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LETTER REGARDING THE TRANSMITTAL OF DRAFT DATA QUALITY OBJECTIVES FOR SITE 34 NSY PORTSMOUTH ME
3/26/2002
TETRA TECH NUS

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PITT-03-2-058

March 26, 2002

Project Number 4089

Ms. Meghan Cassidy
Environmental Protection Agency
Region I (Mail Code: HBT)
1 Congress Street, Suite 1100
Boston, Massachusetts 02114-2023

Mr. Iver McLeod
Maine Department of Environmental Protection
State House Station 17
Augusta, Maine 04333-0017

Reference: Contract No. N62472-90-D-1298 (CLEAN)
Contract Task Order No. 825

Subject: Draft Data Quality Objective (DQO) Data Package, Site 34
Former Oil Gasification Plant, Building 62
Portsmouth Naval Shipyard (PNS), Kittery, Maine

Dear Ms. Cassidy/Mr. McLeod:

On behalf of the U.S. Navy, Tetra Tech NUS, Inc. is pleased to provide to the U.S. Environmental Protection Agency Region I (USEPA) and to the Maine Department of Environmental Protection (MEDEP) 4 copies each of the Draft DQO Data Package for Site 34.

As per the project schedule, comments are requested by **April 10, 2002**.

If additional information is required, please contact Mr. Fred Evans at (610) 595-0567, extension 159.

For the Community Restoration Advisory Board (RAB) members; if you have any comments or questions on these issues, they can be provided to the Navy at a RAB meeting, by calling the Public Affairs office at (207) 438-1140 or by writing to:

Portsmouth Naval Shipyard
Code 106.3R Bldg. 44
Attn: Marty Raymond
Portsmouth, NH 03804-5000

Sincerely,

Pradeep Kumar for

Deborah Cohen, P.E.
Project Manager

DC/kf
Enclosure

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Draft Data Quality Objectives (DQOs) for Site 34
Portsmouth Naval Shipyard, Kittery, Maine

The following provides the Navy's preliminary Data Quality Objectives (DQOs) for the Site Investigation (SI) of Site 34, Former Oil Gasification Plant, at Portsmouth Naval Shipyard (PNS), Kittery, Maine to support a non-time critical removal action for the site. The preliminary DQOs were developed using the U.S. Environmental Protection Agency (USEPA) DQO process. This process requires a concise description of the problem to be solved, a specification of the decisions that must be made to solve the problem and a formulation of the data collection approach necessary to provide inputs for making the decisions. When appropriate, a statistically based specification of the tolerance for making decision errors is also undertaken. For this investigation a statistical approach was not used (see the discussion under DQO step 6).

The Navy's preliminary outputs for DQO steps 1 through 7 are provided herein for review. The DQOs will be revised based on input from the regulators and Restoration Advisory Board (RAB). Once the DQOs for the Site 34 SI are developed, the Quality Assurance Project Plan (QAPP) for the investigation will be prepared.

It is noted that a non-time critical removal action refers to a remedial action taken for a site prior to a final remedial action. Removal alternatives are identified and evaluated in an Engineering Evaluation/Cost Analysis (EE/CA) report. Although it is referred to as a "removal action" alternatives that do not include physical removal of materials can also be considered in the EE/CA. Therefore, in the DQOs for Site 34, "removal action" does not mean physical removal of materials.

Data Quality Objective Step 1: State the Problem

Participants in DQO Development:

- Navy (EFANE): Fred Evans (Remedial Project Manager, Civil Engineer), Jason Speicher (Risk Assessor)
- PNS: Marty Raymond (IRP Coordinator)
- TtNUS (Navy Consultant): Debbie Cohen (Project Manager, DQO lead), Tom Johnston (Lead chemist, DQO Advisor), J.P. Kumar (Engineer), Aaron Bernhardt (Risk Assessor), Angie Scheetz (Project Chemist)

(Additional participants in the DQO development will be added as necessary after the technical meeting on the preliminary DQOs)

Regulatory Environment:

- Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, commonly referred to as Superfund)

Site History:
Site 34 is the location of a former oil gasification process plant. Very limited information is available on the process details. A majority of the history of the site has been obtained from the "Industrial History of Building 62 (Former Gas Manufacturing Plant), by James Dolph and Dennis Turpin, October 1996)" and from general literature describing similar plants that were historically located at several cities around the country. From the 1870s to the early 1900s, the building housed a process that converted kerosene to illuminating gas, which was piped to various locations on the shipyard. Coal was used to provide heat for the process wherein kerosene was subjected to fractional volatilization in equipment called retorts. Tar was produced as a residue from the volatilization process. The heavier fraction of kerosene was deposited in a tar pit within the building. The tar would have contained polycyclic aromatic hydrocarbons (PAHs). Ash, assumed to be from the combustion of coal, is outside the building in an area that is appears to be approximately 100 feet long (along the length of Building 62 and the Building 62 Annex) and 30 feet wide, i.e., up to the edge of the road that runs east-west parallel to the northern side of the buildings. The depth of the ash pile below ground surface is unknown. The ash from coal combustion would likely contain heavy metals from the mineral origin of the coal and PAHs from the partial combustion of coal. A gas purifier may have been used to remove the corrosive gases from the oil gas, which may have led to the production of woodchip waste and limestone waste that would have contained other chemicals such as cyanides, PAHs, and heavy metals.

It is reported by Dolph and Turpin (October 1996) that between 1901 and 1912, the plant was closed and all of the machinery was removed and a concrete floor was laid. This source also reports that between 1915 and 1930, the building was used as a blacksmith shop by the Public Works Department, during which time (in 1919), the building was gutted by a fire. The building is currently used as a bobcat (mini-bulldozer) shop. The annex building is currently used for storage.

In 1997, the Navy contracted Foster Wheeler Environmental Corporation (FWENC) to remove a small quantity of ash observed on the slope behind Building 62. However, after 6 drums of ash were removed, the action was stopped because it became apparent that a much larger quantity of ash was present behind Building 62. The excavation was 6 feet wide by 6 feet long and 2.5 feet deep and ash was visible on all four sidewalls and the base of the excavation. The excavation was covered with a hermculite cover.

Reportedly Building 62 was used for pesticide storage by public works. This activity reportedly occurred after the period when the building was used as a blacksmith shop.

Building 60, located adjacent to the northwest of Building 62, has historically been used for the building of small ships.

