when comparing between alternatives. It is acknowledged that some groundwater treatment alternatives costs are less sensitive to over-estimates of contaminant mass, such as in-situ chemical oxidation which is driven often by total oxidant demand from non-target naturally-occurring compounds and overall size of the treatment area. However, the extent of the treatment area also appears to be overestimated by the Navy, leading to larger than necessary treatment networks (i.e. more extraction wells, injections points, or treatment barriers) under all treatment alternatives. While the RI/FS process is intended to assist with programming of remediation budgets, its primary task in regards to cost is to provide a means for comparison of alternatives. The Navy's approach to building conservatism into each treatment alternative has not allowed for appropriate comparison of the viable alternatives.

p. 15, N.Resp.Cmt. 9 The source of the contamination does not preclude CERCLA liability, so is the PAHs are from asphalt or building debris that has been used as fill at the Site by the Navy historically, the Navy is still responsible for addressing the material under CERCLA. The material does not have to come from a "release from specific units or processes associated with past Navy operations," the filling/disposal of material in the area is a "past Navy operation." Was the asphalt or building debris used as fill in this area?

p. 15, N.Resp.Cmt. 10 A release from "the immediate vicinity of the Sea Freeze building" is still under CERCLA jurisdiction for this Site even though it may not be associated with "the Site 16 CVOC plume." Any releases from within the operable unit that pose a CERCLA risk need to be addressed by the alternatives in this FS. It is understood that this part of the plume is a distal part and that Navy alternatives include MNA to cleanup the distal parts of the plume.

p. 15, N.Resp.Cmt. 13 Although the Navy believes it is premature to make a determination about whether the engineered drainage system affects shallow groundwater, a determination needs to be made as some point in the CERCLA process. If pre-ROD the role of the drainage system in affecting groundwater contamination

needs to be addressed by the proposed alternatives. If the question is left post-ROD to the remedial design stage, then a determination that the drainage system needs to be addressed by the remedy could require the Navy to issue an additional CERCLA decision document to modify the remedy.

p. 16, N Resp Cmt 15 - 19 The Navy concurred that tighter contours were supported by the data, but that the conservative estimate of potential remediation area was appropriate. However, the Navy's 500 µg/L and 1,000 µg/L isoconcentration contours appear to not accurately depict current VOC concentrations, and therefore overestimate the area of remediation. A clearer approach to adding contingency to remediation estimates (such as a contingency percentage on costs) would allow for better transparency and consistency when comparing between alternatives. Given that conservative estimates were used for both extent and contaminant mass, the degree of conservatism is not always apparent to the reviewer. See also the technical response to General Comment No. 8.

p. 19. N.Resp.Cmt. 24 EPA asked that the sentence be removed because the State's classification of the groundwater as GB has no relevance to the CERCLA remedy. Instead the Navy can state: "Note that Site 16 is located in an area regulated under the Federal Safe Drinking Water Act as a potable aquifer, except where the groundwater is saline. Safe Drinking Water Act regulatory standards (MCLs and non-zero MCLGs), along with Federal risk-based standards, were used in the selection of COCs."

p. 19, N.Resp.Cmt. 26 Change the Navy's proposed text to: "and meet the selected PRGs identified in Table 2-4 outside of any waste management area established as part of the soil remedy." Note also that Table 2-4 needs to be relabeled "Preliminary Remediation Goals/Performance Standards – Groundwater" with a footnote explaining that inside any waste management area the values are Performance Standards and outside the waste management area the values are PRGs.

p. 19, N.Resp.Cmt. 27 The sentence can read: "No RAOs were developed for TPH contamination in soil since CERCLA does not have jurisdiction for TPH. TPH will be addressed separately under State authority."

p.20, N. Resp Cmt 32 The Navy's clarifications addressed validity of development of lead PRG, but not arsenic PRG. The development of a site-specific arsenic background for the site based on collection of 7 samples is not clearly justified. Goodness of fit statistics for the fit of limited background arsenic soil data to a log-normal distribution were not provided, and alternative probability distributions where not presented for the data (which may fit the data better). As such the validity of the fit of the data to this distribution and subsequent use of the log-normal distribution is not fully supported. The use of the Upper Prediction Limit as a PRG rather than the 95% Upper Confidence Limit of the mean (as is done in RIDEM background development) should also be justified further.

p.21, N Resp Cmt 33 The Navy's response does not directly address EPA's concern that the naphthalene background value (500 µg/kg) used as the PRG was not developed based on an EPA-approved method or the site-specific SSL of 18 µg/kg based on leachability. Please address.

