Attachment IX

Site-Specific Sampling and Analysis Plan
Remedial Investigation at TNT Area B
Former Plum Brook Ordnance Works
Sandusky, Ohio

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(This SSAP must be used in conjunction with the PBOW SAP, 1996)

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Reviews and Approvals

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15 OCTOBER 98
Date

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15 October 1998
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QA/QC Officer
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10/15/98
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List of Acronyms

AR/COC	Analysis Request/Chain of Custody (Record)
ASTM	American Society for Testing and Materials
bgs	below ground surface
COPC	chemical(s) of potential concern
D&M	Dames and Moore
DERP	Defense Environmental Restoration Program
DNT	dinitrotoluene
DOD	U.S. Department of Defense
DQO	data quality objective
EPA	U.S. Environmental Protection Agency
FS	feasibility study
FUDS	Formerly Used Defense Sites
GIS	geographic information system
IDW	investigation-derived waste
IMS	Ion Mobility Spectrometer
IT	IT Corporation
mg/kg	milligrams per kilogram
MK	Morrison-Knudsen Ferguson Corporation
NASA	National Aeronautic and Space Administration
NGVD	National Geodetic Vertical Datum
PBOW	Plum Brook Ordnance Works
PBS	Plum Brook Station
PCB	polychlorinated biphenyl
PLS	professional land surveyor
PRG	preliminary remediation goals
QA/QC	quality assurance/quality control
QAPP	quality assurance project plan
RBC	risk-based concentration
RI	remedial investigation
SAP	sampling and analysis plan
SHP	safety and health plan

List of Acronyms (Continued)

SOW	statement of work
SPCS	State Plane Coordinate System
SSAP	site-specific sampling and analysis plan
SSHP	site-specific safety and health plan
SVOC	semivolatile organic compound
TAL	target analyte list
TCL	target compound list
TNT	trinitrotoluene
TNTB	TNT Area B
USACE	U.S. Army Corps of Engineers
VOC	volatile organic compound

IX.1.0 Project Description

The U.S. Army is conducting studies of 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 IX-1). It is being investigated under the Defense Environmental Restoration Program (DERP) for Formerly Used Defense Sites (FUDS) and is being managed and technically overseen by the Nashville District 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 operated as the Plum Brook Station (PBS) by the NASA Lewis Research Center based in Cleveland, Ohio.

As an attachment to the PBOW site-wide sampling and analysis plan (SAP) (IT Corporation [IT], 1996a), this site-specific sampling and analysis plan (SSAP) has been prepared for the field work to be carried out in support of the remedial investigation (RI) at Trinitrotoluene Area B (TNTB). This SSAP must be used in conjunction with the SAP and the quality assurance project plan (QAPP) (IT, 1996b) to ensure that work to be performed at the subject site will be of the quality required to satisfy the overall and site-specific project objectives. A site-specific safety and health plan (SSHP) has also been prepared separately for this investigation and must be used in conjunction with the site-wide safety and health plan (SHP) (IT, 1996c).

IX.1.1 Site History

The PBOW site, built in early 1941, 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 during the last quarter of 1945. The property was initially transferred to Ordnance Department, then to the War Assets Administration after it was certified by the U.S. Army to be decontaminated. In 1949, PBOW was transferred to the General Services Administration. NASA acquired PBOW in 1963 and is presently utilizing the site.

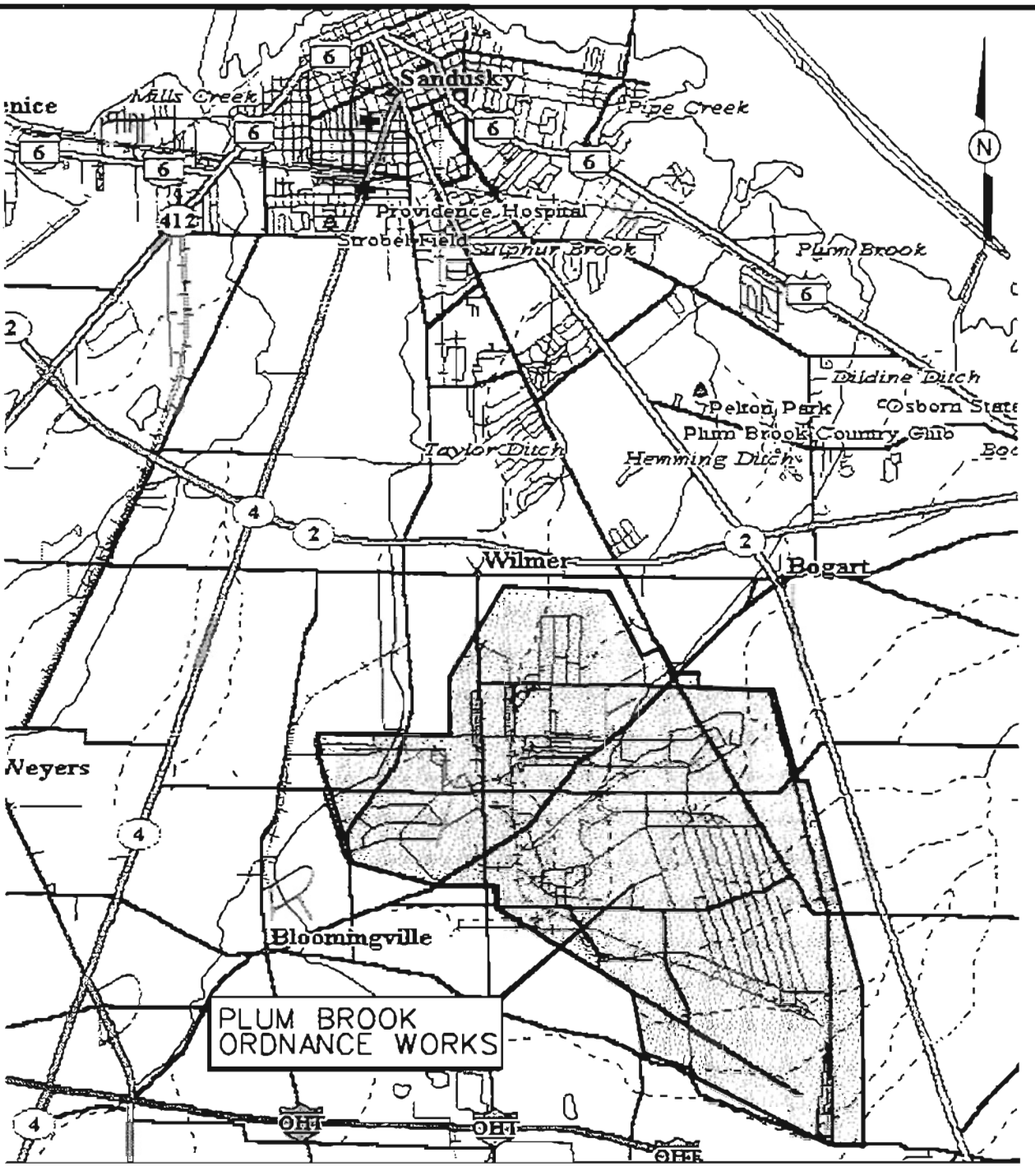

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FIGURE IX-1
VICINITY MAP

PLUM BROOK ORDNANCE WORKS
SANDUSKY, OHIO

INTERNATIONAL TECHNOLOGY CORPORATION

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IX.1.2 Summary of Existing Site Data

The former TNTB is located in the southern part of PBOW and occupies approximately 48 acres of land as shown in Figure IX-2. The NASA Hypersonic Tunnel Facility is located on the northwest side of the area and the B2 facility is located immediately northeast of the site. TNTB was used during World War II as a manufacturing facility for TNT and DNT. During PBOW operations, TNTB contained three TNT lines consisting of six buildings each and one DNT line consisting of one building. Wastewater from TNTB was routed to the Pentolite Road Red Water Ponds through underground flume and sewer lines. Some modifications to the northwest portion of the site were apparently made during NASA construction activities. However, roads, building foundations, and remnants of utilities are still recognizable. According to the records review report (Dames and Moore [D&M], 1995), TNTB was decontaminated along with two other TNT areas in 1955 and again in 1966. However, the decontamination at TNTB was reportedly not as thorough as that in TNT Area A and significant subsurface contamination associated with underground flumes and sewer lines is probably still present. Previous environmental investigations in this area included a 1993 site inspection by Morrison-Knudsen Ferguson Corporation (MK, 1994) and a 1994 TNT Areas site investigation by D&M (D&M, 1997). The MK inspection of the TNTB site included one surface soil sample, two subsurface soil samples, one co-located sample pair of surface water and sediment, and two groundwater samples. Organic compounds were not detected in the surface water sample collected from Ransom Brook, but the co-located sediment sample exhibited detectable organic constituents including 2,4,6-TNT at 25 milligrams per kilogram (mg/kg). One subsurface soil sample also contained 12 mg/kg of 2,4,6-TNT. In addition, one groundwater sample from a downgradient overburden well (MK-MW-17) showed the presence of bis(2-ethylhexyl)phthalate at a concentration of 12 micrograms per liter.

A total of 34 soil samples were collected from 26 borings within the TNTB site during the 1994 D&M investigation (Figure IX-3). Boring locations were placed in and around former buildings that were associated with the TNT production lines. A wide range of nitroaromatic compounds were detected, including TNT at concentrations up to 20,000 mg/kg (near Bi-Tri House) and 2,6-DNT up to 12,000 mg/kg (near DNT Sweating/Graining House).

IT conducted a site-wide groundwater investigation at PBOW in 1996 (IT, 1997) and again in 1997 (IT, 1998); both investigations included collection of groundwater samples from wells in TNTB. There are four existing monitoring wells in TNTB. Two wells MK-MW16 and TNTB-BED-GW002 are located along the south perimeter of TNTB, hydraulically upgradient of the

E 1,916,000

E 1,918,000

E 1,920,000

N 620,000

N 618,000

TAYLOR ROAD

RANSOM BROOK

HYPERSONIC TUNNEL FACILITY

NORTH MAGAZINE ROAD

LIQUID NITROGEN DEWARS

TNT AREA "B"

WEST SCHEID ROAD

LEGEND:

- BUILDINGS
- RAILROAD
- SURFACE DRAINAGE
- SURFACE WATER

SCALE

0 500 1000 FEET

FIGURE IX-2
LOCATION MAP

PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

INTERNATIONAL TECHNOLOGY CORPORATION

STARTING DATE: 9/3/98	DATE LAST
DRAWN BY: R. VANDERGRIFF	DRAWN BY:
14 OCT 98	14:24:11
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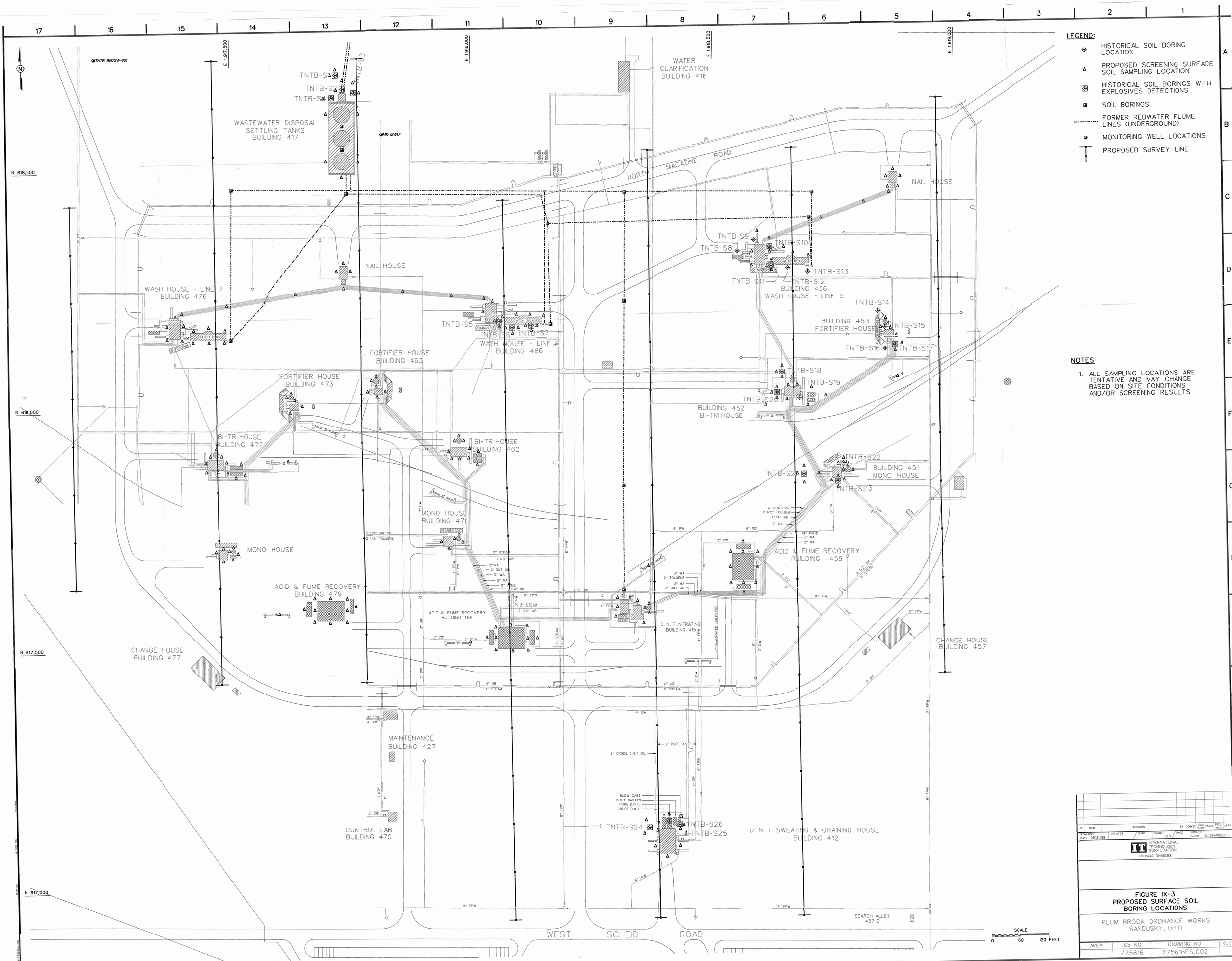


