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July 17, 2009

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Submittal of the Final Site-Specific Work Plan for the
Soil Delineation Investigation at the Pentolite Road Red Water Pond Area
Former Plum Brook Ordnance Works, Sandusky, Ohio
Contract No. W912QR-08-D-0013: Shaw Project Number 132458

Dear Ms. McClanahan:

In accordance with the requirements of Delivery Order No. DX03 of Contract No. W912QR-08-D-0013 Shaw is pleased to submit a final version for the above noted report for Former Plum Brook Ordnance Works located in Sandusky, Ohio.

Enclosed are four copies of the work plan. Control copies of the report have been distributed as shown on the attached page, with an electronic copy being sent to the Center for Expertise and Mr. Mark Bohne, RAB Co-chairperson.

Should you have any questions or require additional information regarding this submittal, please do not hesitate to contact me at (865) 694-7496.

Sincerely,

Steven T. Downey, PE, PMP
Project Manager
Shaw Environmental & Infrastructure, Inc.

Enclosures

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Final
Site-Specific Sampling and Analysis Plan
Addendum to the Sitewide Sampling and Analysis Plan

Soil Delineation Investigation
at the Pentolite Road Red Water Pond Area

Former Plum Brook Ordnance Works, Sandusky, Ohio

Prepared for:

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List of Acronyms

ASTM	American Society for Testing and Materials
DNT	dinitrotoluene
DOD	U.S. Department of Defense
DQO	data quality objective
EPA	U.S. Environmental Protection Agency
FS	feasibility study
IDW	investigation-derived waste
NASA	National Aeronautics and Space Administration
NTCRA	non-time-critical removal action
PARCCS	precision, accuracy, representativeness, completeness, comparability, and sensitivity
PBOW	Plum Brook Ordnance Works
PPE	personal protective equipment
ppm	parts per million
PRRWP	Pentolite Road Red Water Pond
QA	quality assurance
QAPP	quality assurance project plan
QC	quality control
RBDL	risk-based delineation level
RI	remedial investigation
Shaw	Shaw Environmental, Inc.
SSAP	site-specific sampling and analysis plan
SWSAP	sitewide sampling and analysis plan
TNT	trinitrotoluene
USACE	U.S. Army Corps of Engineers

1.0 Project Description

The U.S. Army is conducting studies of the environmental impact of suspected hazardous waste sites at previously owned U.S. Department of Defense (DOD) properties. The former Plum Brook Ordnance Works (PBOW) is located in Sandusky, Erie County, Ohio (Figure 1-1). PBOW is being investigated under the Defense Environmental Restoration Program for Formerly Used Defense Sites. The investigation is being managed and technically overseen by the Nashville and Huntington Districts of the U.S. Army Corps of Engineers (USACE). This 9,000-acre facility was used for the manufacture of explosives during World War II. The site is currently owned by the National Aeronautics and Space Administration (NASA) and is operated as the Plum Brook Station of the John Glenn Research Center at Lewis Field.

This site-specific sampling and analysis plan (SSAP) has been prepared by Shaw Environmental, Inc. (Shaw) for the fieldwork to be carried out in support of the feasibility study (FS) addendum planned for the Pentolite Road Red Water Pond (PRRWP) Area. This SSAP is an addendum to the sitewide sampling and analysis plan (SWSAP) (Shaw, 2008a) and was developed in accordance with the SWSAP and the quality assurance project plan (QAPP) (Shaw, 2008b) to ensure that work performed at the subject site will be of the quality required to satisfy the overall and site-specific project objectives. A sitewide accident prevention/sitewide safety and health plan (Shaw, 2008c) was also prepared for this investigation to help provide a safe work environment.

1.1 PBOW Facility History

The PBOW site was built in early 1941 and manufactured 2,4,6-trinitrotoluene (TNT), dinitrotoluene (DNT), and pentolite. Production of explosives began in December 1941 and continued until 1945. After the plant was shut down, decontamination of TNT, acid, pentolite, and DNT processing lines began; decontamination was completed by the Army during the last quarter of 1945. The property was under the supervision of the Army Ordnance Department. The War Assets Administration accepted custody of the property (3,230 acres) except for the retained area known as the magazine area (2,800 acres) in 1946. The Department of the Army reacquired the 3,230 acres in 1954 and performed cleanup efforts during the 1950s through 1963. Two property use agreements were entered into by the National Advisory Committee of Aeronautics, the predecessor of NASA, and the Army in 1956 and 1958, respectively. In 1963, accountability and custody of the entire PBOW property (6,030 acres) was transferred to NASA by the Department of the Army. NASA has operated and maintained PBOW since 1963, and it is currently the NASA Glenn Research Center, Plum Brook Station.

Figure 1-2 shows various PBOW areas of concern, including the PRRWP Area. The two Red Water Pond Areas are the PRRWP Area and the West Area Red Water Pond Area.

1.2 Pentolite Road Red Water Pond Description and History

The PRRWP is an unlined pond that received waste process water from Wastewater Treatment Plant No. 1 from 1942 to 1945 via an elevated discharge pipe. This waste originated from the TNT manufacturing processes at TNT Area A and TNT Area B. The pond covered an area of 1 to 2 acres during plant operations. In 1977, retention dikes and sump pits were installed at the PRRWP Area in response to reddish-brown water that was observed in an adjacent surface ditch. In April and May 1977, approximately 60,000 gallons of the reddish-brown water were removed, and the original basin was then backfilled. The original pond area was backfilled to a higher elevation than the surrounding area to prevent ponding in the original PRRWP footprint (Dames and Moore, Inc., 1997).

Currently, the PRRWP Area is covered in old field vegetation, scrub/shrub, and moderate forest, with isolated areas of standing water with emergent wetland vegetation. Seasonally ponded areas, which have been observed since the pond was regraded, are present near the PPRWP but outside of the original PRRWP footprint. A drainage ditch, which has been observed as algae covered and containing a few inches of flowing water, is located along the eastern edge of the PRRWP Area. No buildings are present, and the PRRWP Area is not used by NASA.

Focused remedial investigation (RI) sampling at the Red Water Ponds was performed in 1994. A total of 104 soil samples, 7 overburden groundwater samples, and 4 bedrock groundwater samples were collected from both Red Water Pond Areas. Additional samples were collected from only the West Area Red Water Pond Area.

Soil, sediment, surface water, and groundwater sampling was conducted as part of a direct-push investigation conducted in 1998. A total of 20 surface soil, 39 subsurface soil, 20 overburden groundwater, 4 surface water, and 4 sediment samples were collected from the PRRWP Area,. In addition to the samples collected during the focused RI and direct-push investigation, groundwater samples have been collected from overburden and bedrock monitoring wells associated with the PRRWP Area since 1997.

Based on the results of the previous investigations, a focused FS was completed in December 2002 that described a requirement for remediation of soils contaminated with nitroaromatics within the PRRWP Area. Specifically, the focused FS developed and evaluated remedial

alternatives for remediation of primarily TNT-contaminated soil within what was thought to be, based on the RI data, only a small (~ 20-foot-by-20-foot) "hot spot" within the PRRWP Area. A risk-based approach was used to derive a remedial goal (RG) for TNT, which was by far the major contaminant in the original "hot spot" soil. Based on the RI data, it was assumed that once the RG of 13.8 mg/kg was met for TNT that the combined residual risk/hazard of TNT and the other site-related nitroaromatic contaminants would not exceed the risk management levels for cancer risk (i.e., 1E-5 incremental lifetime cancer risk [ILCR]) and noncancer hazard (hazard index [HI] of 1). Note that the based on the RI data, the HI of the residual nitroaromatics (outside of the area interpreted as the "hot spot") not including TNT was 0.6 and the ILCR of these residual nitroaromatics was 8.4E-6 based on the RI data.

An Action Memorandum for a non-time-critical removal action (NTCRA) for PRRWP soils was presented to the public in September 2002, based on the "hot spot" removal approach described in the focused FS. The NTCRA subsequently began in January 2003, and the Action Memorandum was finalized in June 2003. During the NTCRA soil removal, a dark seam of impacted soil was discovered, prompting the need for additional excavation. USACE conducted field-scale and laboratory-scale treatability studies to determine the best approach to address the newly discovered additional contamination at the PRRWP Area. A composting action was selected and began in 2007 and the NTCRA was completed in March 2009. The extent of the NTCRA excavation is depicted on Figure 1-3.

At the completion of the NTCRA, a total of 37 soil samples were collected along the excavation wall, each of which met the RG for TNT. However, during a subsequent review of the soil analytical results from the test pit samples collected along the extent of the NTCRA excavation, it was discovered that the average HI value (of 2) associated with residual soil along the walls of the test pits exceeded the risk management level based on future unrestricted land use. The HI values of specific areas along the perimeter of the NTCRA boundary, which was defined based on meeting the TNT RG, were substantially higher than others. These exceedances of the HI were associated primarily with 1,3-dinitrobenzene, 2-amino-4,6-dinitrotoluene, 4-amino-2,6-dinitrotoluene, but TNT, 2,4-dinitrotoluene (2,4-DNT), and 2,6-dinitrotoluene (2,6-DNT) also contributed to these exceedances. Because areas of the NTCRA perimeter exceeded the risk management criterion of 1, the PRRWP Area could not be considered for no further action. Therefore, the USACE had additional text pits excavated and sampled in May and June 2009 to further delineate the extent of contamination.