p. 22, N.Resp.Cmt. 39 Unclear to EPA what the sentences that we requested removed actually mean. What is the significance of the "relatively high mass" of lead being the reason why the lead is at "environmentally acceptable concentrations." Is the Navy attempting to say: "Although the mass of lead relative to other soil contaminants is high, lead levels do not exceed risk-based standards for unlimited use of the area."

p. 22, N.Resp.Cmt. 41 EPA has determined that Federal Drinking Water (MCLs and non-zero MCLGs) and risk-based standards (Health Advisory for manganese) are the ARARs for groundwater at the Site. They need to be included in Table 2-1 for any groundwater treatment alternatives as cleanup standards and in Table 2-5 as monitoring standards for any alternatives requiring monitoring and institutional controls for areas within the compliance boundary for any waste management areas. Note that the text for these standards in Table 2-5 is incorrect in that groundwater throughout the Site (where soil contamination is being managed in place) will not achieve drinking water standards inside the compliance boundary. Instead, the standards are only used to monitor the areas to ensure that groundwater exceeding the standards does not migrate beyond the compliance boundary.

p.23, Table Use Table text for MCLGs as provided by EPA (see previous comment).

p. 24, 1st Table Use Table text for EPA Health Advisory as provide by EPA (see comment for p. 22, N.Resp.Cmt 41).

p. 24, N.Resp.Cmt. 42. Retain text referring to the 500-year floodplain since the regulation include jurisdiction up to the 500-year flood elevation.

p. 25, N.Resp.Cmt. 44 The Navy's response is inconsistent with its response to Comment 43 in that the Navy agreed to add the Endangered Species Act to address potential sea turtle habitat in Allen Harbor, but states the Fish and Wildlife Coordination Act, which also addresses protecting the aquatic habitat in Allen Harbor is not Applicable. Unless the remediation is outside of the coastal flood zone for the Harbor, include both of these statutes as ARARs.

p. 25, N.Resp.Cmt. 45 EPA's reply to this response is consistent with its previous responses to the Navy regarding groundwater performance standards/PRG and background guidance standards within this document.

Response to EPA Specific Comment No. 46 & 48: concur, provided that this language ("The risk must be evaluated at each well after concentrations of all COCs have decreased below their MCLs." is included in the ROD. EPA reiterates that MCLs are not necessarily considered to be protective if the risk associated with the MCL is higher than EPA's risk management criteria of HQ =1 and cancer risk >1E-04. The NCP requires that remedies achieve both ARARs and protection of human health and the environment.

p. 26, N.Resp.Cmt. 49 As previously noted MCLGs should not be deleted from the Table.

p. 27, N.Resp.Cmt. 50 As previously noted Health Advisories should not be deleted from the Table.

p. 27, N.Resp.Cmt. 51 Sediment monitoring may be required to assess the protectiveness of the groundwater alternatives? How will it be possible to assess any potential risk if contaminants in the vadose zone leach into groundwater at high enough concentrations or site groundwater plumes move out into the Harbor and emerge

into the intertidal or subtidal zone (as occurred at Calf Pasture Point). While there is no current risk from either of these issues, the remedy should include monitoring and a contingency remedy to address any future risk from migration from under the soil cover being proposed.

p.27, N.Resp.Cmt. 52 Any cap/cover installed under the soil alternatives will require storm drainage of some sort. Any cap/cover within the coastal flood zone the cap/cover needs to have drainage that will prevent washout, so these standards need to be complied with.

p. 28, N.Resp.Cmt. 54 Section 3.2 only should cover screening for CERCLA technologies and process options so remove any mention of TPH. If a technology or process option that addresses CERCLA contaminants also addresses TPH that is not a problem but the text shouldn't take into account whether a technology or process option is effective or not in addressing TPH.

p. 29, N Resp Cmt 62 It is unclear to EPA how an effective "cover/containment" remedy can be implemented using newly constructed or existing cover without the integral use of LUCs to ensure the maintenance of such structures. As such, it would appear prudent to add reference to use of LUCs under the containment alternative

p. 29, N.Resp.Cmt. 64 If the Navy decided the add on-site treatment to the remedy after the ROD without evaluating on-site treatment in this FS the Navy would be required to issue a ROD amendment. If on-site treatment is evaluated in this FS the Navy likely would only need to issue an ESD.