Previous Investigations at/offshore of Site 34:

- Estuarine Ecological Risk Assessment (for Operable Unit 4) (sampling in 1991 to 1993) included sampling locations in the offshore area near Site 34 referred to as the Back Channel Area of Concern (AOC).
- In 1998, TtNUS collected two solid samples (one within the ash pile and one soil sample across the road from Building 62). At that time, TtNUS also collected two sediment samples in the intertidal zone.
- Interim Offshore Monitoring (Rounds 1 through 4, 1999 to 2001) includes a monitoring station offshore of Site 34.

The offshore area adjacent to Site 34 is part of the Back Channel AOC of Operable Unit 4 (OU4). Risks associated with OU4 have been evaluated as part of the Human Health Risk Assessment for Offshore Media (HHRA, McLaren/Hart, 1994) and the Estuarine Ecological Risk Assessment (EERA, NCCOSC, 2000). The EERA evaluated OU4 by AOCs. Based on the Interim Record of Decision (ROD) for OU4, only offshore ecological risks pose a potential concern for OU4. Specifically for the Back Channel AOC, intermediate risk to ecological receptors from exposure to sediment was identified. Only one sampling station for the Back Channel AOC was located in the near vicinity of the area offshore of Site 34 and this station was a mussel sampling location (EERA Station 169). The Interim Offshore Monitoring Program (see subsequent discussion of the monitoring program) provides more comprehensive and recent information for the Site 34 offshore area. Therefore, the EERA results are not specifically applicable to the Site 34 investigation.

In 1998, samples were collected at Site 34 and in the intertidal area of Site 34 to support the Navy's relative risk ranking. One sample was collected from the ash, one sample was collected from the soil north of the road on the north side of Building 62, and two sediment samples were collected from the intertidal area. This data is validated and will be used for assessing the nature and extent of contamination.

As part of the interim offshore monitoring program for OU4 (TtNUS, October 1999), it was determined that sediment monitoring was required for OU4. Consideration for locations of IRP sites was used as part of the rationale for location of monitoring stations as part of the program. One monitoring station (MS-01) is located offshore of Site 34. Sediment, mussel, and juvenile lobster samples were collected from this monitoring station in the first 5 rounds of monitoring. The first four rounds of data were evaluated in the Baseline Interim Offshore Monitoring Report. The sediment data from the Rounds 1 through 4 data for monitoring stations in the Site 34 offshore area show exceedances of the Interim Remediation Goals for OU4 (IRGs) for PAHs. Site 34 contamination may be a source of the PAH contamination.

Site Geology/Hydrogeology:

Site-specific information on the site geology and hydrogeology has not been collected. The site is located within 100 feet of the Piscataqua River shoreline; therefore, the groundwater is likely to be tidally influenced. Site 34 is located within the historical area of PNS along the northern shoreline of the original Dennett's Island near the backchannel. Based on the facility-wide investigation performed during the RFI Data Gap (Halliburton NUS, 1995), the ground surface of Dennett's Island slopes moderately from Wyman Avenue toward the backchannel. The approximate elevation of Site 34 is 110 feet (where 100 feet is the mean high water line). Depth to bedrock along original island boundaries is typically 5 to 15 feet. Natural overburden materials are expected to consist of fractured or weathered bedrock, glacial till, or river/tidal deposits. Fresh groundwater is expected to flow from the recharge area located in the central portion of Dennett's Island and discharge to the backchannel. Because Site 34 is located within 100 feet of the backchannel shoreline, the groundwater is expected to be tidally influenced. Brackish to saline groundwater conditions are expected in the overburden groundwater (if present) and shallow bedrock groundwater. Deeper bedrock groundwater is expected to be brackish or saline but depends on the hydraulic connections between the recharge area and the backchannel.

Historical Site Chemical Data:
The sample of the ash/soil material and the sample of the soil from a location within 30 to 40 feet from the north side of the building collected in 1998 were analyzed for Target Contaminant List (TCL) Volatile Organic Compounds (VOCs), TCL Semi-volatile Organic Compounds (SVOCs), Target Analyte List (TAL) metals, cyanide, and pesticides/PCBs. A summary of the data is provided in Table 1, which includes human health risk screening levels and the representative facility background concentrations, which are the 95 percentile Upper Confidence Levels (UCLs) on the mean facility background concentrations.

VOCs were not detected in these samples. Except for 4,4'-DDT none of the other pesticides or PCBs analyzed were detected. The DDT concentrations were 390 µg/kg and 420 µg/kg, which are within the range noted in facility background samples.

Among SVOCs, the most significant detections were PAHs in the range of 1100-180,000 µg/kg in the ash/soil sample, with significantly (one or more orders of magnitude) lower levels of the same compounds in the soil sample. Some of these PAHs are present at concentrations that exceed screening levels noted in Table 1.

Among inorganics, the following metals were detected in the ash/soil sample at concentrations that were significantly (order of magnitude) greater than their respective facility background levels and also exceeded their respective screening levels noted in Table 1: antimony, barium, copper, lead and zinc. Cyanide was not detected in either sample.

During the 1998 sampling event, two samples of intertidal area sediment were also collected and analyzed for the same constituents as the solid samples. No VOCs were detected. No pesticides/PCBs except 4,4'-DDT were detected. DDT was detected only in one sediment sample at 62 µg/kg. Among SVOCs, similar PAHs as those that were detected in the soil samples were also detected in the sediment samples, however at levels that were significantly (order of magnitude or greater) less than their levels in the ash/soil samples. Also, the metals detected at an order of magnitude or lower levels in the sediment samples compared to the ash/soil samples.

As presented in the Baseline Interim Offshore Monitoring Report, PAHs were the only chemicals that exceeded Preliminary Remediation Goals (PRGs) for sediments in the offshore at monitoring station M01 (TtNUS, December 2001). Acenaphthylene exceeded the PRG in Rounds 2, 3, and 4, while fluorene and HMW PAHs exceeded the PRGs only in Round 4. The exceedences of PRGs were based on averaging the PAH concentrations across all three sample locations within that monitoring station. Of the three sample locations at M01, the samples from M01-3 consistently had the greatest PAH levels across all four rounds, although the other two locations at M01 also had elevated PAH levels in some of the rounds. During the development of PRGs, sediment samples were collected from two of the three locations at M01 during Round 2 for toxicity testing (TtNUS, November 2001). Neither sample was toxic in the whole sediment amphipod toxiicity test. However, the sample from M01-3 was toxic in the sediment pore water toxicity test for sea urchin development. The sample from M01-2 was not toxic in the sea urchin development test.