Initially, 42 test pits were installed outside of the perimeter of the NTCRA boundary in May/June 2009. These test pits encircle the NTCRA excavation, each being 30 to 60 feet from

the NTCRA perimeter and approximately 20 feet apart with respect to one another, as shown on Figures 1-4 and 1-5. Soil samples were collected from these test pits and sampled for nitroaromatics. Additional contamination was found in these samples. A preliminary risk evaluation using the method described in Section 2.3.5 of this SSAP was performed on these results. Both the cancer risk (ILCR) and noncancer hazard (HI) values associated with these analytical results indicate that levels exceeding the respective risk management levels still exist widely at areas represented by these test pits. The sample-specific ILCR and HI values are shown on Figures 1-4 and 1-5, respectively.

Seventy-seven additional test pits were excavated after collection of the 42 perimeter step-out test pits, chiefly further north and south of the NTCRA boundary. These results indicate an approximate bounding of the contamination south of the perimeter test pits. The northern samples indicate further contamination into a wet area north of the site, though the concentrations in this northern area appear to be lower than many of those among the 42 perimeter step-out test pits. The results of all of these samples test pit samples will be used to better determine the extent of contamination.

Since completion of the NTCRA, this project has returned to the Comprehensive Environmental Response, Compensation, and Liability Act process RI/FS phase. Further delineation of this contamination is required. The findings from the delineation samples collected to date and those that will be collected as the result of the efforts described by this SSAP will be incorporated into the Soil Delineation Report. The results and evaluation of the Soil Delineation Report will be incorporated into the PRRWP Area FS Addendum, the Red Water Pond Areas Proposed Plan, and the Red Water Pond Areas Decision Document.

2.0 Scope of Work and Objectives

2.1 Scope of Work

As specified in the scope of work (USACE, 2009), field activities covered by this SSAP consist of the following tasks:

- Clearing brush necessary to access sampling locations
- Excavating test pits
- Sampling soil from test pits
- Field screening soil samples from all test pits
- Laboratory analysis of soil samples from selected test pits
- Managing and disposing of investigation-derived waste (IDW)
- Preparing and submitting a geographic information system deliverable
- Preparing an electronic data deliverable
- Preparing and submitting a delineation sampling report

The above activities, analytical data, and evaluation will be presented in a PRRWP delineation sampling report.

2.2 Objectives

The primary objective of the PRRWP Area soil delineation investigation is to delineate the extent of contamination outside the NTCRA excavation at the PRRWP Area. Specific objectives of the delineation investigation are summarized as follows:

- Define site physical features and characteristics.
- Determine nature and extent of DOD-related contamination in soil outside the NTCRA excavation in the PRRWP Area.
- Determine chemical characteristics of contamination.
- Obtain site data of quality, quantity, and distribution appropriate for site characterization, risk assessment, and FS.

2.3 Site-Specific Data Quality Objectives

2.3.1 Overview

The data quality objectives (DQO) process followed during the planning stages of the RI evaluated data requirements that are needed to support the decision-making process and select the best action to satisfy these requirements. Incorporated components of the DQO process,

described in Environmental Protection Agency (EPA) publication 9355.9-01, *Data Quality Objectives Process for Superfund* (EPA, 1993), are discussed in detail in Section 3.3 of the SWSAP. Determining factors for procedures necessary to satisfy investigative objectives and to establish the basis of future actions at PBOW are presented on Figure 3-2 of the SWSAP (Shaw, 2008a).

2.3.2 Data Users and Available Data

A site-specific conceptual model (Section 2.3.3) was developed using existing data to help identify data gaps. Essentially, the data gaps were those areas outside of the NTCRA boundary that have not been adequately sampled with respect to extent of contamination. During the project planning process, effective methodologies for filling the data gaps were designed and reviewed by the data users, including the USACE, OEPA, and NASA, with the most efficient data collection design implemented. The SSAP records the rationale for the design, including the location, number, and type of samples necessary to fill the data gaps and to satisfy the DQOs. The SSAP, along with companion documents, provides the regulatory agencies with sufficient detail that they can conclude whether the investigative effort is adequate to satisfy the study objectives.

2.3.3 Conceptual Site Model

Four factors considered in defining the conceptual model (USACE, 2008) for soil delineation investigation are as follows:

- Potential contaminant sources
- Migration pathways
- Potential receptors
- Types of contaminants in affected media.

A source of contamination at PBOW is past TNT manufacturing activities, including the production and storage of raw materials. Sources at the proposed areas of investigation result from TNT and DNT disposal activities. The migration pathways for potential contaminants include groundwater and/or bedrock groundwater, soil, sediment, and surface water runoff to creeks. Potential ecological receptors at the PRRWP Area are wildlife communities, plant communities, and aquatic communities associated with ephemeral surface water. Exposure of human and ecological receptors to media other than soil has been addressed in previous risk assessments (IT, 2000; Shaw, 2006). Only soil outside of the NTCRA boundary may present a risk or hazard. Potential exposure of humans to contaminants in soil outside of the NTCRA boundary under current land use at PBOW is unlikely, because the site is a secure NASA research station and any contamination would be expected to be below the surface, away from

potential contact. The assumption for future land use is unrestricted; thus, future human exposure is possible. Chemicals of potential concern, based on past use of PBOW and existing analytical data, are nitroaromatic explosives.

2.3.4 Decision-Making Process, Data Uses, and Needs

The decision-making process that will be followed during the RI, presented in detail in Section 3.3.4 of the SWSAP (Shaw, 2008a), consists of a seven-step process. Data uses and needs are summarized in Table 2-1.

2.3.5 Risk-Based Evaluation

Risk-based evaluation will be employed as a tool to guide the selection of test pit sample locations. The ultimate purpose of this evaluation is to determine the extent of nitroaromatic-contaminated soil that may require further remediation. Actual estimates of the remedial volumes will be determined in the FS Addendum.

This risk-based evaluation will involve a comparison of the analytical results collected from the test pit soil samples to risk-based delineation levels (RBDL). The RBDLs will be derived from EPA (2004) Region 9 preliminary remediation goals (PRG) for residential soil to be consistent with prior RI/FS work at the PRRWP Area. Two sets of RBDLs will be derived: one based on noncancer hazards and one based on cancer risks. The results of this evaluation will be used to determine whether the residual human health risks associated with a given test pit represents a human health risk within or below the risk management levels, including both noncancer hazards and cancer risks. Alternatively, the risks/hazards associated with a set of adjacent test pit samples may be averaged, based on a determination of their spatial relationship, relative concentrations and possibly other site-specific considerations, to determine whether the location represented is associated with an acceptable risk/hazard.

The risk management level is defined for cancer risks as a combined ILCR that does not exceed 1E-5, and is defined for noncancer hazard as a combined HI that does not exceed a value of 1. These ILCR and HI values will include the contributions of all site-related nitroaromatic contaminants. If the risk or hazard is unacceptable at a given location, additional test pit excavation will be performed further from the original NTCRA excavation in this direction. In the final analysis of the evaluation for a set of adjacent test pits which represent a given area of the perimeter, the total HI and total ILCR values will be rounded to one significant figure. Once a test pit or set of test pits is identified as meeting the risk management levels, no further test pit excavation is required for the represented area. Only definitive data will be used in the risk-based evaluation. These definitive data will be adequate for comparative analysis to the RBDLs

and the ultimate purposes of this evaluation in determining the extent of remediation that may be necessary in the FS Addendum.

2.3.6 Data Quality, Types, and Quantities

Soil samples will be collected and analyzed to meet the objectives of the RI. Quality assurance (QA)/quality control (QC) samples will be collected for all sample types described in Chapter 3.0 of this SSAP (Table 2-2). All samples will be analyzed by EPA-approved methods and will comply with EPA definitive data requirements. In addition to meeting the quality needs of the RI, data analyzed at this level of quality are appropriate for all phases of the RI and risk assessments.

2.3.7 Precision, Accuracy, Representativeness, Completeness, Comparability, and Sensitivity

Laboratory requirements of precision, accuracy, representativeness, completeness, comparability, and sensitivity (PARCCS) for all samples generated during the investigation are provided in Chapter 3.0 of the QAPP (Shaw, 2008b). Tables 7-1 through 7-5 of the QAPP list the laboratory reporting limits (sensitivity). These standard laboratory reporting limits and method detection limits will be identified in the data package. Table 9-1 of the QAPP addresses the laboratory requirements and laboratory QC parameters that affect PARCCS.

3.0 Field Activities

The delineation activities will be consistent with work conducted previously at the PBOW facility. A series of test pits will be excavated around the perimeter of the NTCRA excavation limits to delineate the extent of contamination outside the NTCRA excavation in the PRRWP Area and to provide access to sample associated soil. A soil sample will be collected from each test pit and field screened for nitroaromatics. Test pits with field screening results above action limits will be backfilled, and a new test pit will be excavated at a location stepped out from the perimeter of the NTCRA excavation. Soil samples with field screening results below action limits will be sent for off-site laboratory confirmation analysis for nitroaromatics. Thus, field activities under this SSAP will include the following:

- Clear brush necessary to access test pit locations.
- Excavate up to 300 test pits to delineate the extent of nitroaromatics contamination around the NTCRA excavation.
- Field screen up to 300 soil samples for nitroaromatics.
- Collect 1 soil sample from up to 100 test pit locations for laboratory analysis of nitroaromatics.
- Manage and dispose of IDW.