LEGEND:

- HISTORICAL SOIL BORING LOCATION
- PROPOSED SCREENING SURFACE SOIL SAMPLING LOCATION
- HISTORICAL SOIL BORINGS WITH EXPLOSIVES DETECTIONS
- SOIL BORINGS
- FORMER REDWATER FLUME LINES (UNDERGROUND)
- MONITORING WELL LOCATIONS
- PROPOSED SURVEY LINE

NOTES:

1. ALL SAMPLING LOCATIONS ARE TENTATIVE AND MAY CHANGE BASED ON SITE CONDITIONS AND/OR SCREENING RESULTS

NO	DATE	REVISION	BY	CHKD	DSGN ENGR	ENGR	PROJ MGR	APPR

STARTING DATE 08/31/98 | INITIATOR | CHKD | DRAWN GTB | CHKD | PROJECT MNGR M. SPANGBERG

IT INTERNATIONAL TECHNOLOGY CORPORATION
KNOXVILLE, TENNESSEE

FIGURE IX-3
PROPOSED SURFACE SOIL BORING LOCATIONS

PLUM BROOK ORDNANCE WORKS
SANDUSKY, OHIO

AKEA	JOH NO.	DRAWING NO.	REV
	775616	775616ES.002	

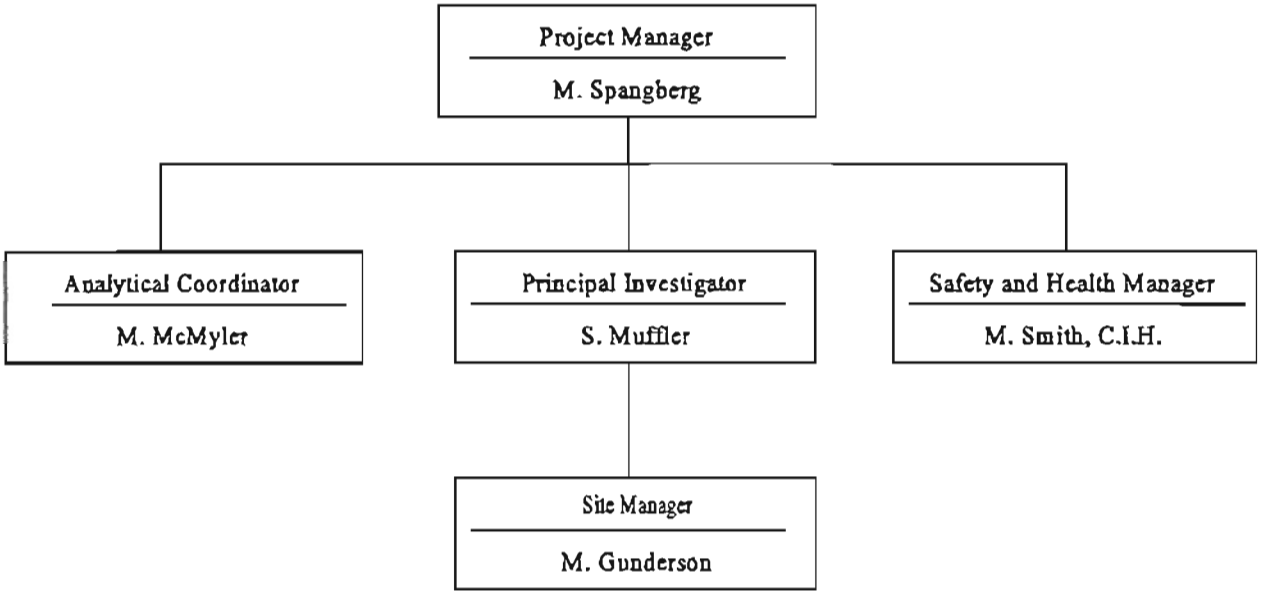
site. Two other wells (MK-MW17 and TNTB-BED-GW001) are located along the north perimeter of TNTB, downgradient of the site. Organic compounds have been detected in MK-MW17 (4-amino-2,6-DNT) and in TNTB-BED-GW002 (benzene) at concentrations above their respective screening levels (IT, 1998).

Two hydrolithologic units are known to exist at PBOW. The overburden unit, composed of glacial outwash materials, has a thickness ranging from a few feet in the south to more than 40 feet in some locations in the north. The water producing capacity of the overburden materials is strongly controlled by seasonal changes and the overburden water-bearing zone is therefore not considered to be a primary source of water. The bedrock unit consists of Devonian limestone and shale that dip to the southeast at approximately 35 feet per mile. Based on previously collected data, the overburden thickness within the TNTB site is generally less than 5 feet.

In general, groundwater flows in a northerly direction, towards Lake Erie, in both the unconsolidated overburden material and consolidated bedrock. However, on the western side of the installation groundwater in the overburden water-bearing zone flows to the northwest while groundwater in the bedrock aquifer flows to the northeast. The groundwater flow regime in the overburden unit shows a strong seasonal variation.

IX.2.0 Project Organization and Responsibilities

The project organization for this RI consists of a project manager, a health and safety officer, a principal investigator, an analytical coordinator, field geologists, and technicians. The names of key IT personnel and their responsibilities are presented below:



IX.3.0 Scope of Work and Objectives

IX.3.1 Scope of Work

As specified in the scope of work (SOW) (USACE, 1998), the RI activities at TNTB will consist of preparation of site-specific addenda to the site-wide SAP and SHP; completion of field activities, including installation of soil borings and collection of soil samples from selected locations for chemical analysis; evaluation of analytical results; report preparation; and a geographic information system (GIS) deliverable.

IX.3.2 Objectives

The primary objective of the RI is to determine the presence of chemical(s) of potential concern (COPC) in soils at TNTB. Specific objectives of the RI are summarized as follows:

- Define site physical features and characteristics
- Determine variability of contamination using screening data
- Determine the nature and extent of source areas
- Determine whether contaminant distribution is consistent with DOD activities.

Sufficient surface and subsurface soil data will be collected so that a feasibility study (FS) can be conducted to select the most effective remediation technology. Additionally, the collected data will be used to conduct human health and ecological risk assessments for the site.

IX.3.3 Site-Specific Data Quality Objectives

IX.3.3.1 Overview

The data quality objectives (DQO) process followed during the planning stages of the RI evaluated data requirements needed to support the decision-making process and selected the best action to satisfy these requirements. Incorporated components of the DQO process, described in the U.S. 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 SAP. Determining factors for procedures necessary to satisfy investigative objectives and to establish the basis of future actions at PBOW are presented in Figure 3-2 of the SAP (IT, 1996a).

IX.3.3.2 Data Users and Available Data

A site-specific conceptual model developed using existing data, helped to identify data gaps. During the project planning process effective methodologies for filling the data gaps were designed and reviewed by the data users with the most efficient data collection design being implemented. The SSAP records the rationale for the design, including the location, number, and type of sampling necessary to fill the data gaps and to satisfy the DQOs. The SSAP, along with companion documents, provides the regulatory agencies with sufficient detail so that they can conclude whether the investigative effort is adequate to satisfy the study objectives.

IX.3.3.3 Conceptual Site Model

Four factors considered in defining the conceptual model for the RI are:

- Potential contaminant sources
- Migration pathways
- Potential receptors
- Contaminants of concern.

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 production and associated activities. The migration pathways for potential contaminants include groundwater, soil, sediment, and surface water runoff to creeks. Likely receptors at PBOW are limited to aquatic organisms in creeks and wildlife. Exposure of humans to potential contaminants under current land use at PBOW is unlikely since the site is a secure NASA research station. Potential receptors near the facility include off-site water users. COPCs based on past use of the site should primarily be nitroaromatic explosives, but may also include volatile organic compounds (VOC), semivolatile organic compounds (SVOC), metals, pesticides/ polychlorinated biphenyls (PCB), and cyanide.

IX.3.3.4 Decision-Making Process, Data Uses, and Needs

The decision-making process, presented in detail in Section 3.3.3 of the SAP (IT, 1996a), consists of a seven-step process that will be followed during the RI (IT, 1996a). Data uses and needs are summarized in Table IX-1.

IX.3.3.5 Risk Evaluation

Confirmation of contamination during the RI will be based upon a comparison of detected contaminants in confirmation soil samples from this investigation to risk-based screening

Table IX-1

Summary of Data Quality Objectives
Remedial Investigation at TNT Area B
Former Plum Brook Ordnance Works
Sandusky, Ohio

Potential Data Users	Available Data	Conceptual Model	Media of Concern	Data Uses and Objectives	Data Types	Analytical Level	Data Quantity
EPA OEPA DOD USACE NASA IT Corporation Other Contractors Possible Future Land Users	Previous environmental investigation of limited scale detected soil contamination	Contaminant Source Burning TNT product on site Migration Pathways Soil, sediment, surface water, and groundwater Potential receptors Wildlife, human Potential Contaminants of Concern VOCs, SVOCs, metals, PCBs, and nitroaromatic explosives	Soils	Determine the existence and nature of soil contamination Determine environmental risks and the necessity of further actions	Soils Metals Explosives VOCs SVOCs PCBs	Field screen Definitive confirmatory samples	360 40 + QA

OEPA - Ohio Environmental Protection Agency.
DOD - U.S. Department of Defense.
EPA - U.S. Environmental Protection Agency.
NASA - National Aeronautics and Space Administration.
VOC - Volatile organic compound.
SVOC - Semivolatile organic compound.
PCB - Polychlorinated biphenyl.

concentrations adapted from the most current risk-based concentrations (RBC) developed by EPA Region 3. Specifically, RBCs used will reflect a cancer risk of 10^{-6} or a hazard index of 0.1. EPA definitive data will be used to determine whether or not the established guidance criteria are exceeded in the media. Definitive data will be adequate for confirming the presence of the contamination and for supporting a risk assessment and feasibility study, if necessary.

IX.3.3.6 Data Quality, Types, and Quantities

Soil, surface water, and sediment samples will be collected and analyzed to meet the objectives of the RI. Quality assurance/quality control (QA/QC) samples will be collected for all sample types as described in Section IX.4.3 of this SSAP. All samples, except the screening 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 characterization and risk assessment. All soil screening samples will be analyzed in the field using Ion Mobility Spectrometer (IMS) field screening methods and the data will be used to determine the nature and extent of the nitroaromatic contamination. The repeatability of the IMS results will be checked in the field using immunoassay or wet chemistry field test procedures.

IX.3.3.7 Precision, Accuracy, and Completeness

Laboratory requirements of precision, accuracy, and completeness for confirmation samples generated during the RI are provided in Chapter 12.0 of the QAPP (IT, 1996b).