p. 30, N.Resp.Cmt. 68, 72, 75, 88-90,114-117,121,122,125, 130, Although EPA withdraws its opposition to including an alternative for MNA in this section given that the Conclusion states that MNA will be used in combination with other process options. Note however that the fourth sentence of the response is inaccurate because the EPA MNA guidance documents EPA policy regarding the use of MNA for CERCLA remedies. Furthermore, the fifth sentence is inaccurate because the Guidance does address what a reasonable time period for MNA is – for example in the first paragraph on page 13 of the Guidance it states: "EPA expects that **MNA will be an appropriate remediation method only where its use will be protective of human health and the environment and it will be capable of achieving site-specific remediation objectives within a timeframe that is reasonable compared to other alternatives."**

However, based on the groundwater data, MNA screening results, and BIOCHLOR modeling results presented, it does not appear that the estimate of the timeframe to achieve the PRGs under alternatives G-2 through G-6 has been done with enough accuracy to warrant that discussion at this point.
Based on a review of the MNA modeling results and groundwater monitoring data for the Site 16, it seems the rate of TCE degradation is overstated by the Navy, and the timeline to site closure under a MNA-only and/or groundwater treatment followed by MNA approach is not able to be accurately estimated by the BIOCHLOR model.
Very limited presence of *cis*-1,2-DCE and vinyl chloride provide the strongest evidence that only insignificant biodegradation is occurring.
The use of site data to calibrate the BIOCHLOR model does not appear to be valid. Firstly, although the model is simplistic it does contain a number of parameters which are calibrated to "fit the data", including rates for longitudinal dispersion, biodegradation of VOCs, and at times seepage rate, and even the input source concentration. With increasing numbers of parameters, more data

points are required to effectively calibrate it, increasing the risk of obtaining a great "data fit" or corroboration but from a meaningless model (one which has extra terms which do not actually have any statistical significance or may interfere with proper calibration of the model).
Typically, this is avoided by using larger data sets, and limiting the number of parameters in a model. Although the model has been calibrated to show the shape of the field data, it does not appear possible to prove the varying of the source concentration, seepage rate, and calibration of longitudinal dispersion or biodegradation rate are valid. In other words, the model has too many parameters and/or input assumptions that can be adjusted/calibrated and not enough data to justify those modeling decisions.
Secondly, the calibration of the model's biodegradation rate does not appear to be valid considering the data used and assumptions made. The biodegradation rate was calibrated using an assumed starting source concentration and one set of groundwater data from approximately 50 years (year 2004) after the release. This is not a sound method as it does not use two data sets separated by time (rather one assumption which is varied based on the best fit of the resulting model and one true data set). This procedure is repeated twice, for a second data set (year 2007), with similar results, which does not make the model any more valid.
The closure timeframes estimates provided by the BIOCHLOR model do not appear valid enough to determine the timeliness of MNA based remedies, and therefore, without further justification MNA is not supported as a viable alternative.
Another approach such as developing a 2-D or 3-D advection and dispersion model (without biodegradation or a very conservative biodegradation rate) based on actual groundwater data (rather than assumed source values) and published parameter values may be more representative of the plume and be more defensible at predicting future timelines to achieve the PRG.
We suggest a technical meeting to more thoroughly discuss this issue.

p. 30, N.Resp.Cmt. 71 The comment does correspond to the text, but the point EPA was not as clear as it could have been. What EPA was attempting to represent is that if the storm sewer has permit limitations (particularly if it is a CSO) the Navy would need to meet pretreatment/discharge standards at the point where the Navy was discharging into the storm sewer, not at the Bay.

p. 31, N.Resp.Cmt. 73 On-site consolidation would not necessarily trigger landfill and on-site disposal facility regulations any more than cover/capping the waste in place. For instance, consolidation could be done under risk-based standards under the R.I. Remediation Regulations, if appropriate.

p. 32, N.Resp.Cmt. 85 Unclear what the subject of the last paragraph (transfer of properties) has to do with the section, which describes what the selected alternatives are (not how they apply to different land uses within the operable unit).

p. 32, N.Resp.Cmt. 86 The No Action Alternative only pertains to CERCLA actions, not outside land use controls that are not incorporated into the CERCLA remedy. The purpose of the No Action Alternative is to compare taking no CERCLA remedial action (other than 5-year reviews) compared with other CERCLA remedial alternatives. For instance under a CERCLA No Action Alternative an active petroleum remediation under State authority could be occurring within an operable unit, but that would have no relevance in the FS to comparing the No Action Alternative to other CERLCA remedial alternatives. The assumption that land use controls managed by previous property transfer agreements will stay in place indefinitely does not

appear to be a valid. While the No Action Alternative does not include the elimination of these controls, there is not any requirement under this alternative that they will remain either. Therefore, the statement that the LUCs will "remain in place" does not appear to be appropriate. The text should be clarified to reflect this uncertainty, or reference to the existing LUCs removed.