Shaw will conduct test pit excavation, soil sample collection, and field screening analysis. Any site clearing that may be necessary for equipment access, as well as utility clearances prior to intrusive activities (Section 3.3), will be coordinated with NASA. Also, a dig permit will be coordinated with NASA prior to any intrusive activates. All test pit and sample locations will be sketched and surveyed; land elevations will be surveyed to within $\pm$ 0.01 foot referenced to the National Geodetic Vertical Datum of 1929, and horizontal coordinates will be to the nearest 1 foot and referenced to the Ohio State Plane Coordinate System 1983 North American Datum (Section 3.2). One edge of each test pit location will be surveyed.

A human health risk evaluation of samples from the test pits will be completed. The evaluation will be used to determine when the residential risks at a given test pit (or set of adjacent test pits) represent an acceptable potential human health risk or hazard. Once an acceptable human health risk and hazard are identified for a test pit or set of test pits, no further test pit excavation is required for the represented area. Shaw will use the human health risk evaluation in this manner to determine the limits of unacceptable risk or hazard around the NTCRA excavation area.

3.1 Soil Investigations

Soil samples will be collected in two steps as part of this investigation. First, soil samples will be collected from each test pit excavation and the sample will be field screened for nitroaromatics using EnSys® field test kits for nitroaromatics. Second, if field screening results do not indicate detections of nitroaromatics above risk-based levels, then a soil sample will be collected from the test pit for laboratory analysis (Section 3.1.2). If test kit results indicate elevated levels of nitroaromatics during field screening, then the excavated soil will be returned to the test pit and a new test pit will be excavated at a location stepped out away from the perimeter of the NTCRA excavation. Table 2-2 summarizes the samples and analytical parameters, and Table 3-1 identifies the specific analytical methods. The following table compares the EnSys® field kit detection limits to the minimum RBDL (lower of cancer or non-cancer-based). Note that the test kits provide results only for total nitroaromatics and total DNTs, rather than individual chemicals.

Comparison of Test Kit Detection Limits to Risk-Based Delineation Levels		
Compound	**Max. Detection Limit (ppm)[a]**	**Minimum[b] RBDL (ppm)**
2,4,6-Trinitrotoluene	0.7	16
2,4-Dinitrotoluene	0.5	0.72[c]
2,6-Dinitrotoluene	2.1	0.72[c]
1,3,5-Trinitrobenzene	0.5	--
1,3-Dinitrobenzene	<0.5	6.1
Tetryl	0.9	--
2-Nitrotoluene	>100	--
3-Nitrotoluene	>100	--
4-Nitrotoluene	>100	--
4-Amino-2,6-dinitrotoluene	>100	12[d]
2-Amino-4,6-dinitrotoluene	Not Detected	12[d]
Nitrobenzene	>100	--

RBDL – Risk-based Delineation Level; -- - RBDL not generated for PBOW soil.
[a] EnSys® TNT test kit detection limits, from Strategic Diagnostics, Inc., at http://www.sdix.com/PDF/Products/7002000%20Ensys%20TNT%20ppf.pdf
[b] Lesser of the noncancer (HI=1) and cancer (ILCR=1E-6) RBDL values.
[c] RBDL values for combined 2,4-dinitrotoluene and 2,6- dinitrotoluene.
[d] RBDL values for combined 2,-amino-4,6-dinitrotoluene and 4-amino-2,6- dinitrotoluene.

A qualified geologist or geotechnical engineer will be on site for all excavation and sampling operations. The geologist/geotechnical engineer will perform logging and collect other information, as described in Section 3.1.1. Results of the field screening at each test pit from which a corresponding laboratory analysis sample was collected will be reviewed to ensure that the concentration of nitroaromatics are safe to ship to the laboratory (i.e., nitroaromatics concentrations less than 10 percent). Also, any materials associated with the PRRWP Area that appear to be contaminated will be field screened. Although not expected, if raw explosive material is encountered during soil sampling, all activities will stop, and Shaw will contact USACE to discuss procedures for disposal of the raw explosive material.

3.1.1 Test Pit Excavations and Soil Samples

A total of up to 300 test pits will be dug with an excavator, around the perimeter of the NTCRA excavation. Actual locations of the test pits will be determined in the field to reflect field conditions and observations. The number of test pits required will depend on the number required to delineate the extent of contamination outside the NTCRA excavation as confirmed by laboratory analytical results. It is anticipated that numerous test pits may be excavated before clean soil is found. For planning purposes, a maximum of 300 field screening soil samples will be collected and a maximum of 100 soil samples will be collected from test pits for laboratory analysis. Initial proposed locations are shown on Figures 1-4 and 1-5. These locations may be adjusted based on the screening and/or analytical results of samples collected from adjacent test pits.

Test pits were excavated and sampled in May and June 2009 around the perimeter of the NTCRA boundary, and further north and south, as discussed in Section 1.2 and presented on Figures 1-4 and 1-5. Additional test pits will be excavated and sampled under this SSAP. These test pits will be stepped out a minimum of approximately 30 feet from the May/June 2009 test pits which encircle the NTCRA boundary. Initial proposed test pit locations are depicted on Figures 1-4 and 1-5. It is anticipated that test pits will also be installed at a number of the staked locations shown on Figures 1-4 and 1-5. Actual test pits locations will be selected in the field based on site conditions, such as the potential wet areas further north of the NTCRA perimeter test pits (e.g., test pits 415 through 425 as shown on Figures 1-4 and 1-5), using professional judgment.

Each test pit shall be excavated to a maximum depth of 10 feet below ground surface, or to the water table or bedrock (competent shale), whichever is encountered first. One composite soil sample will be collected from each test pit. That sample will be collected from the far end (with respect to the remediated area) of each test pit. Each sample shall be collected with the

excavator bucket or a hand auger as a composite sample from a depth of 1 foot below ground surface down to the base of the test pit wall.

The geologist/geotechnical engineer will prepare a location sketch map for each soil sample collected for laboratory analysis. The intent of the location sketch map, beyond giving a general location for each sample, is to give enough information that the test pit location may be revisited with the log alone, within approximately 1 foot accuracy. Critical reference points or landmarks shall be included in the sketch maps to aid locating the sample location during a subsequent visit and for better field orientation. A reasonably accurate handheld global positioning system may be used to supplement the sketch, especially for areas that do not have landmarks for reference.

The location of each test pit sample selected for laboratory analysis shall be continuously logged for visual geotechnical classification of the overburden material from ground surface to the bottom of the test pit. The geologist/geotechnical engineer shall visually classify and log all the test pits on USACE ENG Forms 5056-R and 5056A-R according to the Unified Soil Classification System, EM 1110-1-4000, and the USACE Nashville District's *HTRW Design Branch Logging Manual*.

Continuous logging performed by the geologist/geotechnical engineer will include detailed subsurface information from examining contents of the excavator bucket and the sidewalls of the test pit, recording samples, and noting first-encountered and static groundwater levels for each test pit, if encountered. Soil overburden material will be sampled continuously for the purpose of visual classification of the borehole material, but samples will not be saved for geotechnical analysis. Daily field notes will be kept on a field activity daily log and will include sufficient information to reconstruct the progress of excavation, problems encountered, etc. After database entry is completed, all field forms and documents will be archived in the project files at the Shaw office in Knoxville, Tennessee. A copy of borelogs will be included in an appendix to the final delineation report.

Soil samples from each test pit excavation will be field screened for nitroaromatics using a field test kit for nitroaromatics (e.g., EnSys®). Sensitivities of the test kits are presented in Section 3.0. Field screening test kits shall be used prior to sending the samples for laboratory analysis. The purpose of field screening is to identify test pit locations with elevated detections of nitroaromatics from which samples should not be sent for laboratory analysis. Instead, if a field screening test pit sample indicates an elevated concentration of nitroaromatics, another test pit will be excavated that is stepped out further from the NTCRA excavation.

3.1.2 Soil Sampling Procedures

For each test pit from which a soil sample is collected for laboratory analysis, the geologist/geotechnical engineer will visually classify and log all test pit material as described in Section 3.1.1. Soil samples collected for chemical analysis will be documented by sample collection logs and analysis request/chain-of-custody record forms (Figures 4-7 and 6-2 of the SWSAP [Shaw, 2008a]), following field custody procedures specified in Section 5.1 of the QAPP (Shaw, 2008b). Any changes from this SSAP or the SWSAP will be recorded in chronological order in the variance log shown on Figure 9-1 of the SWSAP (Shaw, 2008a).

For test pits from which laboratory analytical samples are collected, the samples will be collected in the appropriate jars prior to lithologic logging. After the sample container has been filled, the jar will be placed on ice in a cooler and the proper paperwork will be completed. Soil samples for laboratory analysis will be handled and packaged as described in Chapter 5.0. All hand sampling equipment that will come in contact with the samples will be decontaminated prior to use and between each sample collected, in accordance with Section 4.3.

After test pit soil sampling is completed, the test pits will be backfilled with the excavated soil. No soil IDW is anticipated to be generated from this activity.

Each of the up to 100 laboratory samples (and 10 duplicates) will be analyzed only for nitroaromatics, using EPA Method SW-846 8330. The analytical results of these samples will be used to determine whether the NTCRA removed all contamination above risk levels or additional removal is necessary to protect human health and the environment.

3.2 Land Surveying

Each laboratory sampling location will be surveyed to establish coordinates and elevations according to EM 1110-1-4000. Shaw will secure the services of an Ohio-registered professional land surveyor following completion of confirmation soil sampling to determine the coordinates and elevations of confirmation test pits. The horizontal coordinates will be to the closest 1 foot and referenced to the Ohio State Plane Coordinate System. Vertical coordinates (ground elevation) will be to the nearest 0.01 foot and referenced to the 1929 National Geodetic Vertical Datum and the horizontal coordinates will reference the 1983 North American Datum. If the 1929 Datum is not readily available, the existing local vertical datum will be used. All survey data will be tabulated. Loop closure for survey accuracy will be within the horizontal and vertical limits given above. Once sample survey information is available, it will be entered on approved Shaw boring logs.