Land Use (current):
PNS is a military facility with restricted access. The current land use for Site 34 is used by Public Works as the bobcat shop and storage. Building 62 (including the annex) is considered a historical building.

Land Use (future):
The site uses are likely to remain as it is currently. However, unrestricted residential, recreational, commercial, or industrial use of the site may be possible scenarios if the Shipyard were to close.

Conceptual Site Model:
A preliminary site visit indicated that the ash pile is mounded along the northern side of the building in between the building wall and street. The southern side of the building is on Smoot Street, which is at a higher elevation than the street on the northern side. The land on the northern side of the street slopes gently towards the shoreline and then steeply to the water's edge at the Back Channel of the Piscataqua River.

Potential contaminant migration mechanisms identified for the site are:
- Erosion of the ash pile particles.
- Groundwater transport if impacted by site sources such as the ash pile.

A conceptual site model for exposure to potential receptors is not being considered at this time because the objective of this investigation is to obtain information to support a non-time critical removal action. The chemical data from sampling residual contamination at the site following the removal action will be considered for development of a conceptual model for exposure to potential receptors.

Problem Statement
- Data on the nature and extent of contamination is needed to support an EE/CA for a removal action of the source area.
  (Primary media of concern are the ash/soil pile, with associated soil contamination as the secondary media.)
- Data on groundwater and sediment are also needed to assess impacts of contaminants on the environment.
  (Secondary media of concern (i.e., media that have potentially been chemically impacted by the source) are groundwater and sediment.)

<u>Data Quality Objective Step 2: State the Decision(s)</u>

Principal Study Questions:

(A) What are the chemical contaminants, where are they present, and what are their concentrations in ash/soil pile and associated contaminated soil at Site 34?

(B) Have groundwater and sediment been impacted by the source(s) at Site 34?

Secondary Study Question:

(A) Is sufficient information available to evaluate alternatives in the EE/CA?

Potential Actions for Principal Questions:

(A) Conduct an EE/CA for the ash/soil. Evaluate the following potential general response actions:

- No Action
- Limited action (monitoring and land use controls)
- Containment
- Excavation and On-site or Off-site Treatment/Disposal
- Insitu Treatment

(B) Estimate the impact of contaminant source(s) on groundwater and sediment. Propose one of the following actions:

- No Action
- Enter the Remedial Investigation/Feasibility Study process

Potential Actions for Secondary Question:

Evaluate the data and all available information and propose one of the following actions:

- Continue with development of the EE/CA
- Recommend further investigation/data collection to support the EE/CA

(Note: If analytical data indicate the necessity, treatability studies may be necessary to complete the EE/CA.)

Decision Statements:

Note: Two principal decision statements are presented below. The term "No Further Action" applies to each decision statement individually. No further action is required at Site 32 as a whole only if *all* decision statements yield an NFA condition.

Principal Decisions

(A) Determine whether the data are sufficient to determine the nature and extent of contamination associated with the soil/ash pile. If it is, then conduct an EE/CA. If not, recommend additional data collection.

(B) Determine whether an impact has occurred to the groundwater at the site and sediment offshore of the site. If it is, then recommend an RI/FS. If not, recommend no further action.

Secondary Decision

(A) Determine whether adequate information is available to conduct an EE/CA. If it is, then conduct the EE/CA, if not then recommend additional data collection. (Note that this decision

will occur in conjunction with the evaluation of the nature and extent information in the principal study decision.)

Data Quality Objective Step 3: Specify Inputs to the Decision(s)

Inputs to Principal Decision:

- Data required for nature and extent of ash contamination determination:
  - Visual identification of the presence of ash
  - Soil chemistry data
    - PAHs and metals, selected samples for pesticides. (Pesticide use at the site occurred after the ash disposal occurred, therefore, pesticides, if present would be outside the ash pile area).
    - No VOCs, PCBs, dioxins, cyanide, or DRO/GRO based on process knowledge and previous data
    - Include existing soil data from 2 locations collected in 1998
- Data required for groundwater and sediment impact assessment:
  - Groundwater chemistry (PAHs, total and dissolved metals), water levels and well stabilization parameters.
  - Use existing sediment data from MS-01 in the Offshore Monitoring Program, no additional samples required
- Use facility background data as one of the components for evaluating nature and extent of contamination for soil and as one of the components for evaluating impacts to groundwater
- Land survey of all sampling locations

Inputs to Secondary Decision:

- Data required to evaluate alternatives in an EE/CA (aside from nature and extent):
  - Bulk density for soil/ash
  - Grain size (sieve analysis) for soil/ash

- If an organic free product is noted in the field, then a sample will be collected for ignitability, BTU content and total petroleum hydrocarbon (TPH) analysis for an indication of potential disposal options.

Sampling and Measurement Methods:

- Sampling:
  - Soil sampling for bulk density requires shelby tubes. All others can be regular split-spoons or macro cores
  - Groundwater sampling from temporary wells (hydro punches) using low-flow purge method

- Analyses:
  CLP methods will be adequate. Detection limits will be compared against human health risk screening levels (discussed under Decision Rules).

Data Quality Objective Step 4: Establish the Study Boundaries

Principal Decision Study Boundaries:

The spatial and temporal boundaries for investigation to obtain the inputs for the principal decision are as follows:
(A) Two populations of ash/soil are expected as noted below:

- Ash pile (sometimes mixed with soil), which should be visually contaminated (dark/burnt, remainders of coal, and debris mixed in with soil) and odoriferous (like coal and phenolic material).
- Soil which could be contaminated with constituents from the ash pile

Investigate lateral distribution:
The ash pile is present in the area immediately adjacent to the northern wall of Building 62. The soil adjacent to the ash pile could be contaminated from the edge of the ash pile to the northern shoreline. It is assumed that this contamination could have spread laterally approximately 10 feet to the east and west of the ash pile. It is also assumed that no impact of chemical contamination from the ash could have occurred on the south side of Building 62, however, it would be worthwhile to confirm this assumption. There are no temporal considerations for investigation of the lateral distribution of contamination.

Investigate vertical distribution:
There is no need for vertical profiling of the ash pile contamination through chemical analysis. However, the contamination in the soil below the ash pile would require profiling. It is assumed that contamination to a depth of 10 feet bgs (the presumed depth to groundwater at low tide) would need to be investigated. Therefore, the samples near the groundwater table would need to be collected at or near the low tide time of the river. The lag time between the groundwater table at the site and the river is expected to be minimal because of the proximity of the site (less than 100 feet away) to the river.