IX.4.0 Field Activities

Field activities associated with the RI at TNTB will include surface and subsurface soil sampling, field screening for explosives, land surveying, and investigation-derived waste (IDW) management.

IX.4.1 Rationale for Soil Sampling Placement

A maximum of 360 screening surface soil, 60 screening subsurface soil, 20 fixed-base laboratory surface soil, and 20 fixed-base laboratory subsurface soil confirmation samples are proposed at the site (Table IX-2). All field screening samples will be analyzed using IMS for nitroaromatics, whereas the confirmation samples will be analyzed by EPA methods for nitroaromatic compounds, VOCs, SVOCs, PCBs and metals. Soil sample locations will be selected to provide adequate coverage of areas with the potential to be contaminated based on past site usage, previous analytical results at the site (D&M, 1997), and to cover suspected source areas identified during investigations at similar TNT production facilities (West Virginia Ordnance Works and Volunteer Army Ammunition Plant). The locations selected will be further guided by EPA Region 9 preliminary remediation goals (PRG)(Table IX-3). Figure IX-3 presents the design of the initial soil sampling locations.

Screening data will be reviewed daily to determine if there are discernable patterns of soil contamination and to place subsequent delineation samples. Selection of alternate or delineation samples will be completed in consultation with the USACE-Nashville District on-site representative. Data from this soil sampling effort are expected to provide an estimate of contaminated soil volume for use in the subsequent FS.

IX.4.1.1 Surface Soil Placement

Nineteen buildings are associated with three TNT production lines, and a wastewater settling tank area is located in the northern part of the site that is connected to the production lines via underground red water sewers. Seven of these buildings and the settling tanks were sampled during the 1994 D&M investigation. Explosives were detected in some of the samples. These features are summarized in Table IX-2 and are shown on Figure IX-3. Surface soil screening samples will be collected in and around each building area (including the settling tank area) (Table IX-4 and Figure IX-3). Sample identification for surface soil sampling is presented in Table IX-5. Based on the initial field screening results, twenty surface soil fixed-base

Table IX-2

Summary of Environmental Samples and QA/QC Samples to be Collected
Remedial Investigation at TNT Area B
Former Plum Brook Ordnance Works, Sandusky, Ohio

Sample Type	Required Analysis	Sample Quantity	QA/QC Samples[a]	
			Contract Laboratory (QC)	USACE Laboratory (QA)
Soil Screening	IMS field screening for nitroaromatics	360 (surface soil) 40 (subsurface soil)	2/day[b]	--
Soil Confirmation[c]	Nitroaromatics	40	4	4
	TCL VOCs	40	4	4
	TCL SVOCs	40	4	4
	TAL Metals	40	4	4
	PCBs	40	4	4
Surface Water	Nitroaromatics	7	1	1
	TCL VOCs	7	1	1
	TCL SVOCs	7	1	1
	TAL Metals	7	1	1
	PCBs	7	1	1
Sediment	Nitroaromatics	7	1	1
	TCL VOCs	7	1	1
	TCL SVOCs	7	1	1
	TAL Metals	7	1	1
	PCBs	7	1	1

[a] Ten percent of the total number of the confirmation soil samples and surface water/sediment samples will be collected for QA and QC analysis. The sample that is taken for confirmation purpose will also be field screened by IMS.

[b] Two composite samples per day will be collected and analyzed by a wet chemistry field test or immunoassay kit to check the repeatability of the ion mobility spectroscopy (IMS) results.

[c] From the same location a confirmation sample is taken, another sample will also be collected for analysis by IMS techniques.

PCB - Polychlorinated biphenyl.
QA/QC - Quality assurance/quality control.
TAL - Target analyte list.
TCL - Target compound list.
USACE - U.S. Army Corps of Engineers.

Table IX-3

Summary of Explosives Preliminary Remediation Goals
Remedial Investigation at TNT Area B
Former Plum Brook Ordnance Works, Sandusky, Ohio

Compound	Preliminary Remediation Goals[a]	
	Residential (mg/kg)	Industrial (mg/kg)
1,3-Dintrobenzene	5.5E+00	1.1E+02
Nitrobenzene	1.6E+01	1.0E+02
2,4-Dinitrotoluene	1.1E+02	2.1E+03
2,6-Dinitrotoluene	5.5E+01	1.1E+03
1,3,5-Trinitrobenzene	1.6E+03	3.2E+04
2,4,6-Trinitrotoluene	1.5E+01	1.0E+02

[a] From EPA Region 9, Preliminary Remediation Goals for Planning Purposes, 1998.

mg/kg - Milligrams per kilogram.

Table IX-4

Major TNT Production Buildings at TNT Area B
Former Plum Brook Ordnance Works, Sandusky, Ohio

Former Building Name	Building Number	Building Sampled	Previous Data[a]
Mono House	451, 461, 471	451	TNT, 2,4-DNT, 2,6-DNT
Bi-fortifier House	453, 463, 473	453	TNT, 4-amino-DNT,
Tri House	452, 462, 472	452	TNT, 2,4-DNT, 2,6-DNT
Wash House	456, 466, 476	456, 466	TNT, 2-amino-DNT
Nail House	458, 468	--	Not sampled
Recovery House	459, 469, 479	--	Not sampled
DNT Nitrator House	415	--	Not sampled
Settling Tanks	417	417	TNT, 2,4-DNT, 2-amino-DNT
DNT Sweating/Graining House	412	412	2,4-DNT, 2,6-DNT, 3,4-DNT

[a] Data from D&M TNT Areas Site Investigation Report (D&M, 1997).

Table IX-5

Soil Screening Samples to be Collected
Remedial Investigation at TNT Area B
Former Plum Brook Ordnance Works, Sandusky, Ohio

Sample Type	Sample Identification	Number of Samples	Sampling Depth (feet)
Screening Surface Soil	TNTB-SS001-10000-(00-01)	360	0 - 1.0'
	TNTB-SS002-1000-(00-01)		0 - 1.0'
	:		:
	:		:
	TNTB-SS100-10099-(00-01)		:
	TNTB-SS101-10100-(00-01)		:
	:		:
	:		:
	TNTB-SS200-10199-(00-01)		:
	TNTB-SS201-10200-(00-01)		:
	:		:
	:		:
	TNTB-SS359-0358-(00-01)		0 - 1.0'
	TNTB-SS360-0359-(00-01)		0 - 1.0'
Screening [a] Subsurface Soil	TNTB-SSxxx-xxxxx-(depth)	40	2' - 10'
Confirmation Samples to be Screened[b]	PBOW-98-SO-TNTB-SOxxx-xxxxx-(depth)	40	To be determined based on screening results

[a] Screening subsurface soil samples will be collected from selected surface screening locations exhibiting highest detections of nitroaromatic compound(s).

[b] From the same location a confirmation sample is taken, another sample will also be collected for analysis by ion mobility spectroscopy (IMS) technique.

confirmation samples will also be collected (Table IX-6). Each of the confirmation samples will have a corresponding IMS screening sample for correlation of the IMS data.

IX.4.1.2 Subsurface Soil Placement

Ten boreholes will be sampled along the underground red water sewer lines and analyzed by IMS field screening. In addition, based largely on the results of the surface soil field screening samples, subsurface soil for field screening analysis will be sampled from 20 areas with surficial contamination exceeding the Region 9 PRGs (hot spots). This approach will better utilize the limited number of samples available. A maximum of two subsurface screening samples will be collected from each borehole at both the red water sewer line area and the hot spot sample locations. If it is determined that there are less than 20 hot spots, the remainder of those subsurface screening samples will be collected at locations adjacent to building foundations determined to have the greatest likelihood of contamination based on historical data and correlative contaminant patterns at other nitroaromatic sites (i.e. Volunteer Army Ammunition Plant).

Subsurface soil samples will be collected from two-foot intervals from 2 to 10 feet below ground surface (bgs); however, sampling will terminate at bedrock if it is encountered above 10 feet bgs. In each of these boreholes, soil samples from the 4 to 6 feet interval will be collected. If bedrock is not encountered before 8 feet bgs, a second sample beginning at 8 feet bgs will be collected. A complete lithologic description will be performed for each borehole. Initially, only the 4 to 6 foot bgs screening sample will be analyzed by IMS. If a 4 to 6 foot sample has a concentration above PRGs, the lower sample will also be analyzed. Based on the results of the initial IMS screening subsurface sampling, a maximum of 20 subsurface soil confirmation samples will also be collected (Table IX-6). Each of the confirmation samples will have a corresponding IMS screening sample for correlation of the IMS data. Sample identification for subsurface soil screening samples is presented in Table IX-5.

IX.4.2 Sampling Methodology and Procedures

The following sampling methods and operational procedures have been developed to ensure that the data acquired through field sampling will meet the data quality objectives stated in Section IX.3.3. All soil samples collected by IT field personnel will be documented through the use of Analysis Request/Chain of Custody Record forms (AR/COC, Figure 6-2 of the SAP [IT, 1996a]) following field custody procedures specified in Section 5.1 of the QAPP (IT, 1996b). Any

Table IX-6

Confirmation Soil Samples and QA/QC Samples to be Collected
Remedial Investigation at TNT Area B
Former Plum Brook Ordnance Works, Sandusky, Ohio

Sample Identification	QA/QC Samples		
	Field Duplicate	MS/MSD	Field split
PBOW-98-SO-TNTB-SO01-10400-(depth)			
PBOW-98-SO-TNTB-SO02-10410-(depth)			
PBOW-98-SO-TNTB-SO03-10420-(depth)			
PBOW-98-SO-TNTB-SO04-10430-(depth)			
PBOW-98-SO-TNTB-SO05-10440-(depth)			
PBOW-98-SO-TNTB-SO06-10450-(depth)	x		x
PBOW-98-SO-TNTB-SO07-10460-(depth)			
PBOW-98-SO-TNTB-SO08-10470-(depth)			
PBOW-98-SO-TNTB-SO09-10480-(depth)			
PBOW-98-SO-TNTB-SO10-10490-(depth)			
PBOW-98-SO-TNTB-SO11-10500-(depth)			
PBOW-98-SO-TNTB-SO12-10510-(depth)			
PBOW-98-SO-TNTB-SO13-10520-(depth)			
PBOW-98-SO-TNTB-SO14-10530-(depth)	x		x
PBOW-98-SO-TNTB-SO15-10540-(depth)		x	
PBOW-98-SO-TNTB-SO16-10550-(depth)			
PBOW-98-SO-TNTB-SO17-10560-(depth)			
PBOW-98-SO-TNTB-SO18-10570-(depth)			
PBOW-98-SO-TNTB-SO19-10580-(depth)			
PBOW-98-SO-TNTB-SO20-10590-(depth)			
PBOW-98-SO-TNTB-SO21-10600-(depth)			
PBOW-98-SO-TNTB-SO22-10610-(depth)			
PBOW-98-SO-TNTB-SO23-10620-(depth)			
PBOW-98-SO-TNTB-SO24-10630-(depth)			
PBOW-98-SO-TNTB-SO25-10640-(depth)		x	
PBOW-98-SO-TNTB-SO26-10650-(depth)	x		x
PBOW-98-SO-TNTB-SO27-10660-(depth)			
PBOW-98-SO-TNTB-SO28-10670-(depth)			
PBOW-98-SO-TNTB-SO29-10680-(depth)			
PBOW-98-SO-TNTB-SO30-10690-(depth)			
PBOW-98-SO-TNTB-SO31-10700-(depth)			
PBOW-98-SO-TNTB-SO32-10710-(depth)			
PBOW-98-SO-TNTB-SO33-10720-(depth)			
PBOW-98-SO-TNTB-SO34-10730-(depth)			
PBOW-98-SO-TNTB-SO35-10740-(depth)	x		x
PBOW-98-SO-TNTB-SO36-10750-(depth)			
PBOW-98-SO-TNTB-SO37-10760-(depth)			
PBOW-98-SO-TNTB-SO38-10770-(depth)			
PBOW-98-SO-TNTB-SO39-10780-(depth)			
PBOW-98-SO-TNTB-SO40-10790-(depth)			

Note: Confirmation samples will be collected at the same location as an ion mobility spectroscopy (IMS) screening sample. Actual sample locations will be determined based on IMS screening results.

changes from the work plans will be recorded in chronological order in the variance log shown in Figure 9-1 of the SAP (IT, 1996a).