3.3 Utility Clearances

Prior to beginning any intrusive investigation, to fulfill Shaw standard operating procedures and USACE requirements, all sites will be marked for underground utilities by personnel from NASA, Plum Brook Station Health and Safety Division, or other appropriate department.

3.4 Site Access

All Shaw personnel and subcontractors will meet each morning at the NASA Plum Brook Station to attend the morning tailgate safety meeting, calibrate equipment, gather needed material, and replenish water. Therefore, all Shaw personnel and any subcontracted personnel involved must be U.S. citizens. Names of Shaw personnel and Shaw subcontractors will be provided by Shaw to Mr. Robert Lallier, NASA Environmental Coordinator, at least 72 hours in advance so that site access can be arranged. All personnel entering the site will be appropriately trained and instructed by Plum Brook Station concerning site safety issues.

4.0 Sample Analysis and Decontamination Procedures

4.1 Sample Number System

The sample numbering system to be used during this investigation will conform to the USACE Nashville District's numbering convention. Specifically, each sample will be assigned a unique sample identification number that describes where the sample was collected. Each number consists of a group of letters and numbers, separated by hyphens. The sample media and numbering system are described as follows.

Project Code	Year	Sample Type[a]	Site Identification[b]	Location (Well ID)	Sample Number	Depth[c]
PBOW	09	XX	XXXX	XXXX	XXXX	(XXXX)

[a]Sample Type:

SB – subsurface soil sample
MS – matrix spike
MD – matrix spike duplicate

[b]Site identification:

PRRWP – Pentolite Road Red Water Pond

[c]Depth: Indicates depth in feet below ground surface represented by the sampling interval; only required for soil samples.

The complete sample number will be recorded by the Shaw field geologist/geotechnical engineer in the field activity daily log and/or in the boring log, and in the sample collection log as appropriate.

4.2 Analytical Program

The analytical program has been designed to acquire sufficient and defensible data to determine the extent of contamination in the investigated area. Table 3-1 summarizes the analytical parameters required and associated laboratory methods to be used during this investigation.

A contract laboratory will analyze samples for nitroaromatics by EPA Method SW-846 8330. All applicable analyses will meet the recommended method guidance found in *Test Methods for the Evaluation of Solid Waste, Physical/Chemical Methods*, SW-846, Third Edition Update (EPA, 1996) and its subsequent updates. They will meet the QA/QC requirements outlined in EM-200-1-6, *Chemical Quality Assurance for Hazardous, Toxic and Radioactive Waste (HTRW) Projects* (USACE, 1997). The analytical laboratory must comply with *Quality Systems Manual*

for Environmental Laboratories, Final Version 3 (DOD, 2006). All other requested analyses must conform to their specified method(s).

4.3 Decontamination Procedures

Decontamination requirements and procedures are specified in detail in Chapter 5.0 of the SWSAP (Shaw, 2008a) and will be followed during the current investigation. The Shaw field coordinator must contact Plum Brook Station for access to a potable water source to use for decontamination. The following summarizes decontamination procedures for equipment before site entry, between borings, and before site departure:

Nonsampling equipment (e.g., the excavator) that does not contact analytical samples:

- Steam rinse with potable water, or wash and scrub using a brush with nonphosphate detergent and then rinse with potable water.

Equipment that may come in contact with samples for chemical analysis (stainless-steel homogenization bowls, mixing spoons, etc.):

- Wash and scrub using a brush with nonphosphate detergent.
- Rinse with potable water.
- Rinse with American Society for Testing and Materials (ASTM) Type II water.
- Rinse with isopropanol.
- Rinse with ASTM Type II water.
- Final rinse with ASTM Type II water; the volume of water used will be at least five times greater than the volume of hexane used.
- Air dry.
- Wrap in aluminum foil.

Decontamination wash water and rinse water will be managed for disposal as described in Section 6.1.

5.0 Sample Preservation, Packing, and Shipping

Sample containers and caps will be new, certified as precleaned, and made of materials recommended by EPA in Title 40, Code of Federal Regulations, Part 136 and SW-846 (EPA, 1996 [3rd Edition, Update III]). Sample containers and preservatives/preservation methods are summarized in Table 5-1. Sample containers will be supplied and shipped to the job site by the designated primary laboratory.

Each sample container will be bagged before placement in the cooler. Sample holding times will be calculated from the date the sample is collected.

Samples for chemical analysis will be placed on ice in coolers as soon as possible after collection and will be packed to minimize container breakage by using vermiculite, styrofoam peanuts, or bubble wrap to fill void spaces in the cooler. Coolers will be taped, marked, and sealed. Custody will be maintained, as described in Chapter 6.0 of the SWSAP. Samples will be cooled to a temperature of approximately 4 degrees Celsius and maintained at that temperature by means of double-bagged ice until the cooler is received at the laboratory. Coolers will be shipped to the laboratory by a next-day delivery service. The temperature of each cooler will be taken with an infrared thermometer upon receipt. Notification of shipment, including airbill number, will be telephoned or faxed to the laboratory on the day of sample collection. If this is not possible, the laboratory will be notified the following morning.

Completed analytical request/chain-of-custody records will be secured and included with each shipment of coolers to:

ATTN: Sue Bell
Accutest Laboratories
4405 Vineland Road
Orlando, Florida 32811
P: 813-741-3338
F: 813-741-9137
C: 813-992-0090
SueB@accutest.com

6.0 Investigation-Derived Waste Management Plan

Anticipated IDW during field activities includes soil (drill cuttings), decontamination fluid, and disposable personal protective equipment (PPE). Detailed procedures for IDW management are provided in Chapter 8.0 of the SWSAP (Shaw, 2008a). The following is a brief summary of the procedures for handling IDW.

6.1 Decontamination Fluid

Limited quantities of decontamination fluid, including wash water, nonphosphate soapy water, and final rinse water, will be kept in plastic tubs during the decontamination process and placed in 55-gallon drums upon completion of field sampling. Decontamination fluid containing small quantities of solvents such as isopropanol, methanol, and hexane will be collected in metal pans for evaporation.

6.2 Test Kit Sampling Equipment and Personal Protective Equipment

Limited quantities of PPE, test kit sampling equipment, and associated materials will be generated during sampling activities. The PPE includes including Tyvek® suits, nitrile gloves, and disposable rubber overboots. The test kit materials include pipettes, syringes, syringe filters, wooden spatulas, and plastic sample weigh boats. All of the test kit material, except for the syringe filters, will be drained as necessary, and then decontaminated to remove any remaining residue. Liquid waste from the testing will include acetone and developer solution. Liquid waste will be emptied into disposable aluminum pans for evaporation. The syringe filters will be placed into a separate soil IDW drum with the test-kit treated soil as generated waste (see Section 6.3). Other associated materials include plastic sheeting, duct tape, aluminum pans, and paper towels. All of these PPE, test kit sampling, and associated materials will be double-bagged and placed into the on-site Shaw-controlled dumpster.

6.3 Soil and Solids

Solid IDW will include soil samples that have been tested using the field kits and the test kit syringe filters. The soil and syringes will be containerized in a 55-gallon drum or other suitable container and appropriately labeled. At completion of the field effort, the processed soil will be sampled (Section 6.4).

6.4 Investigation-Derived Waste Sampling

All soil IDW will be sampled at the completion of field work. Table 3-1 summarizes the analytical parameters and methods for the IDW samples. For soils, one composite soil sample

will be collected from multiple depths and locations in the storage container to provide a representative composite sample. The composite sample will then be submitted to the identified laboratory for a full toxicity characteristic leaching procedure analysis and nitroaromatics analysis. Seven-day turnaround time will be used, unless otherwise directed by the project manager.

When the analytical results are received, Shaw personnel will evaluate the results and determine off-site disposal methods. Shaw will identify possible disposal facilities; however, USACE is responsible for selecting the facility or facilities to receive the IDW.

7.0 References

Dames and Moore, Inc., 1997, ***Red Water Ponds Focused Remedial Investigation, Final Report, Plum Brook Ordnance Works, Sandusky, Ohio***.

IT Corporation, 2000, ***Risk Assessment and Direct-Push Investigation of Red Water Pond Area, Final, Former Plum Brook Ordnance Works, Sandusky, Ohio***, August.

Oak Ridge National Laboratory-U.S. Environmental Protection Agency (EPA), 2008, ***Regional Screening Levels for Chemical Contaminants***, Oak Ridge, Tennessee, online at http://epa-prgs.ornl.gov/chemicals/index.shtml.

Shaw Environmental, Inc. (Shaw), 2008a, ***Site-Wide Sampling and Analysis Plan, Plum Brook Ordnance Works, Sandusky, Ohio,*** July.

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U.S. Army Corps of Engineers (USACE), 2009, ***Modification to Scope of Work Remedial Investigation), Waste Water Sewer Lines Human Health Risk Assessment and Ecological Risk Assessment and Red Water Pond Areas Proposed Plan and Decision Document, Former Plum Brook Ordnance Works (PBOW), Sandusky, Ohio,*** March.

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U.S. Army Corps of Engineers (USACE), 1997, ***Chemical Quality Assurance for Hazardous, Toxic and Radioactive Waste (HTRW) Projects***, EM 200-1-6, October 1997.