The soil contamination outside the ash pile is expected to be mainly limited to the surface soil. However, because this assumption has a critical bearing on the estimation of the volume of contamination, selected locations will be vertically profiled for contamination up to the depth of the water table to verify the assumption.

(B) Groundwater beneath the building and downgradient of the building will be considered as one population for this investigation to check for impact. Groundwater is expected to be tidally influenced and the diurnal tidal effect on the groundwater is expected to be more significant effect than any seasonal effect. Sampling at low tide is expected to yield contaminant levels more representative of the impact to groundwater than high tide when dilution from surface water instrusion would occur.

Secondary Decision Study Boundaries:
The study boundaries will be within the study boundaries for the principal study decision.

Data Quality Objective Step 5: Decision Rules

Principal Decision Rules:

(Note that the decision rules below are intended to reduce the risk at the site and not for a complete risk assessment, which the Navy might consider if significant residual contamination exists following the removal action)

(A) To determine the extent of ash/soil contamination for the EE/CA, the following rule will apply:

- If both metal and PAH concentrations in samples are distributed such that a boundary of contamination can be determined using "clean" and "dirty" samples, then no further action is needed to determine the extent of ash/soil contamination for the EE/CA. Note that some allowance for professional judgement would be required to make this determination.
  ("Clean" samples are those where both the metal and PAH concentrations are less than selected EE/CA screening levels. "Dirty" samples are those where both the metal and PAH concentrations are greater than selected EE/CA screening levels.)
  Human health risk screening levels such as those presented in Table 1 will be used for the analytical program so that "clean" samples can be included in the risk assessment for the remaining site after the removal action, if necessary.

  Otherwise
  Continue sampling for one more round to determine extent of contamination~~[FIE1]~~

Screening levels for soil will be determined as follows:

- For each carcinogenic chemical, a background comparison (site data set comparison to the facility background data set) will be conducted, then a residential incremental cancer risk of 5×10^{-6} will be used. (This screening level will ensure that the data obtained will help delineate an extent of contamination for the removal action, which will result in residual contamination targeting a cumulative incremental cancer risk of 10^{-5}.). This assumes that two cancer-risk driving chemicals will be identified.
- For non-carcinogenic chemicals, a background comparison (site data set comparison to the facility background data set) will be conducted and a hazard index level of 0.5 will be used (This screening level will ensure that the data obtained will help delineate an extent of contamination for the removal action, which will result in residual contamination targeting a cumulative hazard index of 1.0.). This approach assumes that no more than two non-carcongenic chemicals affecting the same target organ would be identified.

- For lead, a background comparison (site data set comparison to the facility background data set) will be conducted and the mean of the site data will be compared to a screening level. The screening level will be selected to be mid range between residential and industrial screening levels. This screening level will take into account the mean background lead level to ensure that the site-related contamination can be distinguished from background levels at an acceptable level of statistical confidence.

(B) To determine whether an impact has occurred to the groundwater, the following decision rule will apply:

- If any groundwater sample contains a metal or PAH concentration exceeding its screening level with consideration of facility background levels, then recommend further action under an RI/FS. If not, recommend no further action. (The screening level for groundwater will be the lower of a construction worker risk level or an ambient water quality criterion with a dilution factor. The risk level for a construction worker exposure scenario will be developed using an incremental cancer risk of $5x10^{-6}$ for carcinogenic chemicals or a hazard index of 0.5 for non-carcinogenic chemicals. Again, this approach assumes that two cancer-risk driving chemicals and two non-carcinogenic chemicals affecting the same target organ are identified. Tap-water PRGs will not be used because the water is expected to be brackish/saline. For surface water dilution, a dilution factor of 100 is proposed, for screening purposes.

Otherwise
Recommend further data collection to refine the dilution factor for groundwater in surface water, if needed, to establish the need for no further action for groundwater.

Secondary Decision Rules:
To determine whether adequate data has been collected to conduct an EE/CA, the following decision rule applies:

- If a preliminary screening of technologies and process options indicates that an adequate set of alternatives can be developed and evaluated for effectiveness, implementability and cost, then conduct the EE/CA.

Otherwise
Collect additional site-specific data (such as treatability studies) before conducting the EE/CA.

Data Quality Objective Step 6: Establish Decision Error Tolerances
(THIS STEP IS NOT USED FOR THIS PROJECT BECAUSE A BIASED SAMPLING PLAN IS REQUIRED TO MEET THE DECISION INPUTS)

Data Quality Objective Step 7: Sampling Plan Design

It is assumed that the ash is contaminated and must be addressed in the removal action. Therefore, visual evidence of the predominance of ash in any sample is adequate to determine that the sample is contaminated. Based on this conservative assumption, the primary sampling objective is to determine the horizontal and vertical extent of the soil contamination that was caused by the constituents in the ash. Sampling of the ash itself would not be required to determine whether contamination exists. However, sampling of the ash will be required to obtain characteristics to aid in the engineering evaluation of remedial options. The other primary sampling objective is to investigate whether a groundwater contamination has occurred.

A secondary objective is to obtain information to support the EE/CA. The following is a discussion of the sampling and analytical plan. Please refer to the attached Figure 1.

Given the relatively small area covered by the ash pile (approximately 90 feet long x 15 to 30 feet wide), and considering that ash and residue from the operation would have been similar in composition over time, a relatively minor variability in the chemical constituents of the ash may be expected. Further, the soil contamination is assumed to be similar in chemical constituents to the overlying ash. Therefore, a minimal number of sampling locations should be adequate for characterizing the horizontal variability of soil contamination beneath the pile. At 34-SB01, 34-TW05 and 34-SB02, boring will proceed from the top of the ash pile with visual determination of the physical characteristics of the ash, until the underlying soil is encountered. When a visual determination is made that soil has been encountered, then samples of soil will be collected at discrete sampling depths until groundwater is encountered or 10 feet below ground surface (whichever is shallower) for chemical analysis which will be used for vertical "profiling" of contamination. Sampling for engineering parameters to support the EE/CA will also be required, and these are discussed further later on.