The confirmation samples (shown on Table IX-6) will be of definitive data quality to be used in risk assessment of TNTB. Confirmation sample locations will be selected based on the screening results and will consist of both surface and subsurface samples. Confirmation samples will be collected to confirm either positive detection (hot spot) or negative detection (non-detect) from field screening. Therefore, up to five confirmation samples shall be selected from screening locations exhibiting non-detect in field analysis. All confirmation samples will also be screened using IMS; therefore, a sufficient quantity of sample will be collected for both the confirmation and IMS analyses. Confirmation samples will be collected following the same procedures as for screening samples. The selection of boring locations for confirmation samples will be determined in consultation with the USACE-Nashville District on-site representative.

IX.4.2.1 Surface Soil Sampling

At each field screen surface sample location, soil will be collected with a stainless-steel trowel between 0 and 1 foot from the four corners and at the center of a 1-foot square placed over the sample location. Each of these 5 subsamples of soil will be homogenized in a stainless-steel bowl. The composited soil will be placed into a 125 milliliter amber sample jar. The sample will be placed on ice in a sample cooler until the sample is delivered to field laboratory personnel for nitroaromatic analysis.

Surface soil samples collected for confirmation analysis at the fixed base laboratory will be sampled by two methods, one for the soil to be analyzed for VOCs and a second for the soil to be analyzed for the remainder of the analyses (nitroaromatics, SVOCs, metals, and PCBs). The samples will be collected no deeper than 1 foot deep. The VOC-analyzed soil will be sampled using a stainless-steel lined drive sampler. The drive sampler will be hammered to depth then the sleeve will be removed, capped, and placed in a sample cooler. The soil to be analyzed for the remaining analyses will be sampled with a stainless-steel hand auger between 0 and 1 foot from the four corners and at the center of a one-foot square placed over the sample location. Each of these five subsamples of soil will be homogenized in a stainless-steel bowl, then transferred to the appropriate sample jars. Each confirmation sample will also have an associated IMS screening sample.

IX.4.2.2 Subsurface Soil Sampling

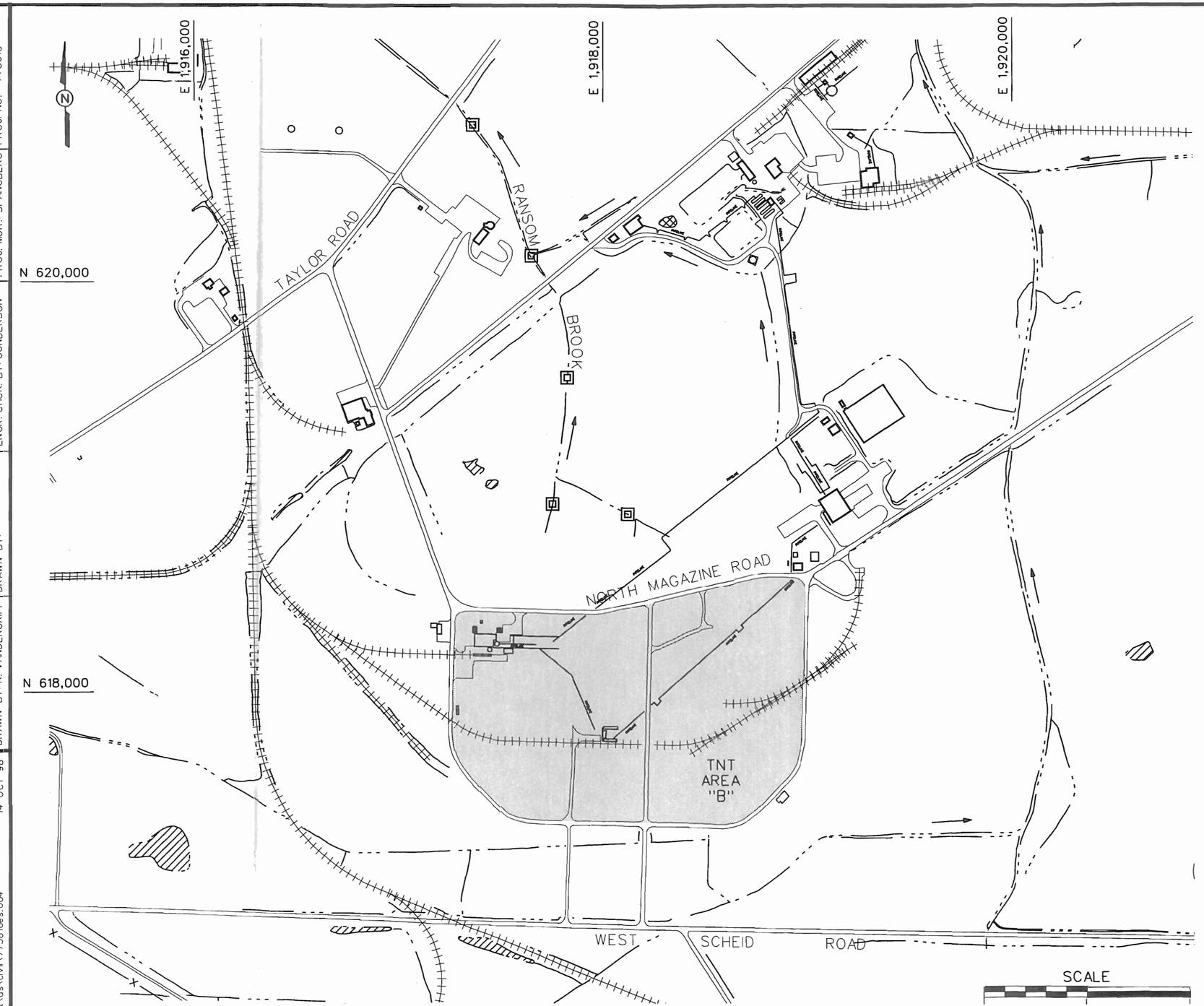
At each field screen subsurface sample location, an approximately 1.5-inch diameter, stainless-steel, acetate-lined sampling core will be hydraulically hammered to the required depth. The drive point will then be retracted and the soil sampler will be driven forward, filling the liner with soil. If the sample is to submitted for screening analysis, all of the sample will be placed into a stainless steel bowl and homogenized. Soil from the bowl will be transferred to a 125 milliliter amber jar for IMS analysis for nitroaromatics.

If the soil sample is for confirmation analysis, a portion of the liner will be cut and the ends will be covered with vinyl end caps with a square piece of 2-inch wide Teflon™ tape in between. This portion of the sample, to be analyzed for VOCs, will be placed on ice in a cooler. The remainder of the soil in the liner will be placed into a stainless-steel bowl, homogenized, and transferred to appropriate sample jars, then placed on ice. Each confirmation sample will also have an associated IMS screening sample. To obtain a sufficient volume to fill all the appropriate sample jars, it may be necessary to collect additional soil. If another boring is necessary, it will be immediately adjacent to the original location to the same depth as the first sample.

All subsurface soil samples will be visually inspected and logged on the hazardous, toxic, and radiologic waste drilling log (Figure 4-11 of the SAP) by an IT field geologist using the Unified Soil Classification System. Upon completion of the boring, the hole will be backfilled with either soil cuttings from the hole or granulated bentonite.

IX.4.2.3 Surface Water and Sediment Samples

Five surface water samples and five co-located sediment samples will be collected from pre-marked locations along Ransom Brook between Taylor Road and TNTB. The SOW called for ten samples to be collected. However, upon further review of site conditions it was determined that five samples would be sufficient to characterize any contamination that may be present in Ransom Brook, primarily due to the short distance between the head waters of the brook and Taylor Road (Figure IX-4). Ransom Brook initiates in a general area immediately north of TNTB (Table IX-7 and Figure IX-4). It is likely that Ransom Brook contains minimal flow or is even dry during certain times of the year, such as in summer. Sampling of surface water from Ransom Brook must be conducted when there is sufficient flow in the channel. In addition to the two samples from Ransom Brook, up to two samples will be collected from seeps or surface water at the headwaters of the creek. These two headwater samples will only be collected if there



LEGEND:

- BUILDINGS
- RAILROAD
- SURFACE DRAINAGE
- SURFACE WATER
- PROPOSED SURFACE WATER/ SEDIMENT SAMPLING LOCATIONS
- SURFACE WATER FLOW DIRECTION

NOTES:

UP TO TWO ADDITIONAL SURFACE WATER/ SEDIMENT SAMPLING LOCATIONS WILL BE SAMPLED IF THERE IS A SUFFICIENT QUANTITY OF WATER AVAILABLE FOR ANALYSIS. IF SAMPLED, THEY WILL BE COLLECTED FROM SEEPS UPGRADIENT OF RANSOM BROOK.

SCALE
0 500 1000 FEET

FIGURE IX-4
PROPOSED SURFACE WATER AND SEDIMENT SAMPLE LOCATIONS

PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

INTERNATIONAL TECHNOLOGY CORPORATION

STARTING DATE: 9/2/98	DRAFT. CHCK. BY: VANDERGRIFF	INITIATOR: GUNDERSON	DWG. NO.: ...5616es.004
DRAWN BY: R. VANDERGRIFF	ENGR. CHCK. BY: GUNDERSON	PROJ. MGR.: SPANGBERG	PROJ. NO.: 775616
DATE LAST PLT: 14 OCT 98 14:17:50	DRAWN BY:		

c:\itds\civil\775616es.004 rvanderg

Table IX-7

Surface Water and Sediment Samples and QA/QC Samples to be Collected
Remedial Investigation at TNT Area B
Former Plum Brook Ordnance Works, Sandusky, Ohio

	Sample Identification[a]	QA/QC Samples		
		Field Duplicate	MS/MSD	Field Split
Surface Water	PBOW-98-SW-TNTB-SW01-10200-0000			
	PBOW-98-SW-TNTB-SW02-10210-0000			
	PBOW-98-SW-TNTB-SW03-10220-0000	X	X	X
	PBOW-98-SW-TNTB-SW04-10230-0000			
	PBOW-98-SW-TNTB-SW05-10240-0000			
	PBOW-98-SW-TNTB-SW06-10250-0000[b]			
	PBOW-98-SW-TNTB-SW07-10260-0000[b]			
Sediment	PBOW-98-SD-TNTB-SD01-11000-0000			
	PBOW-98-SD-TNTB-SD02-11010-0000			
	PBOW-98-SD-TNTB-SD03-11020-0000			
	PBOW-98-SD-TNTB-SD04-11030-0000	x	x	x
	PBOW-98-SD-TNTB-SD05-11040-0000			
	PBOW-98-SD-TNTB-SD06-11050-0000[b]			
	PBOW-98-SD-TNTB-SD07-11050-0000[b]			

[a] Surface water and sediment samples are co-located (i.e., SW01 and SD01 are from the same location).

[b] These surface water and sediment samples may be collected at the headwaters of the Ransom Brook if a sufficient quantity of water is available at the time of the collection of the brook samples.

MS/MSD - Matrix spike/matrix spike duplicate.
QA/QC - Quality assurance/quality control.

is an adequate quantity of water for analysis. Although shown in the attached schedule to occur at the end of the field sampling effort, this sampling will be completed as soon as possible. The USACE-Nashville District on-site representative will be notified prior to any schedule changes in field sampling.

IX.4.2.3.1 Surface Water Sampling

The equipment required for surface water sampling includes a stainless-steel pitcher, a 100-foot measuring tape, proper sampling containers, and any required health and safety devices.

The following procedure will be followed for the collection of surface water samples:

- Refer to the health and safety plan before proceeding with sampling.
- Surface water shall be collected first, prior to any sediment sampling.
- Surface water sampling shall occur from downstream to upstream with VOCs being collected first followed by SVOCs, explosives and other required samples.
- Two persons will perform the sampling. One person will carefully adopt an optimal sampling position and remain in that position until all sampling at that locality is completed in order to minimize the agitation of the sediment and water. The other person will be positioned within arms length of the sampler on dry ground, to aid in field measurements, filling of sample bottles, and to fill out sample collection log.
- At each sampling location, a decontaminated stainless-steel pitcher will be triple rinsed with water from the creek. Alternatively, the samples bottles may be directly immersed in the surface water body, unless split samples are required. At end of sampling, field parameters including Eh, pH, specific conductance, temperature, and dissolved oxygen will be measured and recorded in sample collection log.
- Surface water sample locations will be flagged and shown in the collection log for use during land survey.
- For seeps, the construction of temporary collection boxes may be required.

IX.4.2.3.2 Sediment Sampling

The equipment required for sediment sampling includes an Ekman dredge or similar device, stainless-steel bowls, wood stakes, hammer, a 100-foot tape, proper sample container, and required health and safety device.