U.S. Department of Defense (DOD), 2006, ***Quality Systems Manual for Environmental Laboratories***, Final Version 3, DoD Environmental Data Quality Workgroup, Department of Navy, Lead Service, January.

U.S. Environmental Protection Agency (EPA), 2004, ***Region 9 Preliminary Remediation Goals (PRG) Table,*** Region 9, San Francisco, California, October, http:www.epa.gov/region09/waste/sfund/prg/files/prgtable.pdf.

U.S. Environmental Protection Agency (EPA), 1996, ***Test Methods for the Evaluation of Solid Waste, Physical/Chemical Methods***, EPA Publications SW-0846, Third Edition, Update III, (http://www.epa.gov/sw-846/sw846.htm).

U.S. Environmental Protection Agency (EPA), 1993, ***Data Quality Objectives for Superfund: Interim Final Guidance***, OSWER Directive No. 9355.9-01, Office of Emergency and Remedial Response, Washington, D.C., EPA 540-R-93-071.

TABLES

Table 2-1

Data Quality Objectives
Soil Delineation Investigation
at the Pentolite Road Red Water Pond Area
Former Plum Brook Ordnance Works, Sandusky, Ohio

Potential Data Users	Available Data	Conceptual Model	Media of Concern	Data Uses and Objectives	Data Types to be Collected	Analytical Level
OEPA DOD USACE NASA Shaw Other Contractors Possible Future Land Users	Previous environmental investigations show varying degrees of nitroaromatic contamination in the soil.	Contaminant Source Production of TNT, DNT, and pentolite. Past DOD operations. Migration Pathways Leaking of materials in sewer lines to soil and groundwater. Leaching from soil to groundwater. Potential Contaminants of Concern Nitroaromatic explosives	Soil	Determine nature and extent of DOD-related contamination in soil outside the NTCRA excavation at the PRRWP Area. Determine chemical characteristics of contamination. Evaluate fate and transport of contamination. Obtain site data of quality, quantity, and distribution appropriate for site. Obtain site data of quality, quantity, and distribution appropriate for site characterization, risk assessment, and feasibility study.	Soil Nitroaromatic explosives	Definitive (Analytical) and screening level (EnSys TNT soil test kits)

DOD - U.S. Department of Defense.
EPA - U.S. Environmental Protection Agency.
NTCRA - Non-time-critical removal action.
OEPA - Ohio Environmental Protection Agency.
PRRWP - Pentolire Road Red Water Pond.
USACE - U.S. Army Corps of Engineers
NASA - National Aeronautics and Space Administration.
Shaw - Shaw Environmental, Inc.

*The actual analytical samples and methods planned are described in Table 2-2.

Table 2-2

Soil Laboratory Analytical Samples
Soil Delineation Investigation
at the Pentolite Road Red Water Pond Area
Former Plum Brook Ordnance Works, Sandusky, Ohio

Test Pit Soil Samples						
Parameters	**Field samples**	**QA/QC Samples**	**Rinsates**	**Source Water**	**Trip Blanks**	**Matrix Spike/Duplicates**
Nitroaromatics	100	10	10	1	NA	10/10

QA - Quality assurance (field split).

QC - Quality control (field duplicate).

Table 3-1

Analytical Parameters and Methods
Soil Delineation Investigation
at the Pentolite Road Red Water Pond Area
Former Plum Brook Ordnance Works, Sandusky, Ohio

Sample Matrix	Analytical Parameters	Analytical Method[b]
Soil	Nitroaromatics	SW-846 8330[a]
Soil	Nitroaromatics (Screening)	SW-846 8515
Liquid IDW	TCL VOCs	SW-846 5030B/8260B[a]
	TCL SVOCs	SW-846 3510C/8270C[a]
	Total TAL Metals	SW-846 3005A/6010B/7470A[a]
	Nitroaromatics	SW-846 8330[a]
	pH	SW 9040C
	Ignitability	SW-846 1010[a]
	Corrosivity	SW-846 1110[a]
	Reactivity	7.3.3.2/7.3.4.2[a]
Solid IDW	TCLP VOCs	SW-846 1311/5030B/8260B [a]
	TCLP SVOCs	SW-846 1311/3510C/8270C [a]
	TCLP Metals	SW-846 1311/3010A/6010B/7470A [a]
	Nitroaromatics	SW-846 8330[a]
	Ignitability	SW-846 1010[a]
	Corrosivity	SW-846 1110[a]
	Reactivity	7.3.3.2/7.3.4.2[a]

TCL - Target compound list; VOC - Volatile organic compound; SVOC - semivolatile organic compound; TAL - target analyte list
PCB - polychlorinated biphenyl; TCLP - toxicity characteristic leaching procedure; IDW - investigation-derived waste.

[a]Analyses found in *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods,* EPA Publication, Third Edition.
[b]Analyses found in *Methods for Chemical Analysis of Water and Wastes*, EPA-600/4-79-020, March 1983, and subsequent revisior
[c] Water quality parameter.
[d] American Society for Testing and Materials.

Table 5-1

Analytical Methods, Containers, Preservatives, and Holding Times
Soil Delineation Investigation
at the Pentolite Road Red Water Pond Area
Former Plum Brook Ordnance Works, Sandusky, Ohio

Matrix	Parameter	Analytical Method	Sample Container*	Preservation Requirements	Holding Time
Soil	Nitroaromatics	SW-846 8330	(1) 8 oz CWM glass with Teflon-lined lid	Cool to 4°C	14 days extraction/40 days
Soil	Nitroaromatics (Screening)	SW-846 8515	(1) poly bag	Cool 4°C	ASAP
Liquid IDW	TCL VOCs	SW-846 5030B/8260B	(3) 40 ml VOA vial	Cool to 4°C, HCL to pH <2	14 days
	TCL SVOCs	SW-846 3510C/8270C	(2) 1 L amber glass	Cool to 4°C	7 days extraction/40 days
	Nitroaromatics	SW-846 3535/8330	(1) 1 L amber glass	Cool to 4°C	7 days extraction/40 days
	TAL Metals	SW-846 3005A/6010B/7470A	(1) 500 mL HDPE	Cool to 4°C, HNO_3 to pH <2	6 months (28 days for Hg)
	Ignitability	SW-846 1010	(1) 1 L Amber	Cool to 4°C	ASAP
	pH	SW-846 9040C			
	Corrosivity	SW-846 1110			
	Reactive Cyanide	7.3.3/7.3.4			
	Reactive Sulfide	7.3.3/7.3.4			
Soil IDW	TCLP VOCs	SW-846 1311/5030B/8260B	(1) 8 oz CWM glass with Teflon-lined lid	Cool to 4°C	7 days TCLP extraction/14 days extraction
	TCLP SVOCs	SW-846 1311/3510C/8270C			7 days TCLP extraction/14 days extraction/40 days
	TCLP Metals	SW-846 1311/3010A/6010B/7470A			7 days TCLP extraction/14 days /ext./6 months (28 days for Hg)
	Nitroaromatics	SW-846 8330			14 days extraction/40 days
	Ignitability	SW-846 1010			ASAP
	Corrosivity	SW-846 1110			ASAP
	Reactive Cyanide	7.3.3/7.3.4			ASAP
	Reactive Sulfide	7.3.3/7.3.4			ASAP

*Number of containers required in ( ).
°C - Degrees Celsius.
CWM - Clear wide mouth.
H_2S0_4 - Sulfuric acid.
HCI - Hydrochloric acid.
HDPE - High density polyethylene.
Hg - Mercury.
HNO_3 - Nitric acid.
L - Liter.
mL - Milliliter.
NaOH - Sodium hydroxide.
PAH - Polynuclear aromatic hydrocarbon.
SVOC - Semivolatile organic compound.
TAL - Target analyte list.
TCL - Target compound list.
TOC - Total organic compound.
VOC - Volatile organic compound.
IDW - Investigative-derived waste.
EPA - U.S. Environmental Protection Agency.
VOA - Volatile organic analysis.
OZ - Ounces.
Ext. - Extraction
ASAP - As soon as possible.