p. 33, N.Resp.Cmt.88 In this section remove both the second and fourth sentences since neither existing non-CERCLA land use restrictions no natural attenuation have any relevance to the No Action Alternative, since neither is a remedial component of the alternative.

p. 33, N.Resp.Cmt. 89 Remove the sentence – the only subject that should be discussed regarding meeting NCP standards for this criterion is whether the alternative includes active treatment as a component of the CERCLA remedy, which the No Action Alternative does not.

p. 33, N.Resp.Cmt. 93 Where soil exceeds leachability standards a permeable cover does not meet RI Remediation Standards. In those area either all soil exceeding leachability standards needs to be removed or in impermeable cap meeting RI Remediation Regulation standards (or, in the alternative, relevant and appropriate Solid Waste Landfill cap standards) would be the ARARs that would meet the leachability standard.

p. 33, N.Resp.Cmt. 94 Remove the second sentence since capping is not "treatment" under this criterion. The statement regarding generation of investigation derived waste does not seem pertinent to the section. EPA's request for removing this sentence appears to be appropriate.

p. 34, N.Resp.Cmt. 95 Based on the Navy's response, change the first sentence to: "Overall, the sustainability impact of Alternative S-2 is low to moderate based on sustainability analysis using SiteWise™ (see Appendix H)."

new comment 95A Appendix H, Sustainable Evaluation of Remedial Alternatives: EPA did not complete a detailed technical evaluation of the analysis presented in Appendix H. In general, EPA supports Navy's efforts to evaluate the sustainability of planned remediation efforts and identify opportunities to mitigate environmental impacts of the remediation. EPA agrees that these considerations can be evaluated under the short-term effectiveness criteria. In addition, EPA agrees with Navy's statements to others that "(t)he results presented ...are provided with the intention of giving more information in order to make a more intelligent decision on which treatment to use". Further, EPA suggests that a valuable use of the results presented here will be in the design of the selected remedy to ensure that the drivers of any significant impacts are considered and that those environmental impacts are mitigated to the extent practicable. The Navy's efforts should be consistent with EPA Region 1's Clean and Green Policy issued on February 18, 2010 (http://www.clu-in.org/greenremediation/docs/R1GRPolicy.pdf). In addition, EPA has developed a number of Green Remediation Fact Sheets that provide best management practices (BMPs) for a number of common remediation processes. Navy should consider these as they move forward with the remediation of the NUSC site: excavation and surface restoration (http://www.clu-in.org/greenremediation/docs/GR_Quick_Ref_FS_exc_rest.pdf), bio-remediation (http://www.clu-in.org/greenremediation/docs/GR_factsheet_biorem_32410.pdf), and clean fuel and emission technology (http://www.clu-

in.org/greenremediation/docs/Clean_FuelEmis_GR_fact_sheet_8-31-10.pdf). Review of these BMP fact sheets may provide additional recommendations for reducing the environmental footprint of the remedies that could be added to the Recommendations Section of this analysis.

p. 34, N.Resp.Cmt. 96 The backfill is a cover in all locations where the subsurface soil under the cover poses a CERCLA risk to unlimited use. Note that groundwater monitoring of any area where waste is left in place would be required under waste management ARARs standards even if there was no current groundwater risk requiring a CERCLA groundwater remedy.

p. 34, N.Resp.Cmt. 97 Lead at this site is not naturally occurring. The comment refers to the statement in the sentence that the lead does not pose a CERCLA risk – this is only true if the lead does not pose a risk to unlimited use. Only the pounds of lead that pose a risk should be included in the calculation of contaminants removed under the alternative.

p. 35, N.Resp.Cmt. 100 See EPA's response to N.Resp.Cmt. 93.

p. 35, N.Resp.Cmt. 101 See EPA's response to N.Resp.Cmt. 95.

p. 35, N.Resp.Cmt. 103 If the presence of co-mingled TPH with the CERCLA waste results in higher remedial costs, that added cost for addressing the TPH should not be included in the analysis.

p. 35, N.Resp.Cmt. 104 See EPA's response to N.Resp.Cmt. 96.