Considering typical historical filling and waste disposal practices, it is likely that disposal of the waste occurred adjacent to the building in the beginning of the plant operations and continued in an outwardly direction over time. Visual information of the presence of ash indicates that the disposal did not extend beyond what is currently known to be Storer Street. However, surface soil contamination (in the 0-1 ft bgs depth) has been noted in samples taken from the northern side of this street in 1998, which is expected to have been caused by erosion of the ash pile surface followed by deposition. Therefore, subsurface soil contamination is not expected to be found in the area north of Storer Street, which needs to be verified. Similarly, based on visual information, the ash disposal seems to have ended at a distance of approximately 23 feet beyond the eastern end of Building 62, with a limited area of ash disposal in the space between Building 62 and Building 63. Also based on visual information, the western edge of the ash disposal seems to be near the end of Building 62-Annexe. These four visual observations of the horizontal extent of the ash also need to be verified with samples at 34-SB03, 34-TW04, 34-MW02, and 34-TW-01. Soil samples will be taken at discrete sampling depths until groundwater is encountered or 10 feet below ground surface (whichever is shallower) for chemical analysis, which will be used to verify that the location is "clean". (It is acknowledged that surface soil sampling alone will not suffice at these three locations because contaminants could have leached from the ash and migrated into the subsurface soil while the surface soil may not have been impacted. Therefore, subsurface soil sampling is required at these four locations. The soil sampling interval will begin at the depth where the fraction of ash in comparison to the soil is no longer predominant in a sample.

In order to investigate whether the groundwater has been impacted, the subsurface zone where the most likely location of the source of contamination (i.e., the ash pile) is present will be investigated. Also, a monitoring well will be required in a location upgradient of the source to provide a perspective on the groundwater contamination beneath the source. From past knowledge of hydrogeology at PNS, the general groundwater flow direction is known to be towards the Piscataqua River, and therefore the upgradient monitoring well will be located on the Smoot Street side of Building 62. It is also noted that the groundwater is expected to be tidally influenced at this site because of its proximity (i.e., less than 100 feet) from the shoreline. Therefore, the groundwater flow direction is expected to reverse at high tide. To verify the groundwater flow direction at low tide, additional groundwater elevation information is also required. Three additional monitoring wells will be installed to provide a preliminary plot of the groundwater potentiometric surface and thereby to allow an interpretation of the groundwater

flow direction. Unless a determination has been made that there has been an impact to the groundwater at this site, it is not necessary to install permanent monitoring wells. Moreover, because of the rapidly changing terrain at the proposed locations of some of the monitoring wells (in the ash pile and downgradient), a well point (i.e., a small diameter well of temporary construction using a truck-mounted drill rig) would be easier to install. Therefore, all of the monitoring wells will be installed as temporary well points.

In order to meet the secondary objective, additional sampling locations in a row between the edge of the ash pile and the borings used for profiling will be required. These sampling locations will be used for visual identification of the depth of the ash only, and will terminate when the interface with the soil is encountered. Locations 34-SB04, 34-SB05, 34-SB06, 34-SB07 and 34-SB08 will be used to obtain information that will supplement the visual observations from 34-SB01, 34-TW05 and 34-SB02 to profile the cross-section of the ash pile. For confirmation that the bottom of the ash pile has been encountered, the lack of a predominance of ash in comparison to the soil fraction will be used as the indicator. For engineering parameters, a few samples representative of the ash will be needed. Composite samples from three locations selected in the field to be representative of the variability in type of material will be collected for grain-size (sieve analysis) and intact samples using Shelby tubes will be collected from the same locations for bulk density testing. If adequate recovery cannot be obtained (i.e., 24 inches), then a composite will be taken and laboratory instructed to recompact the material for bulk density measurement. The laboratory will also be instructed to measure a bulk density of the material without compaction or loosely filled container to obtain. The two readings will be used to obtain a range of bulk densities for engineering purposes. If a sample containing a free product is noted (i.e., oily appearance and odor), then that sample will be collected for TPH and BTU content.

The following is a summary of the sampling and analytical rationale (please refer to the conceptual sampling plan depicted in Figure 1):

- 34-SB01, 34-TW05, 34-SB02 will be used for profiling the soil contamination beneath the ash pile. Each location will be used to represent the contamination in approximately one third of the area of contamination. 34-TW05 will be converted to a temporary well. Soil sampling intervals will be as follows: 0-2 feet bgs, 2-4 feet bgs, 4-6 feet bgs, 6-8 feet bgs, 8-10 ft bgs or depth of water table. The sampling depths are considered so that the volume of contaminated material can be calculated under the ash pile within a thickness of approximately 2 feet. The samples will be analyzed for TAL metals and PAHs. The data will not undergo a complete validation for risk assessment purposes. The cost of analysis and data management/reporting for a total of 15 samples from these locations is expected to be relatively minor compared to any remedial action at the site involving excavation or in-situ treatment for the entire area. Therefore, reduction in number of sampling intervals is not required. On the other hand, because of the relatively small area and expected maximum depth of contamination, further refinement of sampling intervals is not warranted.
- 34-SB03, 34-TW04, 34-MW02, 34-TW-01 verification for "clean" by sampling 0-2, 4-6 and 8-10 or depth of water table. TAL metals and PAHs, pesticides will be analyzed in these samples.
- 34-TW03 for 0-2, 2-4, 4-6, 6-8, 8-10 or depth of water table to determine whether deeper contamination exists. TAL metals and PAHs will be analyzed in these samples.
- 34-TW01, 34-TW-02, 34-TW03, 34-TW04 and 34-TW05 will be sampled at low tide. Groundwater samples will be analyzed for TAL metals and PAHs.

Borings 34-SB04, 34-SB05, 34-SB06, 34-SB07 and 34-SB08 will be used to obtain additional information of the profile of the ash thickness using visual inspection for the predominance of ash. Three samples selected to be representative of the variability of the ash from 34-SB04, 34-SB05, 34-SB06, 34-SB07 and 34-SB08 will be collected for sieve analysis and bulk density. The sieve analysis will be conducted on composite samples from the selected borings and bulk density will be an intact (shelby tube) sample collected from the same or different borings. A discretionary sample will be collected for TPH and BTU analyses if a free product is noted.