FIGURES

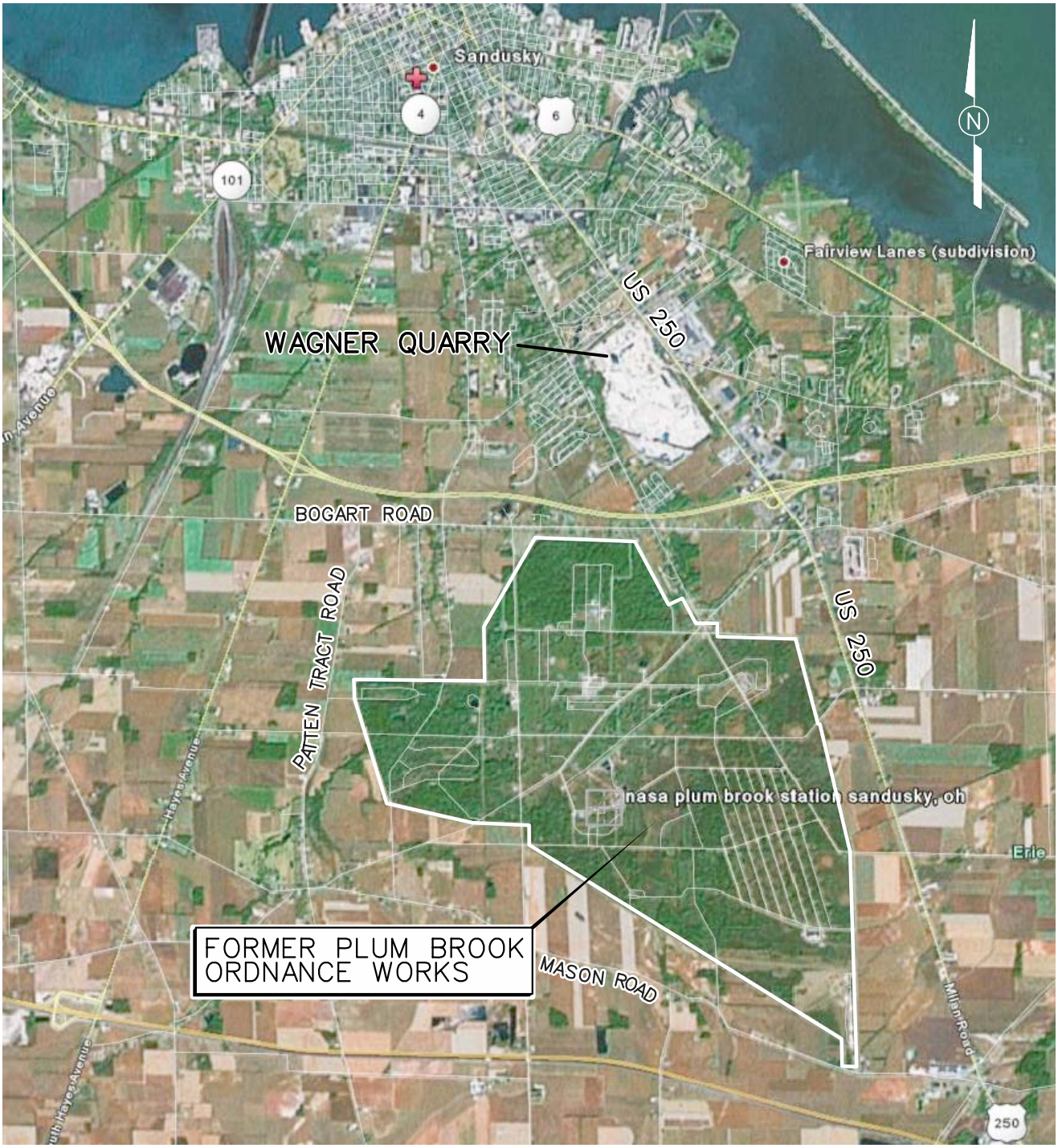

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FIGURE 1-1
PBOW VICINITY MAP

PENTOLITE ROAD RED WATER POND AREA
SOIL DELINEATION SSAP
FORMER PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

Shaw® Shaw Environmental & Infrastructure, Inc.

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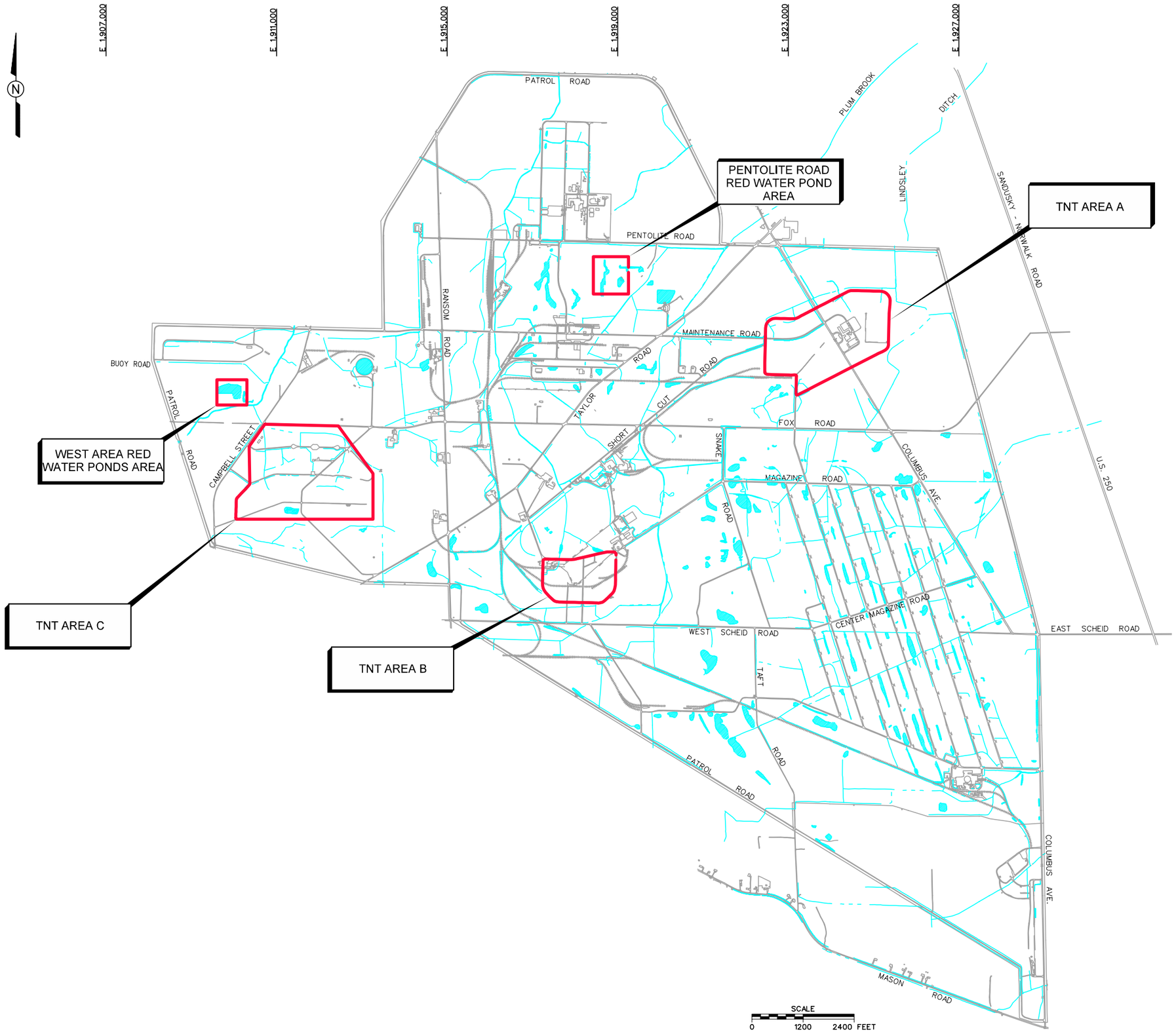

LEGEND

- AREA OF CONCERN
- BUILDINGS
- RAILROAD
- SURFACE WATER
- DITCH
- FENCE (PBOW BOUNDARY)

FIGURE 1-2
LOCATION MAP

PENTOLITE ROAD RED WATER POND AREA
SOIL DELINEATION SSAP
FORMER PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

Shaw® Shaw Environmental & Infrastructure, Inc.

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INITIATOR: C. ANGLIN
PROJ. MGR.: S. DOWNEY
DRAFT. CHCK. BY: C. BENTLEY
ENGR. CHCK. BY:
DATE LAST REV.:
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STARTING DATE: 06/03/09
DRAWN BY: C. BENTLEY
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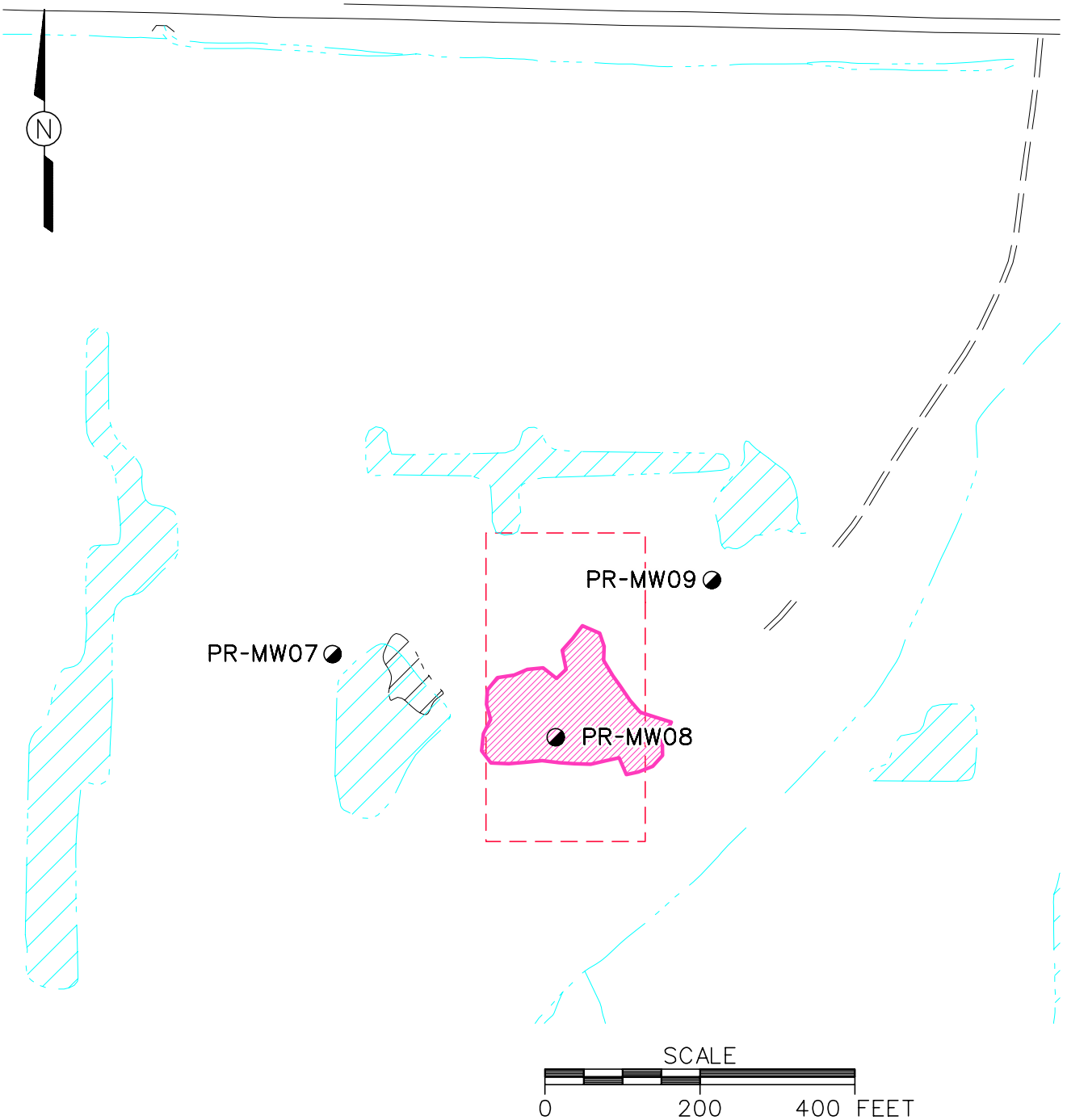