The following procedure will be followed for the collection of surface water samples:

- Refer to the health and safety plan before proceeding with sampling.
- The collection of sediment samples from Ransom Brook shall be conducted using a decontaminated Ekman dredge or similar device. In flowing water, the sample shall be taken at the location upstream of the sampler.
- Sediment sampling should occur in areas of low flow with sediment consisting of fine sand or smaller grain size.
- Fill the sample containers with sediment from the bowl, packing the VOC samples as soon as possible. Samples collected for VOC analysis will be placed in the container with no headspace. Sample containers will be labeled and placed on ice in a cooler. When all required samples are collected, the sampling location will be staked and flagged for use in land survey.

IX.4.3 Boring Abandonment

Upon completion of soil sampling, soil borings will be abandoned by backfilling with soils removed during sampling. Any remaining space will be grouted to the surface. The type of grout to be used will be bentonite-cement slurry grout with approximately 5 percent bentonite powder and 95 percent Type 1 portland cement, mixed with 5 to 6 gallons of clean water. The IT field geologist will check the abandoned boring after 24 hours for any grout settlement or depression and add more grout if necessary. Due to the shallow boring depth, use of a tremie pipe is optional.

IX.4.4 Land Surveying

Prior to commencing soil screening sampling activities, IT will secure the services of an Ohio-registered professional land surveyor (PLS) to establish up to eight baselines for screening sampling grids. These baselines will be placed to establish sampling grids based on the historical site layout and previous analytical results. Each baseline will be up to 1,600 feet in length with nodes spaced at 100-foot intervals.

Following completion of confirmation soil sampling and surface/water sediment sampling activities, the PLS will determine the coordinates and elevations of confirmation soil borings and surface water/sediment samples. The horizontal coordinates will be surveyed to the closest 0.1 foot and referenced to the State Plane Coordinate System (SPCS). Vertical elevations will be

surveyed to the nearest 0.01 foot and referenced to the 1929 National Geodetic Vertical Datum (NGVD).

Locations of screening samples will be determined based upon the surveyed (baselines) screening sample grids, where measurements to grid nodes and other known site features will be used to locate each sample point.

IX.5.0 Sample Analysis and Decontamination Procedures

IX.5.1 Sample Number System

The confirmation sample numbering system to be used during this investigation for fixed base samples 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 numbering system to be used for the RI is described as follows:

Project Code	Year	Sample Type[a]	Site Identification	Boring Number	Sample Number	Sample Depth (ft)
PBOW	1998	XX	TNTB	XXXXX	XXXXX	XX-XX

[a]Sample types:

ER - Equipment rinsate sample
FB - Field blank
FD - Field duplicate sample
FS - Field split sample
MD - Matrix spike duplicate sample
MS - Matrix spike sample
SO - Soil sample
SD - Sediment sample
SW - Surface water sample.

PBOW-98-SO-TNTB-SB001-10340-04-06 signifies that this soil sample was collected from a depth of 4 to 6 feet at soil boring SB01 in TNTB with a sample number of 0560. The sample identification number will be recorded by the IT field geologist in the field activity daily log, boring log, and sample collection log as shown respectively in Figures 4-1, 4-11, and 4-16 of the SAP (IT, 1996a). Tables IX-6 and IX-7 present the confirmation soil samples and QA/QC samples to be collected.

The soil screening sample numbering system will also conform to USACE-Nashville District's numbering convention except that project code and gear will not be included. TNTB-SS002-10001- (00-01) signifies that this soil sample was collected from a depth of 0 to 1 foot at surface soil location SS002 in TNTB with a sample number of 10002.

IX.5.2 Analytical Program

The analytical program has been designed to acquire sufficient and defensible data to determine the extent of soils in the investigated areas that has been impacted by nitroaromatic compounds. Table IX-8 summarizes the analytical parameters required and associated laboratory methodologies to be utilized during this investigation.

A total of 360 surface and 40 subsurface soil samples will be analyzed using IMS technique for screening nitroaromatic constituents. Table IX-5 presents the screening sample identifications for tracking purpose. The analysis will be performed in an on-site laboratory equipped with self-sustained IMS unit capable of carrying out analyses using all explosive standards and generating hardcopies. IMS field screening will be performed by an experienced chemist following procedures established in the IMS field screening SOP. Note that the IMS field screening SOP will be submitted under separate cover.

At least 40 confirmation soil samples will be analyzed by an off-site contract laboratory for nitroaromatics, target compound list (TCL) VOCs, TCL SVOCs, target analyte list (TAL) metals, and PCBs. Laboratory QC procedures and data quality requirements are specified in and referenced to appropriate sections of the QAPP (IT, 1996b). Confirmation sample locations will be selected based on the screening results and will consist of both surface and subsurface samples.

In addition to soil samples, five to seven surface water and five to seven sediment samples will be analyzed for nitroaromatics, TCL VOCs, TCL SVOCs, TAL metals, and PCBs.

IX.5.3 Decontamination Procedures

Decontamination requirements and procedures are specified in detail in Chapter 5.0 of the SAP (IT, 1996a) and will be followed during the current investigation at TNTB. IT field coordinator must contact PBS for access to a potable water source for decontamination use. The following summarizes decontamination procedures for equipment before site entry, between borings, and before site departure:

Nonsampling equipment (augers, drill rod, etc 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.

Table IX-8

Summary of Analytical Parameters and Methods
Remedial Investigation at TNT Area B
Former Plum Brook Ordnance Works, Sandusky, Ohio

Sample Media	Analytical Parameters[a]	Methods[b]
Screening Soils	Nitroaromatic Compounds	IMS (on-site laboratory)
Confirmation Soils	Nitroaromatic Compounds	EPA SW-846 8330
	TCL VOCs	EPA SW-846 8260A
	TCL SVOCs	EPA SW-846 3540C/8270C
	TAL Metals[c]	EPA SW-846 3050B/6010B/7471A
	PCB	EPA SW-846 3540B/8082
Surface Water	Nitroaromatic Compounds	EPA SW-846 8330 (modified)
	TCL VOCs	EPA SW-846 8260A
	TCL SVOCs	EPA SW-846 3540C/8270C
	TAL Metals	EPA SW-846 3050B/6010B/7470A
	PCB	EPA SW-846 3540B/8082
Sediment	Nitroaromatic Compounds	EPA SW-846 8330
	TCL VOCs	EPA SW-846 8260A
	TCL SVOCs	EPA SW-846 3540C/8270C
	TAL Metals	EPA SW-846 3050B/6010B/7471A
	PCB	EPA SW-846 3540B/8082

[a] The analytical methods, except ion mobility spectroscopy (IMS), are found in the following references:

Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, U.S. Environmental Protection Agency (EPA) Publication SW-846, Third edition, Update III, September 1996.
Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, U.S. Environmental Protection Agency (EPA) Publication SW-846, Third edition, Update II, September 1994.

[b] Target analyte list (TAL) and target compound list (TCL) are used to only designate analyte lists, with no requirements for Contract Laboratory Program (CLP) method quality control (QC) or data reporting packages.

[c] TAL metals include Ag, Al, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, K, Mg, Mn, Na, Ni, Pb, Sb, Ti, V, As, Hg, Se, and Zn.

PCB - Polychlorinated biphenyl.
SVOC - Semivolatile organic compound.
VOC - Volatile organic compound.

Sampling equipment (split spoons, spoons, bowls, etc that contact analytical samples):

- Field screening sample:
  - Deionized water/low phosphate detergent wash
  - Deionized water rinse (American Society for Testing and Materials [ASTM] Type II)
  - Isopropyl alcohol rinse
  - Air dry
  - Wrap in aluminum foil
- Confirmation samples
  - Wash and scrub using a brush with nonphosphate detergent.
  - Rinse with potable water.
  - Rinse with ASTM Type II water.
  - Rinse with methanol.
  - Final rinse with ASTM Type II water; the volume of water used will be at least five times greater than the volume of methanol used.
  - Air dry.
  - Wrap in aluminum foil.

IX.6.0 Sample Preservation, Packing, and Shipping

Sample containers and caps will be new, certified as precleaned containers from I-CHEM, made of materials recommended by the EPA in Title 40, Code of Federal Regulations, Part 136 and SW-846 (3rd Edition). Sample containers and preservatives/preservation methods are summarized in Table 5-1 of the QAPP (IT, 1996b). 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, not the date that it is received by the laboratory.

Samples for chemical analysis will be placed in coolers as soon as possible after collection and will be packed so as to minimize the possibility of container breakage by using Vermiculite or styrofoam peanuts to fill void spaces in the cooler. Samples will be cooled as promptly as feasible to a temperature of approximately 4 degrees Celsius and maintained at that temperature by means of blue ice or double-bagged ice from the time the shipping carton is sealed using tape and custody tape until it is received at the laboratory. Coolers will be shipped to the laboratory by a next-day-delivery service. Notification of shipment, including airbill number, will be telephoned or faxed to the laboratory the day of sample collection. If this is not possible, the laboratory will be notified the following morning.

Completed AR/COC records will be secured and included with each shipment of coolers to:

Sample Receiving
Quanterra Environmental Services
5815 Middlebrook Pike
Knoxville, Tennessee 37921
Telephone: (423)-588-6401

or (for QA samples):

Curtis and Tomkins
Attention: Mrs. Carol Wortham
2323 Fifth Street
Berkeley, California 94710
Telephone: (510) 486-0900.

IX.7.0 Investigation-Derived Waste Management Plan

Anticipated IDW during field activities includes excess soil samples, decontamination fluid, and disposable personal protective equipment. Detailed procedures of IDW management is provided in Chapter 8.0 of the SAP (IT, 1996a). The following is a brief summary of the procedures for handling IDW.

IX.7.1 Surface Soil

Residual surface soil will be used as backfill or spread out on the surface at the point of origin. Therefore, no IDW will be generated during surface soil sampling.

IX.7.2 Drill Cuttings From Borings

Soil cuttings from soil borings and excess soil samples will be returned immediately after sample collection to the point of origin (backfill). Therefore, no IDW will be generated during soil boring for subsurface soil sampling.

IX.7.3 Excess Soils and Laboratory Wastes from Field Screening

Excess soils generated during on-site field screening analyses will be placed in 55-gallon drums for later disposal. Other laboratory wastes will be placed in separate drums for later off-site disposal.

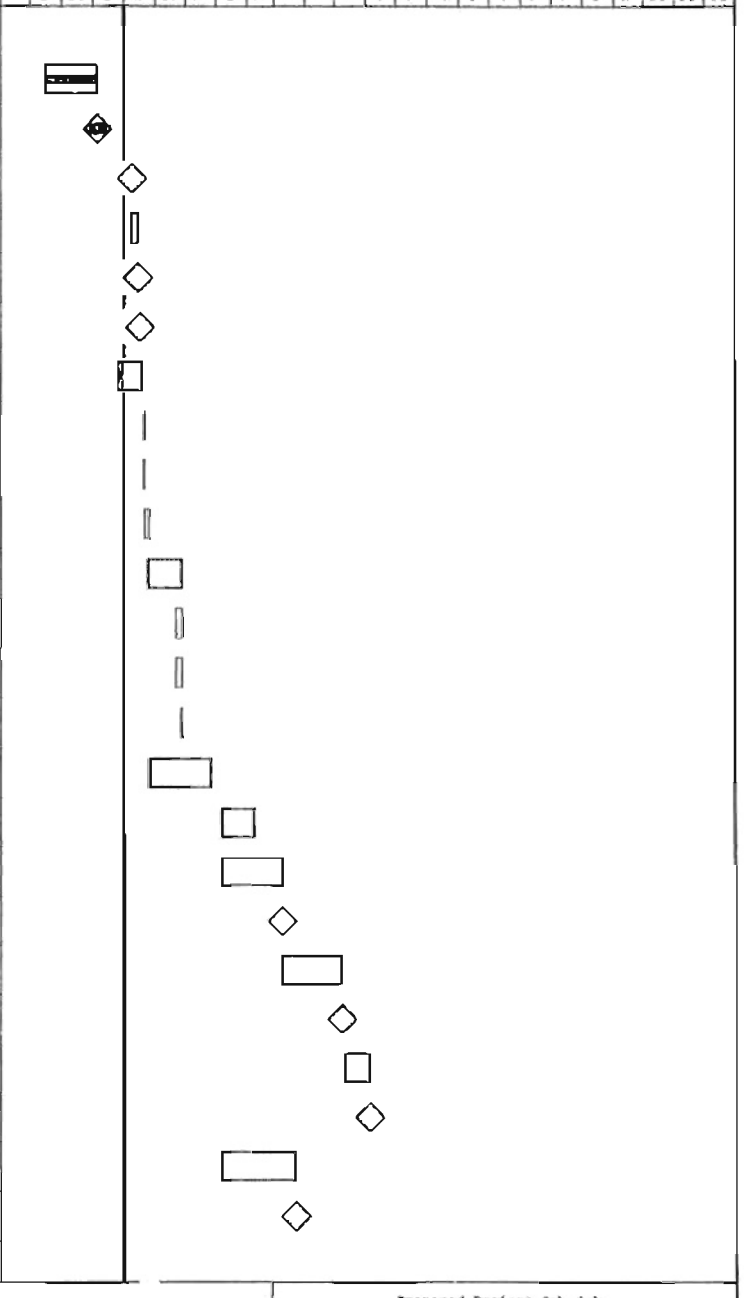
IX.7.4 Decontamination Fluid

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 will be placed in 55-gallon drums upon completion of field sampling. Decontamination fluid containing small quantities of solvents such as methanol or hexane will be collected in metal pans for evaporation. IDW drums will be labeled to indicate project name, date collected, and contents and stored on pallets in the staging area located east of the Building 9201 on Pentolite Road.