Table 1

Soil Data for
Site 34 Compared to Screening Levels and Representative Facility Background Levels
Portsmouth Naval Shipyard, Kittery, Maine

Location Sample Depth of Range (ft) Sample Date Matrix	BCSG BC-6203-SS-0001 (0-0.667) 8/5/98 Soil		BCSG BC-6204-SS-0001 (0-1) 8/5/98 Soil		Screening Level[1]	Foot Note Reference	Representative Facility Background Levels
Volatile Organic Compounds (µg/kg)							
1,1,1-TRICHLOROETHANE	11	UJ	11	UJ	100	N	NA
1,1,2,2-TETRACHLOROETHANE	11	UJ	11	UJ	0.2	C	NA
1,1,2-TRICHLOROETHANE	11	UJ	11	UJ	0.9	C	NA
1,1,2-TRICHLOROTRIFLUOROETH	11	UJ	11	UJ	NA	NA	NA
1,1-DICHLOROETHANE	11	UJ	11	UJ	1000	N	NA
1,1-DICHLOROETHENE	11	UJ	11	UJ	3	C	3
1,2-DICHLOROETHANE	11	UJ	11	UJ	1	C	NA
1,2-DICHLOROPROPANE	11	UJ	11	UJ	1	C	NA
2-BUTANONE	11	UJ	11	UJ	730000	Nx0.1	NA
2-HEXANONE	11	UJ	11	UJ	310000	2,Nx0.1	NA
4-METHYL-2-PENTANONE	11	UJ	11	UJ	79000	Nx0.1	NA
ACETONE	11	U	11	U	800	N	ND
BENZENE	11	UJ	11	UJ	2	C	NA
BROMODICHLOROMETHANE	11	UJ	11	UJ	30	C	NA
BROMOFORM	11	UJ	11	UJ	40	C	NA
BROMOMETHANE	11	UJ	11	UJ	10	N	NA
CARBON DISULFIDE	11	UJ	11	UJ	2000	N	NA
CARBON TETRACHLORIDE	11	UJ	11	UJ	3	C	NA
CHLOROBENZENE	11	UJ	11	UJ	70	N	NA
CHLORODIBROMOMETHANE	11	UJ	11	UJ	0.2	C	NA
CHLOROETHANE	11	UJ	11	UJ	3000	C	NA
CHLOROFORM	11	UJ	11	UJ	30	C	NA
CHLOROMETHANE	11	UJ	11	UJ	1200	C	NA
CIS-1,3-DICHLOROPROPENE	11	UJ	11	UJ	0.2	C	NA
ETHYLBENZENE	11	UJ	11	UJ	700	sat	NA
METHYLENE CHLORIDE	43	U	24	U	1	C	2
STYRENE	11	UJ	11	UJ	200	sat	ND
TETRACHLOROETHENE	11	UJ	11	UJ	3	C	8
TOLUENE	11	UJ	11	UJ	600	sat	1
TOTAL1,2-DICHLOROETHENE	11	UJ	11	UJ	NA	NA	NA
TOTAL XYLENES	11	UJ	11	UJ	10000	sat	NA
TRANS-1,3-DICHLOROPROPENE	11	UJ	11	UJ	0.2	C	NA
TRICHLOROETHENE	11	UJ	11	UJ	3	C	NA
VINYL CHLORIDE	11	UJ	11	UJ	0.7	C	NA
Semivolatile Organic Compounds (µg/kg)							
1,2,4-TRICHLOROBENZENE	360	U	360	U	NA	NA	NA
1,2-DICHLOROBENZENE	360	U	360	U	NA	NA	NA
1,3-DICHLOROBENZENE	360	U	360	U	1300	Nx0.1	NA
1,4-DICHLOROBENZENE	360	U	360	U	100	C	67
2,2'-OXYBIS (1-CHLOROPROPANE	360	U	360	U	2900	C	NA
2,4,5-TRICHLOROPHENOL	910	U	910	U	14000	N	NA
2,4,6-TRICHLOROPHENOL	360	U	360	U	8	C	NA
2,4-DICHLOROPHENOL	360	U	360	U	50	N	NA
2,4-DIMETHYLPHENOL	1,100		360	U	400	N	NA
2,4-DINITROPHENOL	910	UJ	910	UJ	10	N	NA
2,4-DINITROTOLUENE	360	U	360	U	0.04	N	NA
2,6-DINITROTOLUENE	360	U	360	U	0.03	N	NA
2-CHLORONAPHTHALENE	360	U	360	U	390000	Nx0.1	NA
2-CHLOROPHENOL	360	U	360	U	200	N	NA
2-METHYLNAPHTHALENE	11,000		1,300		NA		44
2-METHYLPHENOL	480		20	J	800	N	NA
2-NITROANILINE	910	U	910	U	350	Nx0.1	NA
2-NITROPHENOL	360	U	360	U	49000	3,Nx0.1	NA
3,3'-DICHLOROBENZIDINE	360	UJ	1,700	J	0.3	C	NA
3-NITROANILINE	910	UJ	910	UJ	NA		NA
4,6-DINITRO-2-METHYLPHENOL	910	U	910	U	NA		NA
4-BROMOPHENYLPHENYLETHER	360	U	360	U	NA	NA	NA
4-CHLORO-3-METHYLPHENOL	360	UJ	360	UJ	NA		NA
4-CHLOROANILINE	360	U	360	U	30	N	NA
4-CHLOROPHENYLPHENYLETHE	360	U	360	U	NA	NA	NA
4-METHYLPHENOL	1,400		54	J	31000	Nx0.1	NA
4-NITROANILINE	910	UJ	910	UJ	NA		NA
4-NITROPHENOL	910	UJ	910	UJ	49000	Nx0.1	NA
ACENAPHTHENE	28,000		1,100		29000	N	NA
ACENAPHTHYLENE	4,000		1,400		370000	4,Nx0.1	74
ANTHRACENE	360	U	2,200		590	N	62
BENZO(A)ANTHRACENE	85,000	J	9,500		0.08	C	229
BENZO(A)PYRENE	51,000	J	5,300		62	C	263
BENZO(B)FLUORANTHENE	46,000	J	9,000		200	C	1700
BENZO(G,H,I)PERYLENE	3,500	J	360	U	5600	6,Nx0.1	410
BENZO(K)FLUORANTHENE	60,000	J	5,300		2000	C	1100
BIS(2-CHLOROETHOXY) METHAN	360	U	360	U	NA		NA

Table 1

Soil Data for
Site 34 Compared to Screening Levels and Representative Facility Background Levels
Portsmouth Naval Shipyard, Kittery, Maine