LEGEND

- BUILDINGS
- APPROXIMATE HISTORICAL LOCATION OF POND
- SURFACE DRAINAGE
- SURFACE WATER
- OVERBURDEN/SHALE MONITORING WELL LOCATION
- COMPLETED TNT SOIL REMEDIATION AREA

FIGURE 1-3
LOCATION OF THE NONTIME CRITICAL REMOVAL ACTION EXCAVATION AT THE PENTOLITE ROAD RED WATER POND AREA

PENTOLITE ROAD RED WATER POND AREA
SOIL DELINEATION SSAP
FORMER PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

Shaw® Shaw Environmental & Infrastructure, Inc.

STARTING DATE: 06/03/09	DATE LAST REV.:	DRAFT. CHCK. BY: C. BENTLEY	INITIATOR: C. ANGLIN	prrwp_sd_ssap_003.dgn
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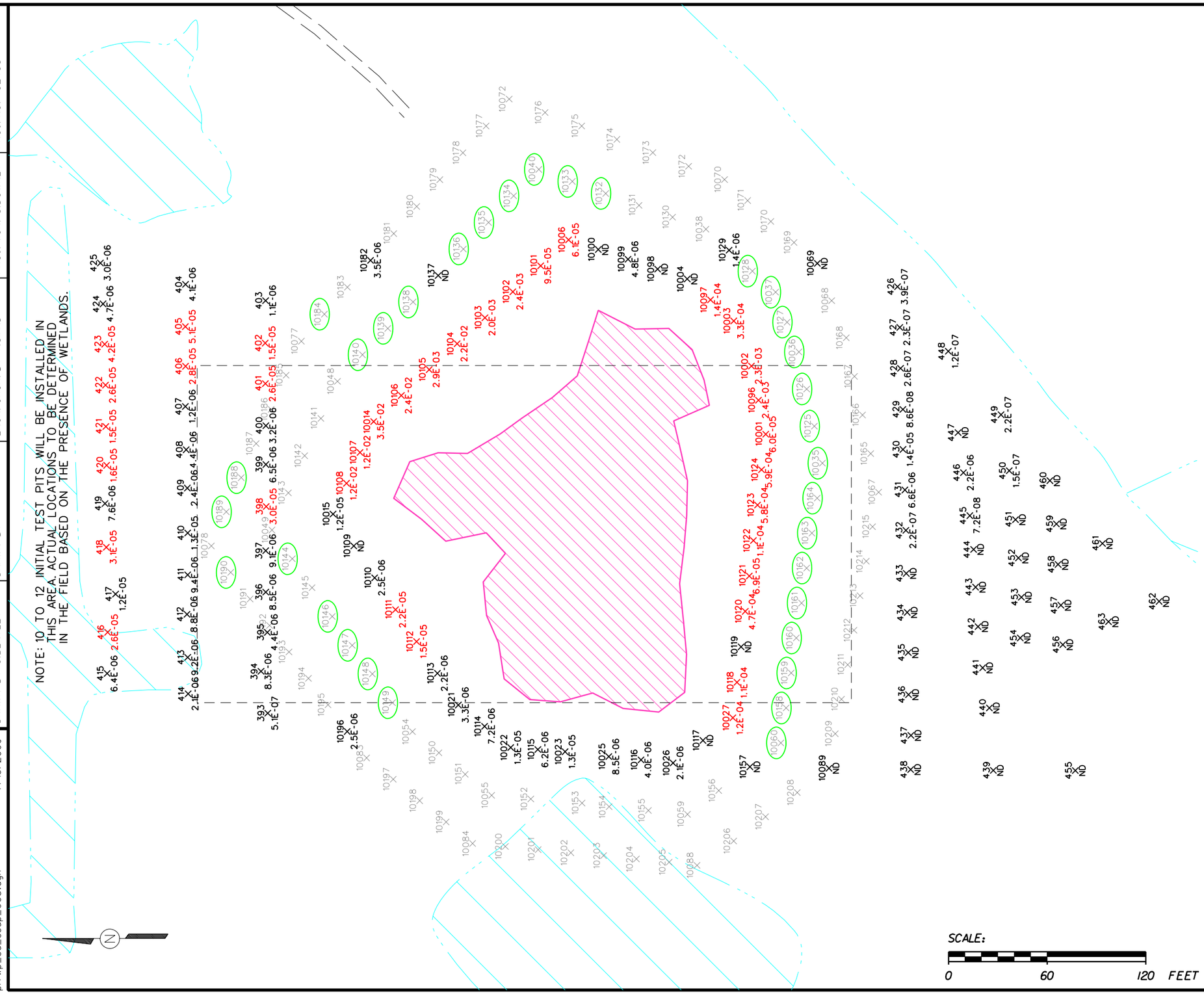

LEGEND:

- APPROXIMATE HISTORICAL LOCATION OF POND
- EXISTING PAVEMENT
- SURFACE DRAINAGE
- SURFACE WATER
- COMPLETED TNT SOIL REMEDIATION AREA FOR NON-TIME CRITICAL REMOVAL ACTION
- 403 / 1.1E-06 — TEST PIT/ID AND ASSOCIATED ILCR VALUE OF ANALYTICAL RESULTS BASED ON A SINGLE TEST PIT LOCATION
- ND — NON-DETECT FOR CARCINOGENIC NITROAROMATICS
- PROPOSED TEST PIT LOCATION (MAY BE ADJUSTED IN THE FIELD BASED ON SCREENING/ANALYTICAL RESULTS OF ADJACENT TEST PITS)

NOTES:

1. TEST PIT SAMPLES WERE COLLECTED BY McTECH, INC., IN MAY/JUNE 2009 AND ANALYZED FOR NITROAROMATICS.
2. THE ANALYTICAL RESULTS OF SAMPLES FROM TEST PIT LOCATIONS SHOWN IN BLACK DID NOT EXCEED THE INCREMENTAL LIFETIME CANCER RISK (ILCR) CRITERION OF 1E-5, BASED ON RESIDENTIAL USE.
3. THE ANALYTICAL RESULTS OF SAMPLES FROM TEST PIT LOCATIONS SHOWN IN RED EXCEED THE ILCR CRITERION OF 1E-5, BASED ON RESIDENTIAL USE.
4. LOCATIONS SHOWN IN GRAY ARE STAKED, BUT NO TEST PITS WERE DUG.
5. PROPOSED TEST PIT LOCATIONS ALSO CONSIDER NONCANCER HAZARDS (FIG. 1-5).

SCALE:

0 60 120 FEET

FIGURE 1-4
CANCER RISK RESULTS FOR SPRING 2009 TEST PIT SAMPLES AND PROPOSED LOCATIONS FOR ADDITIONAL TEST PITS

PENTOLITE ROAD RED WATER POND AREA
SOIL DELINEATION SSAP
FORMER PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

Shaw® Shaw Environmental & Infrastructure, Inc.