p. 35, N.Resp.Cmt. 105 See EPA's response to N.Resp.Cmt. 97.

p. 35, N.Resp.Cmt. 107 See EPA's response to N.Resp.Cmt. 93.

p. 36, N.Resp.Cmt. 108 See EPA's response to N.Resp.Cmt. 95.

p. 36, N.Resp.Cmt. 110 See EPA's response to N.Resp.Cmt. 103.

p. 36, N.Resp.Cmt. 112 See EPA's response to N.Resp.Cmt. 95.

p. 36, N.Resp.Cmt. 113 See EPA's response to N.Resp.Cmt. 103.

p. 37, N.Resp.Cmt. 114, 116, 117, 121,122, 125 See EPA's response to N.Resp.Cmt. 68. A reasonable time for an MNA needs to be compared to active remedies. Outside of any waste management area compliance zone established under the soil alternatives groundwater needs to meet drinking water standards through MNA within a time period comparable to active treatment alternatives. It does not matter that groundwater is currently not being used as a potable water supply (see EPA groundwater remediation guidance).

p. 37, N.Resp.Cmt. 115 See EPA's response to N.Resp.Cmts. 86, 88, and 89.

p. 38, N.Resp.Cmt. 118 See EPA's response to N.Resp.Cmt. regarding the Table 2 ARARs. The revised alternative-specific ARARs tables needs to be provided for EPA to fully comment on.

p. 38, N.Resp.Cmt. 119 The text for the TBC risk guidances Action to Be Taken should state that the No Action Alternative will not meet risks calculated using the guidances. Based on

standards for other CERCLA sites in the Region, if PCBs exceed 1 ppm they require remedial action under TSCA's risk-based standards.

p. 38, N.Resp.Cmt. 120 See EPA's response to N.Resp.Cmts. 41 (regarding both MCLGs and EPA's Health Advisory) and 119.

p. 39, N.Resp.Cmt. 123 EPA will need to review the revised Section 5.0 to determine if the Navy has incorporated all of the issues raised in EPA's responses to the Navy's Response to Comments. The compliance zone around the potential waste management area needs to be delineated to determine where groundwater (outside of the compliance zone and outside of areas with saline groundwater) requires treatment.

p. 39, N.Resp.Cmt. 124 EPA will need to review the revised Tables to determine if the Navy has incorporated all of the issues raised in EPA's responses to the Navy's Response to Comments.

p. 40, N.Resp.Cmt. 126 Note from previous EPA responses that groundwater treatment to federal drinking water standards is only required for groundwater outside of the compliance zone for any waste management area established and outside of any area with saline groundwater (if the groundwater poses a risk to ecological receptors in Allen Harbor, then some additional remediation in saline areas might be required).

p.45, N Resp Cmt 131 It was not EPA's intent to propose a two well approach to capture the contaminant plume down gradient of the former Building 41 area, but rather to question the rationale behind a remedy that requires 45 extraction wells. The equation used by EPA can be sourced from Figure 14 on page 21 of EPA publication 600/R-08/003 (rather than Figure 13 on page 20). As the written and diagrammatic definitions of the variables provided on Figure 14 indicate, Y is the capture zone width from central line of the plume, or half the full width of the capture zone. Thus, the full width (w) of the capture zone will equal 2 x Y. Figure 14 provides formulae for the capture width in terms of Y for both the maximum upgradient capture zone and the capture zone at the extraction well. It is correct that EPA's previous calculation provided the value of the capture width Y for the maximum capture zone rather than at the extraction well itself. If the capture zone immediately adjacent to the extraction well were considered, the total width of the capture zone would be 100.6 feet. It is correct that if the overburden aquifer were homogeneous with no impediments to vertical flow, it would be appropriate to use the full saturated thickness of the aquifer when computing capture zone widths. However, the stratigraphy observed at the site suggests significant hydraulic conductivity contrasts in the overburden that will likely influence the width of a capture zone created by an extraction well, particularly in the area immediately adjacent to the extraction well. While the hydraulic rationale underlying the design of the extraction system considered as a remedial alternative has not been clearly established in the FS, it appears that this design also relies on the screening of extraction wells over discrete depths in an apparent attempt to capture the contaminant plume at isolated depths in the overburden. Thus, the Navy also appears to intend to focus capture on discrete depths rather than the entire saturated overburden. Additional discussion and hydraulic analysis are necessary to justify the assumption that 45 extraction wells are necessary to contain the plume in Site 16 Area. Please schedule a technical meeting to discuss this issue.