Location Sample Depth of Range (ft) Sample Date Matrix	BCSG BC-6203-SS-0001 (0-0.667) 8/5/98 Soil		BCSG BC-6204-SS-0001 (0-1) 8/5/98 Soil		Screening Level[1]	Foot Note Reference	Representative Facility Background Levels
BIS(2-CHLOROETHYL) ETHER	360	U	360	U	0.2	C	NA
BIS(2-ETHYLHEXYL) PHTHALATE	360	U	360	U	35000	C	167
BUTYLBENZYLPHTHALATE	360	U	360	U	810000	N	NA
CARBAZOLE	19,000	J	910		30	C	94
CHRYSENE	83,000	J	11,000		8000	C	1600
DIBENZO(A,H)ANTHRACENE	20,000	J	1,700		62	C	190
DIBENZOFURAN	27,000		870		29000	Nx0.1	NA
DIETHYLPHTHALATE	360	U	360	U	4900000	Nx0.1	NA
DIMETHYLPHTHALATE	360	U	360	U	100000000	max	NA
DI-N-BUTYLPHTHALATE	360	U	30	J	270000	N	100
DI-N-OCTYLPHTHALATE	36,000	UJ	360	U	120000	Nx0.1	100
FLUORANTHENE	170,000	J	10,000		210000	N	1700
FLUORENE	34,000		1,700		28000	N	42
HEXACHLOROBENZENE	360	U	360	U	100	C	NA
HEXACHLOROBUTADIENE	360	U	360	U	100	C	NA
HEXACHLOROCYCLOPENTADIEN	360	U	360	U	10000	N	NA
HEXACHLOROETHANE	360	UJ	360	UJ	20	C	NA
INDENO(1,2,3-CD)PYRENE	38,000	J	6,700		620	C	440
ISOPHORONE	360	U	360	U	30	C	NA
NAPHTHALENE	18,000		820		4000	N	43
NITROBENZENE	360	U	360	U	7	N	NA
N-NITROSO-DI-N-PROPYLAMINE	360	U	360	U	0.002	C	NA
N-NITROSO-DIPHENYLAMINE	360	U	360	U	60	C	NA
PENTACHLOROPHENOL	910	UJ	910	UJ	1	C	NA
PHENANTHRENE	180,000	J	8,700		5600	6,Nx0.1	208
PHENOL	420	J	360	UJ	5000	N	98
PYRENE	140,000	J	20,000		210000	N	1400
Pesticides/PCBs (µg/kg)							
4,4'-DDD	7.3	UJ	7.4	U	800	C	26
4,4'-DDE	7.3	UJ	180		1700	C	580
4,4'-DDT	390	J	420	J	1700	C	680
ALDRIN	99	R	8.9	J	20	C	NA
ALPHA-BHC	3.8	UJ	3.8	U	0.03	C	NA
ALPHA-CHLORDANE	3.8	UJ	8.6	R	500	10,C	NA
AROCLOR-1016	73	UJ	74	U	390	Nx0.1	NA
AROCLOR-1221	150	UJ	150	U	220	C	NA
AROCLOR-1232	73	UJ	74	U	220	C	NA
AROCLOR-1242	73	UJ	74	U	220	C	NA
AROCLOR-1248	73	UJ	74	U	220	C	NA
AROCLOR-1254	73	UJ	74	U	220	C	NA
AROCLOR-1260	73	UJ	74	U	220	C	NA
BETA-BHC	3.8	UJ	3.8	U	0.1	C	NA
DELTA-BHC	3.8	UJ	3.8	UJ	90	7,C	NA
DIELDRIN	7.3	UJ	7.4	U	0.2	C	NA
ENDOSULFAN I	3.8	UJ	3.8	U	900	N	NA
ENDOSULFAN II	7.3	UJ	7.4	U	900	N	NA
ENDOSULFAN SULFATE	7.3	UJ	7.4	U	900	8,N	NA
ENDRIN	7.3	UJ	7.4	U	50	N	NA
ENDRIN ALDEHYDE	7.3	UJ	7.4	U	1800	9,Nx0.1	NA
ENDRIN KETONE	7.3	UJ	7.4	U	NA		NA
GAMMA-BHC (LINDANE)	3.8	UJ	3.8	U	0.5	C	NA
GAMMA-CHLORDANE	3.8	UJ	3.8	U	500	10,C	NA
HEPTACHLOR	3.8	UJ	3.8	U	110	C	NA
HEPTACHLOR EPOXIDE	3.8	UJ	3.8	U	30	C	NA
METHOXYCHLOR	38	UJ	38	U	8000	N	NA
TOXAPHENE	380	UJ	380	U	440	C	NA
Miscellaneous (mg/kg)							
CYANIDE	1	U	1	U	1.1	Nx0.1	NA
Inorganic Compounds (mg/kg)							
ALUMINUM	6,350	J	15,600	J	7600	Nx0.1	20284
ANTIMONY	231	J	12.3	J	0.3	N	4.7
ARSENIC	16.5		17.6		0.39	C	14.3
BARIUM	140		176		82	N	86
BERYLLIUM	0.52	U	0.83		3	N	0.82
CADMIUM	3.6	J	1.1	J	0.4	N	2.1
CALCIUM	2,600	J	6,760	J	NA		2006
CHROMIUM	88		55.7		2	C	68
COBALT	14.7		21.5		470	Nx0.1	11.8
COPPER	317	J	85.4	J	290	Nx0.1	86
IRON	18,500	J	37,000	J	2300	Nx0.1	23479
LEAD	5,450		485		400	5,NA	326

Table 1

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Site 34 Compared to Screening Levels and Representative Facility Background Levels
Portsmouth Naval Shipyard, Kittery, Maine