STARTING DATE: 07/08/09	DATE LAST REV.:	DRAFT. CHCK. BY: C.BENTLEY	INITIATOR: T.SIARD
DRAWN BY: C.BENTLEY	DRAWN BY:	ENGR. CHCK. BY: T.SIARD	PROJ. MGR.: S.DOWNEY
			PROJ. NO.: 132458

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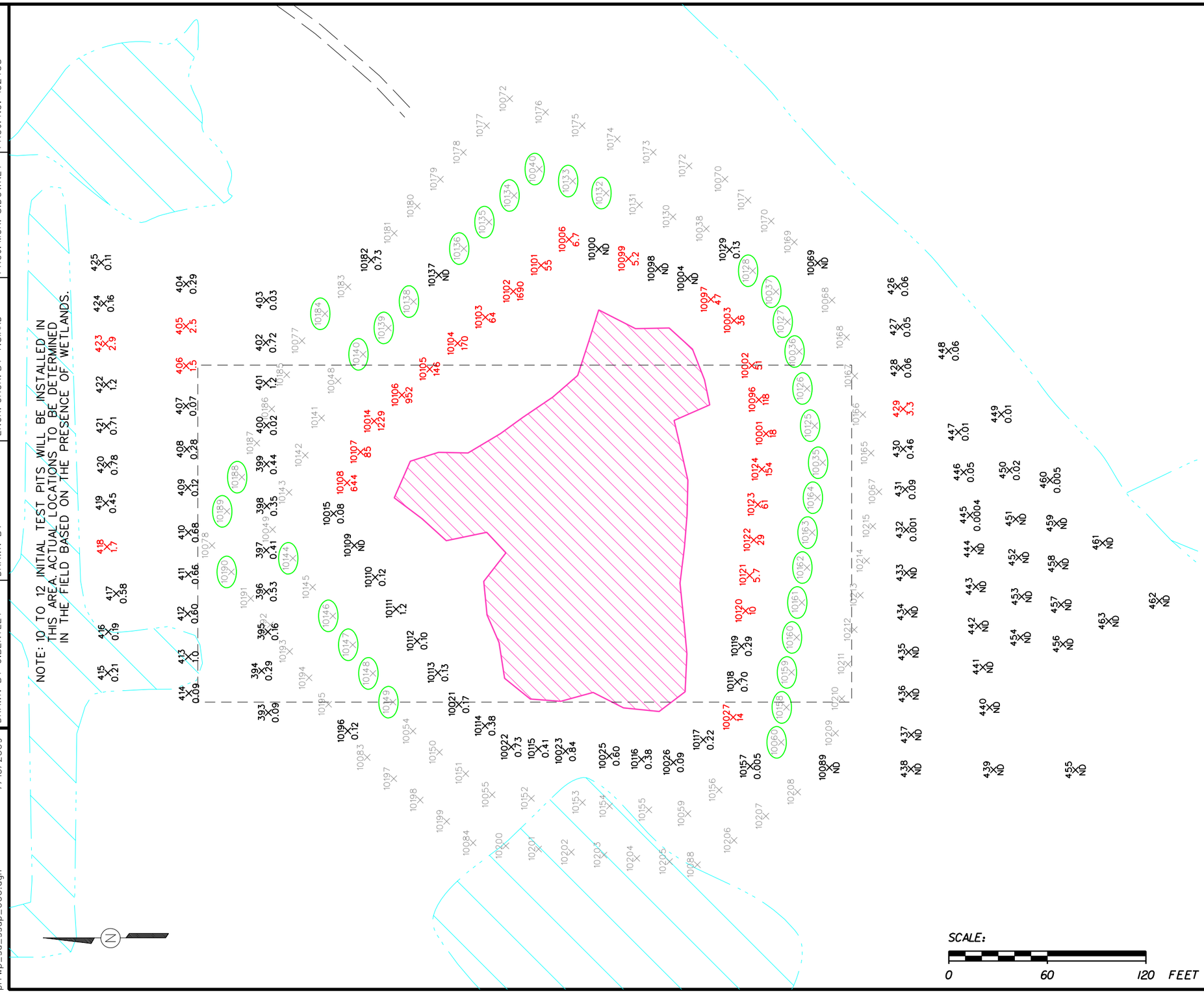

LEGEND:

- APPROXIMATE HISTORICAL LOCATION OF POND
- EXISTING PAVEMENT
- SURFACE DRAINAGE
- SURFACE WATER
- COMPLETED TNT SOIL REMEDIATION AREA FOR NON-TIME CRITICAL REMOVAL ACTION
- 403 / 0.03 — TEST PIT/ID AND ASSOCIATED HI VALUE OF ANALYTICAL RESULTS BASED ON A SINGLE TEST PIT LOCATION
- ND — NON-DETECT
- PROPOSED TEST PIT LOCATION (MAY BE ADJUSTED IN THE FIELD BASED ON SCREENING/ANALYTICAL RESULTS OF ADJACENT TEST PITS)

NOTES:

1. TEST PIT SAMPLES WERE COLLECTED BY McTECH, INC., IN MAY/JUNE 2009 AND ANALYZED FOR NITROAROMATICS.
2. THE ANALYTICAL RESULTS OF SAMPLES FROM TEST PIT LOCATIONS SHOWN IN BLACK DID NOT EXCEED THE HAZARD INDEX (HI) CRITERION OF 1.
3. THE ANALYTICAL RESULTS OF SAMPLES FROM TEST PIT LOCATIONS SHOWN IN RED EXCEED THE HI CRITERION OF 1.
4. LOCATIONS SHOWN IN GRAY ARE STAKED, BUT NO TEST PITS WERE DUG.
5. PROPOSED TEST PIT LOCATIONS ALSO CONSIDER CANCER RISKS (FIG. 1-4).

SCALE:

0 60 120 FEET

Shaw® Shaw Environmental & Infrastructure, Inc.

FIGURE 1-5
NONCANCER HAZARD INDEX RESULTS FOR SPRING 2009 TEST PIT SAMPLES AND PROPOSED LOCATIONS FOR ADDITIONAL TEST PITS

PENTOLITE ROAD RED WATER POND AREA
SOIL DELINEATION SSAP
FORMER PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

STARTING DATE: 07/08/09	DATE LAST REV.:	DRAFT. CHCK. BY: C.BENTLEY	INITIATOR: T.SIARD	prrwp_sd_ssap_006.dgn
DRAWN BY: C.BENTLEY	DRAWN BY:	ENGR. CHCK. BY: T.SIARD	PROJ. MGR.: S.DOWNEY	PROJ. NO.: 132458

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PBOW_standard.tbl cbentley prrwp_sd_ssap_006.dgn

Response to Comments
Site-Specific Work Plan
Addendum to Site-Wide Sampling and Analysis Plan
Soil Delineation Investigation at the Pentolite Road Red Water Pond Area
Former Plum Brook Ordnance Works
Sandusky, Ohio
June 17, 2009

Comments by Janusz Bycxkowski, Ph.D., Risk Assessor, Ohio Environmental Protection Agency, Division of Emergency and Remedial Response, received July 14, 2009.

General Comment

Comment 1: **This Site-Specific Work Plan has been prepared for a very narrow purpose of supporting the delineation of contaminants during the non-time-critical removal action (NTCRA) at the specified area of concern.**

However, as stated in the document (page 1-3): "…*This project will return to normal Comprehensive Environmental Response, Compensation, and Liability Act process (RI/FS phase) at the end of the NTCRA…* [...] *The analytical results* [...] *to be re-evaluated, as necessary, with respect to contamination extent and human health risk…*"

Therefore, the sensitivity of analytical methods used to detect and quantify chemicals of concern should be adequate to risk-based criteria for "acceptable" concentrations, as mandated in RI/FS program by CERCLA and/or OEPA – DERR.

For example, this Document states: "…*The soil RBRCs will be derived based on residential criteria…[…] If the risk or hazard is unacceptable at a given location is unacceptable* (sic!), *additional test pit excavation is required further from the original NTCRA excavation in this direction… […] data analyzed at this level of quality are appropriate for all phases of RI and risk assessments…*"

but next it states:
"…*Soil samples from each test pit excavation will be field screened for nitroaraomatics using a field test kit… […] having sensitivities less than the following: 5 parts per million (ppm) of TNT; 1.0 ppm of 2,4-DNT; 2.5 ppm of 2,6-DNT; and 2.0 ppm of 1,3-dinitrobenzene… […] to identify test pit location with elevated detections of nitroaromatics from which samples should not be sent for laboratory analysis…*"

I suggest that this work plan should be revised, either to emphasize that it is prepared for a limited purpose of identifying and eliminating hot spots only, or to assure that the chemical analytical methodology used will be of

sufficient sensitivity that the reporting limits will not exceed the risk based screening levels, as recommended for RI/FS program by OEPA – DERR (2004) <http://www.epa. state.oh.us/derr/rules/screening.pdf>

Response 1: Text will be added to Section 1.2 (Pentolite Road Red Water Pond Area description and History) that clarifies the purpose and context of the delineation work. The reporting limits and method detection limits will meet the U.S. Environmental Protection Agency (EPA, 2004) Region Preliminary Remediation Goal (PRG) values, adjusted to a hazard quotient of 0.1, that have been used for screening at the Pentolite Road Red Water Pond Area. The field screening samples will not be used in a quantitative risk assessment, nor will they be used directly for any close-out strategy. As explained in response to the reviewer's Comment No. 2, the field screening samples are used as a tool in the delineation of the extent of contamination. Definitive laboratory analysis will be used for confirmatory sampling.

Comment 2: **The sensitivities stated for field screening of nitroaromatic chemicals of concern (a procedure not recommended by Risk Assessment Guidance for Superfund) are insufficient to assure that the reporting limits (RL) will be at or below the respective risk-based screening levels (SL).**

While in "*all phases of RI and risk assessments*" it should be RL ≤ SL, the cancer risk-based SL for mixture of 2,4- and 2,6-DNT in soil = 0.71 ppm. Even lower is the non-cancer SL for 2,4-DNT alone = 0.16 ppm, or for 1,3-dinitrobenzene SL = 0.61 ppm.

Still the planned field screening can be successfully used to identify hot spots, while reducing the number of samples sent to the stationary laboratory, but the results of such a screening cannot be used in health risk assessments. Moreover, at the end of the remedial process, a re-sampling and analysis by the stationary laboratory would be necessary to confirm that the residual concentrations of chemicals of concern are within the levels protective of human health and the environment.

Response 2: The field screening test kits are being used as a tool to identify areas suspected as exceeding the overall risk management levels for incremental lifetime cancer risk of 1E-5 and hazard index of 1. A confirmation analytical sample will be collected for each final test pit location relied upon as representing the extent of contamination. As described in the response to the reviewer's Comment No. 1, the reporting limits and method detection limits of the confirmation samples will meet the adjusted PRG criteria.