IX.8.0 Project Schedule

The project schedule is presented in Figure IX-5.

ACTIVITY DESCRIPTION	EARLY START	EARLY FINISH	ORIG DUR
Notice to Proceed	26MAY98A		0
Prepare & Submit SSAP & SSHP	15JUL98A	4SEP98A	76
Submit Draft SSAP & SSHP		4SEP98A	0
Receive Comments		8OCT98	0
Revise SSAP/SSHP	8OCT98	14OCT98	7
Submit Revised SSAP/SSHP		14OCT98	0
Receive Approval of Final SSAP/SSHP		16OCT98	0
Field Preparation/Subcontracting	25SEP98A	18OCT98	22
Mobilization to PBOW	21OCT98	21OCT98	1
Kickoff Meeting	21OCT98	21OCT98	1
Site Clearing/Surveying	22OCT98	25OCT98	4
Soil Sampling & Field Screening	25OCT98	27NOV98	34
Sediment & Surface Water Sampling	22NOV98	27NOV98	6
Final Surveying	22NOV98	27NOV98	6
Demob	27NOV98	27NOV98	1
Lab Analysis	26OCT98	26DEC98	62
Data Validation	6JAN99	7FEB99	33
Volume I Report	6JAN99	7MAR99	61
Submit Draft Volume I Report		7MAR99	0
Review Draft Volume I Report	7MAR99	6MAY99	61
Receive Comments Draft Volume I Report		6MAY99	0
Revise Draft Volume I Report	9MAY99	3JUN99	26
Submit Final Volume I Report		3JUN99	0
Volumes II & III Draft Reports	6JAN99	21MAR99	75
Submit Draft Volumes II & III Reports		21MAR99	0



Plot Date 13OCT98
Data Date 1OCT98
Project Start 26MAY98
Project Finish 31OCT99

(c) Primavera Systems, Inc.

Activity Bar/Early Dates
Critical Activity
Progress Bar
Milestone/Flag Activity

NCOE 3885

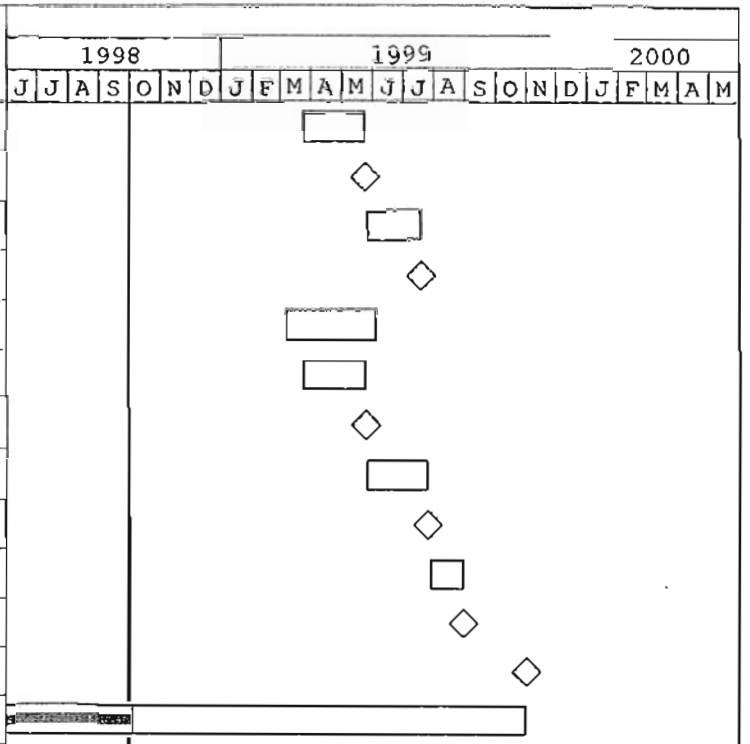
USACE - Nashville District
Plum Brook Ordnance Works
TNT Area B Investigation

Proposed Project Schedule

Date	Revision	Checked	Approved

Figure IX-5
(page 1 of 2)

ACTIV. DESCRIPTION	EARLY START	.RLY FINISH	ORIG DUR
Review Draft Volumes II & III Reports	24MAR99	23MAY99	61
Receive Comments Draft Volumes II & III Reports		23MAY99	0
Revise Draft Volumes II & III Reports	26MAY99	18JUL99	54
Submit Final Volumes II & III Reports		18JUL99	0
Prepare Final Database Deliverable	7MAR99	3JUN99	89
Draft Volume IV Report	24MAR99	24MAY99	62
Submit Draft Volume IV Report		24MAY99	0
Review Draft Volume IV Report	26MAY99	25JUL99	61
Receive Comments on Draft Volume IV Report		25JUL99	0
Revise Draft Volume IV Report	28JUL99	29AUG99	33
Submit Final Volume IV Report		29AUG99	0
Final Volumes I, II, III, & IV Approval		31OCT99	0
Project Management and Quality Control Plan	26MAY98A	31OCT99	524



Plot Date 13OCT98
Data Date 1OCT98
Project Start 26MAY98
Project Finish 31OCT99

Activity Bar/Early Date
Critical Activity
Progress Bar
Milestone/Flag Activity

Note Hrs

USACE - Nashville District
Plum Brook Ordnance Works
TNT Area B Investigation

Proposed Project Schedule

Date	Revision	Checked	Approved

Figure IX-5
(page 2 of 2)

IX.9.0 References

Dames and Moore (D&M), 1997, ***TNT Areas Site Investigation, Final Report, Plum Brook Ordnance Works, Sandusky, Ohio***, prepared for U.S. Army Corps of Engineers, Nashville District/Huntington District, April 1997.

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INTERNATIONAL TECHNOLOGY CORPORATION

DISCIPLINE SIGN-OFF REVIEW

Client Name: U.S. Army Engineer District, Nashville; CELRN-EP-R-M

Project Description: RI/FS of TNT Area B, Former Plum Brook Ordnance Works, Sandusky, Ohio

Contract Number: DACA62-94-D-0030 Delivery Order Number: 0034

Project Number: 775616 Task / Phase Number: 02000000

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☐ SAP, SSAP, CDAP, or QAPP		
☒ SHP or SSHP	SSHP, Revision 1, October 1998	**Document Status**
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☐ Risk Assessment / Evaluation		☐ Internal Draft
☐ Specifications & Plans		☐ Draft
☐ Design Calculations		☐ Draft Final
☐ Tables		☒ Final
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NOTICE: By signature above, parties certify that the subject document has been prepared by and/or reviewed by them (as appropriate), that all review comments have been resolved, and that the document is ready for submittal.

Attachment IX

Site-Specific Safety and Health Plan
Remedial Investigation of TNT Area B
Former Plum Brook Ordnance Works
Sandusky, Ohio

Prepared by:

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Knoxville, Tennessee 37923

Submitted to:

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U.S. Army Engineer District, Nashville
Post Office Box 1070
Nashville, Tennessee 37202-1070

IT Project No. 775616
Control Copy No. ____

October 1998
Revision 1

This Site-Specific Safety and Health Plan Attachment must be used in conjunction with the Sitewide Safety and Health Plan for Site Investigations and Groundwater Investigations at the former Plum Brook Ordnance Works, dated July 1997.

Reviews and Approvals

Project Manager
IT Corporation — 15 OCTOBER 98 — Date

Health and Safety Manager
IT Corporation — 10/13/98 — Date

Site Coordinator
IT Corporation — 10/15/98 — Date

Site Safety and Health Officer
IT Corporation — 10/15/98 — Date

This Site-Specific Safety and Health Plan Attachment must be used in conjunction with the Sitewide Safety and Health Plan for Site Investigations and Groundwater Investigations at the former Plum Brook Ordnance Works, dated July 1997.

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Control Copy No. 21	M. Gunderson
Control Copy No. 22	Project File
Control Copy Nos. 23, 24, and 25	Field personnel

Plum Brook Project Emergency Contacts

Note: All field crews will be provided 2-way radios from the Plum Brook Communications Center. In the event of an emergency, contact the Plum Brook Communications Center by radio and they will contact and coordinate emergency response personnel.

Fire Department	(419) 627-5837
Ambulance	911
Police Department	(419) 627-5863
Providence Hospital	(419) 621-7000
National Response Center	(800) 424-8802
Poison Control Center	(800) 462-0800
Ohio EPA Emergency Spill Number	(800) 282-9378
Linda Ingram, USACE Technical Coordinator	(615) 736-7122
Mike Spangberg, IT Project Manager	(423) 690-3211
Mike Gunderson, IT Site Manager	2-way radio
Melissa Smith, IT H&S Manager	(423) 690-3211
Dr. Elaine Theriault, IT Occupational Physician	(800) 299-3674

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List of Acronyms

DNT	dinitrotoluene
NIOSH	National Institute of Occupational Safety and Health
PBOW	Plum Brook Ordnance Works
PPE	personal protective equipment
SHP	safety and health plan
SSHP	site safety and health plan

IX.1.0 Site Work Plan Summary

Project Objective. The objectives of this investigation at the former Plum Brook Ordnance Works (PBOW), Sandusky, Ohio, are summarized as follows:

- Determine if there are hazardous substances present at the site in a manner that constitutes unacceptable risk to human health and the environment.
- Define site physical features and characteristics (aquifer background conditions).
- Evaluate fate and transport pathways (groundwater modeling).
- Determine current and future routes of exposure.