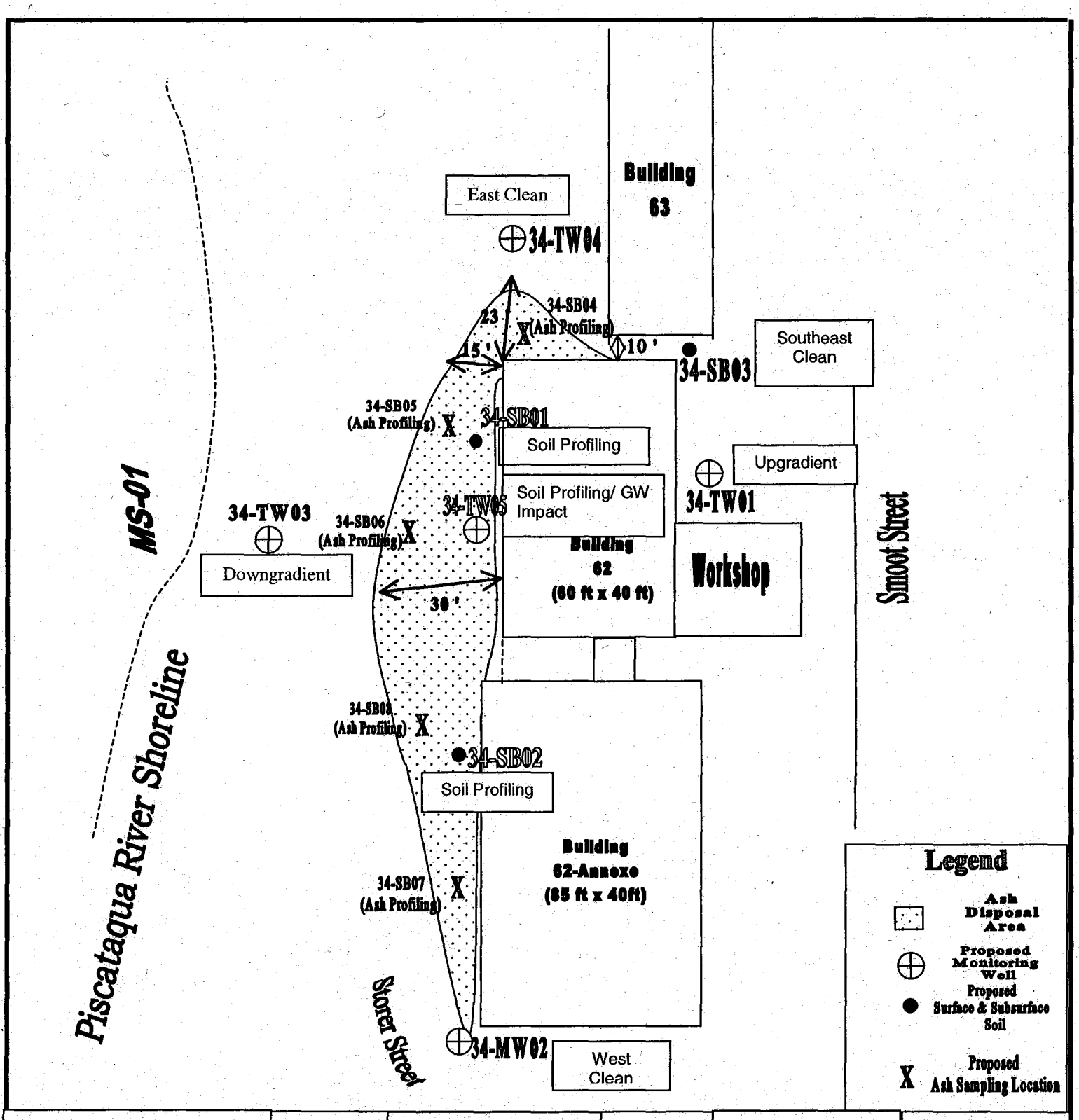
Location Sample Depth of Range (ft) Sample Date Matrix	BCSG BC-6203-SS-0001 (0-0.667) 8/5/98 Soil		BCSG BC-6204-SS-0001 (0-1) 8/5/98 Soil		Screening Level[1]	Foot Note Reference	Representative Facility Background Levels
MAGNESIUM	3,140	J	11,400	J	NA		7948
MANGANESE	178		405		180	Nx0.1	330
MERCURY	1.7	J	0.66	J	2.3	Nx0.1	0.57
NICKEL	26	J	70.7	J	7	N	42
POTASSIUM	1,360		2,880		NA		1772
SELENIUM	1.9	J	0.56	UJ	0.3	N	0.53
SILVER	0.49	U	0.47	U	2	N	NA
SODIUM	141		143		NA		1370
THALLIUM	0.59	UJ	0.57	UJ	0.52	Nx0.1	0.23
VANADIUM	21.9		60.4		55	Nx0.1	57
ZINC	4,190		1,060		230	Nx0.1	150

Source of Representative Facility Background Levels:
"Facility Background Report for Portsmouth Naval Shipyard, Kittery, Maine" TtNUS, INC., May 2000.

IDL Instrument Detection Limit
MDL Method Detection Limit
NA Not Available
ND Not Detected

µg/L = micrograms per liter.
mg/kg = milligrams per kilogram.
mg/L = milligrams per liter.
Blank cell indicates that information is not available or not applicable
PRG = Preliminary Remediation Goal
C= Carcinogen, value presented for the Soil Target Reporting Limit is the SSL
C_{prg}=Carcinogen, value presented for the Soil Target Reporting Limit is the PRG.
N= Non-carcinogen, value presented for the Soil Target Reporting Limit is the SSL
Nx0.1 indicates that the value presented for the Soil/Aqueous Target Reporting Limit is 1/10th of the PRG
sat=Soil saturation, Not a risk based number
max=Ceiling limit, Not a risk based number

1. Lowest of Federal Soil Screening Levels and Region IX Preliminary Remediation Goals (PRGs). Sources are:
   -U.S. EPA Region IX screening criteria [referred to as EPA Region IX Preliminary Remediation Goals (PRGs)] for Residential Soil (U.S. EPA Region IX, November 2000). Please note that 1/10 the PRG for a non-carcinogen value is presented if this value is lower than SSL. This does not apply to PRGs that are not a risk-based number.
   -U.S. EPA Generic SSLs for Migration to Ground Water, dilution attenuation factor = 1 (U.S. EPA, May 1996);
2. EPA Region 3 RBC presented
3. Value for 4-nitrophenol presented
4. Value for acenaphthene presented.
5. 400mg/kg value is based on IEUBK, 1994 model.
6. Value for naphthalene presented
7. Value for alpha-BHC presented
8. Value for Endosulfan presented
9. Value for endrin presented.
10. Value for chlordane presented.



DRAWN BY J.P. Kumar	DATE Feb 12, '02	Tetra Tech NUS, Inc.	CONTRACT NUMBER 825	PROJECT 4089
CHECKED BY	DATE	CONCEPTUAL SITE LAYOUT AND PROPOSED SAMPLING PLAN FOR SITE 34 (BUILDING 62) SITE INVESTIGATION, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE		
NOT TO SCALE			DRAWING NUMBER FIGURE 1	