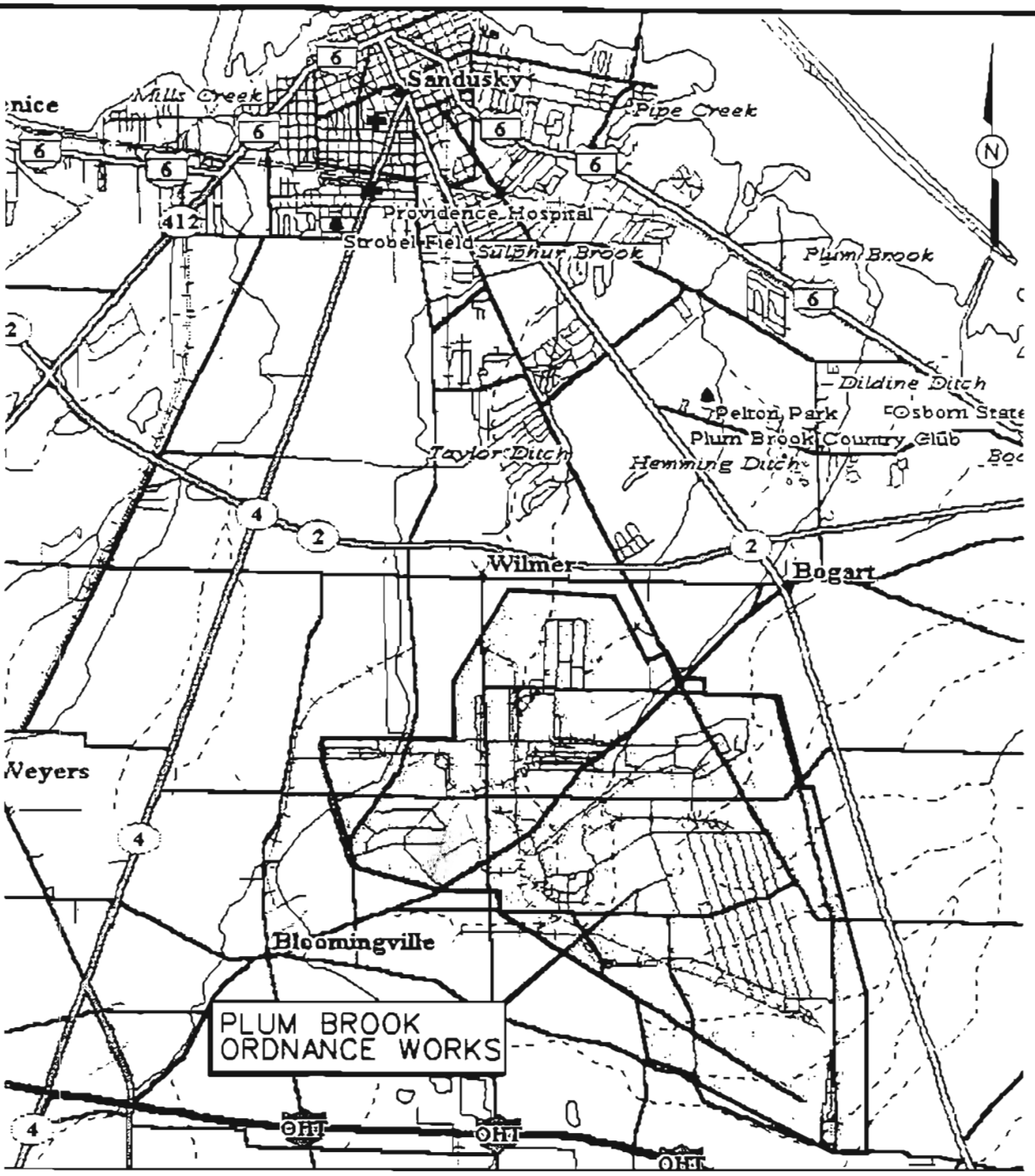
Project Tasks

- Surveying
- Soil boring and sampling
- Decontamination of equipment (high-pressure water jetting operations)
- Sediment/seep and surface water sampling.

Personnel Requirements. Up to 15 employees.

Note: All personnel on this site shall have received training, informational programs, and medical surveillance as outlined in the sitewide safety and health plan (SHP) for site investigations at PBOW, and be familiar with the requirements of this site-specific SHP (SSHP). Figure IX.1-1 presents PBOW and the hospital location map. Figure IX.1-2 shows the route from TNT Area B to U.S. Highway 250. The TNT Area B work zones will change daily due to the large area to be sampled. Based on the sampling, sufficient work zones boundaries will be established at least 10 feet from surface sampling locations and 30 feet from all boring locations.

Project Schedule. Late fall 1998.



NOT TO SCALE

FIGURE IX-1

SITE AND HOSPITAL
LOCATION MAP

PLUM BROOK ORDNANCE WORKS
SANDUSKY, OHIO

INTERNATIONAL
TECHNOLOGY
CORPORATION

STARTING DATE: 12/16/97 | DATE LAST REV: 02 SEP 98 | DRAFT CHCK BY | INITIATOR: D KESSLER | DWG NO: V77561GES 001
DRAWN BY: D BILLINGSLEY | DRAWN BY: RVANDERG | ENGR CHCK BY: D KESSLER | PROJ MGR: M SPANGBERG | PROJ NO: 77561

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N 625.000
N 621.000
N 617.000
N 613.000
N 609.000

BOGART ROAD
PATROL ROAD
DITCH
LINDSLEY
SANDUSKY - NORWALK ROAD
RANSOM ROAD
MAINTENANCE ROAD
TAYLOR CUT ROAD
PATROL ROAD
CAMPBELL STREET
SHORT CUT ROAD
MAGAZINE ROAD
COLUMBUS AVE.
U.S. 250
CENTER MAGAZINE ROAD
WEST SCHEID ROAD
EAST SCHEID ROAD
TNT AREA B
PATROL ROAD
COLUMBUS AVE.
MASON ROAD

SCALE
0 1200 2400 FEET

LEGEND:

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

FIGURE IX-2
ROUTE FROM TNT AREA B TO US HIGHWAY 250

FORMER PLUM BROOK ORDNANCE WORKS
NASA PLUM BROOK STATION
SANDUSKY, OHIO

INTERNATIONAL TECHNOLOGY CORPORATION

STARTING DATE: 10/16/98	DATE LAST REV.:	INITIATOR: R. ELLIS	DWG. NO.: ...\775616es.008
DRAWN BY: R.VANDERGRIFF	DRAWN BY:	PROJ. MGR.: SPANGBERG	PROJ. NO.: 775616
		ENGR. CHCK. BY: R. ELLIS	
		DRAFT. CHCK. BY:	

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IX.2.0 Site Characterization and Analysis

IX.2.1 Anticipated Hazards

The activity hazard analysis in Chapter 5.0 contains project-specific practices utilized to reduce or eliminate anticipated site hazards. The activity hazard analysis indicates specific chemical and physical hazards that may be present and encountered during each task from on-site operations. Below each task is a list of hazards and specific actions that will be taken to control the respective hazards. These control measures may include work practice controls, engineering controls, and/or use of appropriate personal protective equipment (PPE).

The potential contaminants of concern include nitroaromatic compounds. The following table indicates maximum concentrations of contaminants detected during previous investigations at TNT Area B:

Chemical	Maximum Soil Concentration (mg/kg)
2,4,6-Trinitrotoluene	20,000
1,3,5-Trinitrobenzene	25
2,4-Dinitrotoluene	11,000
2,6-Dinitrotoluene	12,000

Table IX.2-1 contains chemicals anticipated and chemicals to be used during project activities.

IX.2.2 General Site Information

A description of the site including location, site topography, and site accessibility is presented in Section 1.3 of the site-wide sampling and analysis plan prepared by IT Corporation in September 1996.

Table IX.2-1

Toxicological and Physical Properties of Chemicals
Plum Brook Ordnance Works, Sandusky, Ohio

Substance [CAS]	IP[a] (eV)	Odor Threshold (ppm)	Route[b]	Symptoms of Exposure	Treatment	TWA[c]	STEL[d]	Source[e]	IDLH (NIOSH)[f]
1,3-Dinitrobenzene [99-65-0]	10.43		Inh Abs Ing Con	Anoxia, cyanosis, visual disturbances, central blind spot of vision, bad taste, burning of mouth, dry throat, thirsty; yellowing hair, eyes, and skin; anemia, liver damage.	Eye: Irrigate immediately Skin: Soap wash immediately Breath: Respiratory support Swallow: Immediate medical attention	1 mg/m³ (skin) 0.15 ppm (skin) 1 mg/m³ (skin)		PEL TLV REL	50 mg/m³
Benzene [71-43-2]	9.24	34–119	Inh Abs Ing Con	Irritates eyes, nose, respiratory system; giddiness; headache, nausea, staggered gait; fatigue, anorexia, lassitude; dermatitis; bone-marrow depression. Carcinogenic.	Eye: Irrigate immediately Skin: Soap wash promptly Breath: Respiratory support Swallow: Immediate medical attention	1 ppm (10 ppm) NIC–0.1 skin 0.1 ppm	5 ppm C1 ppm (Ca)	PEL TLV REL	Ca [1,000 ppm]* *OSHA
Chromium (as Cr) [7440-47-3]	NA	NA	Inh Ing Con	Irritation of eyes, skin, and upper respiratory system; fibrosis of lungs.	Eye: Irrigate immediately Skin: Wash flush Breath: Respiratory support Swallow: Immediate medical attention	1 mg/m³ 0.5 mg/m³	- -	PEL TLV	250mg/m³ (as Cr)
Dinitrotoluene (DNT)	N/A	-	Inh Abs Ing Con	Anoxia, cyanosis, anemia, jaundice; reproductive effects. Animal carcinogen.	Eye: Irrigate immediately Skin: Soap wash immediately Breath: Respiratory support Swallow: Immediate medical attention	1.5 mg/³ (skin) NIC-0.2 mg/m³ (skin) 1.5 mg/m³ (skin)	- - -	PEL TLV REL	Ca [50 mg/m³)
Ethyl benzene [100-41-4]	8.76	0.09-0.6	Inh Ing Con	Irritates eyes, mucous membranes; headache; dermatitis; narcosis, coma.	Eye: Irrigate immediately Skin: Water flush promptly Breath: Respiratory support Swallow: Immediate medical attention	100 ppm 100 ppm 100 ppm	125 ppm 125 ppm 125 ppm	PEL TLV REL	800 ppm

Table IX.2-1

Toxicological and Physical Properties of Chemicals
Plum Brook Ordnance Works, Sandusky, Ohio

Substance [CAS]	IP[a] (eV)	Odor Threshold (ppm)	Route[b]	Symptoms of Exposure	Treatment	TWA[c]	STEL[d]	Source[e]	IDLH (NIOSH)[f]
Gasoline [8006-61-9]	?	0.3	Inh Ing Con	Intoxication, headaches, blurred vision, dizziness, nausea; eye, nose, and throat irritation; potential kidney and other cancers. Carcinogenic.	Eye: Irrigate immediately (15 min) Skin: Soap wash promptly Breath: Respiratory support Swallow: Immediate medical attention	300 ppm 300 ppm Ca, lowest feasible conc. (LOQ 15 ppm)	500 ppm 500 ppm	PEL TLV REL	?
Methanol	10.85	4.2-5960	Inh Abs Ing Con	Irritated eyes, headache, drowsiness, lightheadedness, nausea, vomiting, disturbance in vision, blindness.	Eye: Irrigate immediately Skin: Water flush promptly Breath: Fresh air Swallow: Immediate medical attention		200 ppm (skin) 200 ppm (skin) 200 ppm	PEL TLV REL	6,000 ppm
Nitric acid [7697-37-2]	11.95	0.3-1	Inh Ing Con	Irritated eyes, mucous membranes, and skin; delayed pulmonary edema, pneumonitis, bronchitis; dental erosion.	Eye: Irrigate immediately Skin: Wash flush promptly Breath: Respiratory support Swallow: Immediate medical attention	2 ppm 2 ppm 2 ppm	4 ppm 4 ppm 4 ppm	PEL TLV REL	25 ppm
Nitrobenzene [98-95-3]	9.92	0.37	Inh Abs Ing Con	Irritation of eyes, skin, anoxia; dermatitis; anemia; methemoglobinemia; testicular effects.	Eye: Irrigate immediately Skin: Wash flush Breath: Respiratory support Swallow: Immediate medical attention	1 ppm (skin) 1 ppm (skin) 1 ppm (skin)		PEL TLV REL	200 ppm
Portland cement			Inh	Fine gray powder that can be irritating if inhaled or in eyes.	Eye: Irrigate immediately Skin: Soap wash flush Breath: Respiratory support Swallow: Immediate medical attention		10 mg/m^3 10 mg/m^3/total dust 5 mg/m^3 respirable fraction	TLV PEL/REL	
Toluene [108-88-3]	8.82	0.16-37	Inh Abs Ing Con	Fatigue, weakness; confusion, euphoria, dizziness, headache; dilated pupils, lacrimation; nervousness, muscular fatigue, insomnia; paralysis; dermatitis.	Eye: Irrigate immediately Skin: Soap wash promptly Breath: Respiratory support Swallow: Immediate medical attention	100 ppm 50 ppm (skin) 100 ppm	150 ppm 150 ppm	PEL TLV REL	500 ppm

Table IX.2-1

Toxicological and Physical Properties of Chemicals
Plum Brook Ordnance Works, Sandusky, Ohio

Substance [CAS]	IP[a] (eV)	Odor Threshold (ppm)	Route[b]	Symptoms of Exposure	Treatment	TWA[c]	STEL[d]	Source[e]	IDLH (NIOSH)[f]
1,3,5-Trinitrobenzene	?		Inh Ing Con Abs	Irritating to the skin, mucus membranes, and eyes; nausea, vomiting, diarrhea, and abdominal pain; liver damage.	Eye: Irrigate immediately Skin: Soap wash promptly Breath: Respiratory support Swallow: Immediate medical attention	0.1 mg/m^3 0.1 mg/m^3 0.1 mg/m^3	0.3 mg/m^3	PEL TLV REL	100 mg/m^3
Trinitrotoluene (TNT) [118-96-7]	10.59 ev		Inh Abs Ing Con	Irritation of skin, mucous membranes; liver damage, jaundice; cyanosis, sore throat; kidney damage; cardio irregularity.	Eye: Irrigate immediately Skin: Soap wash promptly Breath: Respiratory support Swallow: Immediate medical attention	1.5 mg/m^3 (skin) 0.1 mg/m^3 (skin) 0.5 mg/m^3 (skin)		PEL TLV REL	500 mg/m^3

[a]IP = Ionization potential (electron volts).
[b]Route = Inh, Inhalation; Abs, Skin absorption; Ing, Ingestion; Con, Skin and/or eye contact.
[c]TWA = Time-weighted average. The TWA concentration for a normal work day (usually 8 or 10 hours) and a 40-hour work week, to which nearly all workers may be repeatedly exposed, day after day without adverse effect.
[d]STEL = Short-term exposure limit. A 15-minute TWA exposure that should not be exceeded at any time during a work day, even if the TWA is not exceeded.
[e]PEL = Occupational Safety and Health Administration (OSHA) permissible exposure limit (29 CFR 1910.1000, Table Z).
TLV = American Conference of Governmental Industrial Hygiene (ACGIH) threshold limit value—TWA.
REL = National Institute for Occupational Safety and Health (NIOSH) recommended exposure limit.
[f]IDLH (NIOSH)—Immediately dangerous to life or health (NIOSH). Represents the maximum concentration from which, in the event of respirator failure, one could escape within 30 minutes without a respirator and without experiencing any escape-impairing or irreversible health effects.
NE = No evidence could be found for the existence of an IDLH (NIOSH Pocket Guide to Chemical Hazards, Pub. No. 90-117, 1990).
C = Ceiling limit value which should not be exceeded at any time.
Ca = Carcinogen.
NA = Not applicable.
NIC = Notice of Intended change (ACGIH).

IX.3.0 Personal Protective Equipment

The work activities will begin in the following levels of protection.

Task	Initial Level of PPE
Staging equipment	Level D
Surveying	Level D
Soil boring and sampling	Modified Level D*
Decontamination of equipment	Modified Level D*
Sediment/seep/surface water sampling	Level D

*Initial level will be raised to Level C or higher if air monitoring results in the worker's breathing zone are above action levels. Note: If unusual conditions or odors are encountered and air monitoring instruments do not detect volatile organic chemicals or hydrogen sulfide, turn equipment off, evacuate the work area, and contact the Health and Safety Manager for further assistance.

A complete description of Level D, Modified Level D, and Level C follows.

Level D. The following equipment will be used for Level D protection:

- Coveralls or work clothing
- Steel-toed safety boots
- Safety glasses
- Hard hat
- Hearing protection (when working near/adjacent to operating equipment)
- U.S. Coast Guard-approved personal flotation device (where potential for drowning exists).

Modified Level D. The following equipment will be used for Modified Level D protection:

- Permeable Tyvek, Kleenguard, or its equivalent
- Polyvinyl chloride boot covers
- Nitrile gloves (outer)
- Lightweight nitrile gloves (inner)
- Steel-toed safety boots
- Safety glasses
- Hard hat
- Hearing protection (when working near/adjacent to operating equipment).

Level C. Level C protection will not be used unless air monitoring data indicate the need for upgrade; however, the equipment shall be readily available on site. The following equipment will be used for Level C protection:

- National Institute of Occupational Safety and Health (NIOSH)-approved full face, air purifying respirators equipped with organic vapor/acid gas cartridge in combination with high-efficiency particulate air filter
- Hooded, saran-coated Tyvek, taped at gloves, boots, and respirator
- Nitrile gloves (outer)
- Lightweight nitrile gloves (inner)
- Neoprene steel-toed boots or polyvinyl chloride overbooties/steel-toed safety boots
- Hard hat
- Hearing protection (when working near/adjacent to operating equipment).

Level B. Level protection will not be used unless air monitoring data indicate the need for upgrade will be used for Level B protection:

- Pressure-demand NIOSH-approved self-contained breathing apparatus
- Hooded, saran-coated Tyvek, taped at gloves, boots, and respirator
- Nitrile gloves (outer)
- Latex or lightweight nitrile gloves (inner)
- Neoprene steel-toed boots or polyvinyl chloride overbooties/steel-toed safety boots
- Hard hat
- Hearing protection (when working near/adjacent to operating equipment).

Personnel Decontamination: All personnel working in the exclusion zone wearing modified Level D or higher must undergo personnel decontamination prior to entering the support zone. Level D will require no personnel decontamination. The personnel decontamination area shall consist of the following stations.

Station 1. Personnel leaving the exclusion zone will remove the gross contamination, by physical means, from their outer clothing and boots (i.e., dislodging/displacement, rinsing, wiping: no blowing, brushing etc.).

Station 2. Equipment for this station may include plastic-lined waste receptacle, chair, clean damp cloths or paper towels, and plastic bags. At Station 2, personnel will remove their Tyvek coveralls and gloves and deposit them in the lined waste receptacles. Personnel will wipe their respirators (if used), hard hats, and boots with clean, damp cloths and then remove those items. Those items are then hand-carried to the next station.

Station 3. Equipment for this station may include a wash basin with soap and water and a respirator sanitation station. At this station, personnel will thoroughly wash their hands and face before leaving the decontamination zone. Respirators will be sanitized and then placed in a clean, plastic ziplock bag.

Donning Procedures.

- Put on boots and boot covers and tape the coveralls.
- Put on gloves.
- Tape the coveralls over the gloves at the wrist.
- If Level C PPE is required, don respirator and check for secure fit.
- Put hood or head covering over the respirator.
- Put on the remaining protective equipment (i.e., hard hat, safety glasses, etc.).

IX.4.0 Site Monitoring

The environmental contaminants of concern are volatile and semivolatile chemicals including 2,4-dinitrotoluene (DNT), 2,6-DNT, 1,3,5-trinitrobenzene, and 2,4,6-trinitrotoluene.

Table IX.4-1 contains action levels for site monitoring.

Monitoring will be performed by the site safety and health officer initially for the location, then periodically during the performance of boring operations (sampling every 5- to 10-foot soil boring depth). A calibrated photoionization detector will be utilized to monitor the wells and breathing zones, to determine if any organic material may be present that would necessitate upgrading of protection level.

No air monitoring is required for operations that do not disturb existing materials (i.e., site setup, surveying, decontamination, and miscellaneous support zone activities).

Table IX.4-1

Action Levels
Plum Brook Ordnance Works, Sandusky, Ohio

When in Level B PPE

Analyte	Action Level	Required Action[a,b]
Volatile organic chemicals	• ≥ 50 ppm above background in breathing zone (BZ)	Stop work, evacuate work area.

When in Level C PPE

Analyte	Action Level	Required Action[a,b]
Volatile organic chemicals	• ≥ 25 ppm above background in BZ	Stop work, suspend work activities for 15 to 30 minutes, if readings are sustained, then upgrade to Level B personal protectivie equipment (PPE).

When in Level D/Modified D PPE

Analyte	Action Level	Required Action[a,b]
Volatile organic chemicals	• ≥ 5 ppm above background in BZ	Stop activities, suspend work activities for 15 to 30 minutes; if readings are sustained, then upgrade to Level C PPE.

When in Support Zone

Analyte	Action Level	Required Action
Volatile organic chemicals	• ≥ 1 ppm above background in BZ	Evacuate support zone and re-establish perimeter of EZ.

[a]Four instantaneous peaks in any 15-minute period or a sustained reading for 5 minutes in excess of the action level will trigger a response.
[b]Contact with the health and safety (H&S) manager must be made prior to continuance of work. The H&S manager may then initiate perimeter/integrated air sampling along with additional engineering controls.

No one is permitted to downgrade levels of PPE without authorization from the H&S manager.

IX.5.0 Activity Hazard Analysis

The attached activity hazard analysis (Table IX.5-1) is provided for the following activities:

- Setup of equipment and general field activities
- Surveying
- Soil boring and sampling
- Decontamination (high-pressure water jetting operations)
- Sediment/seep and surface water sampling.

Table IX.5-1

Activity Hazard Analysis
Plum Brook Ordnance Works, Sandusky, Ohio

Activity	Potential Hazards	Recommended Controls
Setup of equipment and general field activities	Slip, trip, and fall hazards	• Determine best access route before transporting equipment. • Practice good housekeeping; keep work area picked up and clean as feasible. • Continually inspect the work area for slip, trip, and fall hazards. • Look before you step; ensure safe and secure footing.
	Heavy lifting	• Use proper lifting techniques. Lifts greater than 60 pounds require assistance or mechanical equipment.
	Falling objects	• Stay alert and clear of materials suspended overhead; wear hard hat and steel-toed boots.
	Flying debris, dirt, dust, etc.	• Wear safety glasses/goggles; ensure that eye wash is in proper working condition.
	Pinch points	• Keep hands, fingers, and feet clear of moving/suspended materials and equipment. • Beware of contact points. • Stay alert at all times!
	Cuts/bruises	• Use cotton or leather work gloves for material handling.
	Bees, spiders, and snakes	• Inspect work area carefully and avoid placing hands and feet into concealed areas.
	Fire	• Fire extinguishers shall be suitably placed, distinctly marked, readily accessible, and maintained in a fully charged and operable condition.
	Hazard communication	• Label all containers as to contents and dispose of properly. • Ensure Material Safety Data Sheets (MSDS) are available for hazardous chemicals used on site.
	Noise	• Sound levels above 85 A-weighted decibels (dBA) mandates hearing protection.
	Lighting	• Adequate lighting will be provided to ensure a safe working environment.
	Cold stress	• Workers should wear insulated clothing when temperatures drop below 40°F. • Drink warm beverages on breaks. Refrain from drinking caffeinated beverages. • Remove wet clothing promptly. • Take breaks in warm areas. • Reduce work periods as necessary. • Layer work clothing.

Table IX.5-1

Activity Hazard Analysis
Plum Brook Ordnance Works, Sandusky, Ohio

Activity	Potential Hazards	Recommended Controls
Setup of equipment and general field activities (continued)	Frostbite	• Personnel should wear inner cotton gloves and insulating sock to protect extremities from cold weather. • Take breaks in warm areas. • Remove wet gloves and socks promptly.
	Poison ivy/oak/sumac	• Avoid plant areas if possible. • Wear long sleeves and long pants. • Promptly wash clothing that has contacted poisonous plants. • Wash affected areas immediately with soap and water.
	Ticks	• Wear light-colored clothing (can see ticks better). • Mow vegetated and small brush areas. • Wear insect repellant. • Wear long sleeves and long pants. • Visually check oneself promptly and frequently after exiting the work area.
	Heat rash	• Keep the skin clean and dry. • Change perspiration-soaked clothing, as necessary. • Bathe at end of work shift or day. • Apply powder to affected area.
	Heat cramps	• Drink plenty of cool fluids even when not thirsty. • Provide cool fluid for work crews. • Move victim to shaded, cool area.
	Heat exhaustion	• Conduct physiological worker monitoring as needed (i.e., heart rate, oral temperature). • Set up work/rest periods. • Use the buddy system. • Allow workers time to acclimate. • Have ice packs available for use. • Take frequent breaks.
	Heat stroke	• Evaluate possibility of night work. • Perform physiological monitoring on workers during breaks. • Wear body cooling devices.

Table IX.5-1

Activity Hazard Analysis
Plum Brook Ordnance Works, Sandusky, Ohio

Activity	Potential Hazards	Recommended Controls
Setup of equipment and general field activities (continued)	Contact with moving equipment/vehicles	• Work area will be barricaded/demarcated. • Equipment will be laid out in an area free of traffic flow. • Barricades shall be used on or around work areas when it is necessary to prevent the inadvertent intrusion of pedestrian traffic. • Barriers shall be used to protect workers from vehicular traffic. • Barriers shall be used to guard excavations adjacent to streets or roadways. • Flagging shall be used for the short term (less than 24 hours) to identify hazards until proper barricades or barriers are provided. • Heavy equipment shall have backup alarms.
	Forklift operations	• • Use qualified and trained forklift operators. • The operator shall not exceed the load capacity rating for the forklift. • The load capacity shall be clearly visible on the forklift. • Forklift operators shall inform their supervisor of any prescribed medication that they are taking that would impair their judgement.
	Portable electric tools	• Portable electric tools which are unsafe due to faulty plugs, damaged cords, or other reason, shall be tagged (do not use) and be removed from service. • Portable electric tools and all cord and plug connected equipment shall be protected by a ground-fault circuit interrupter (GFCI) device. • Electrical tools shall be inspected daily prior to use.
	Extension cords	• Extension cords that have faulty plugs, damaged insulation, or are unsafe in any way shall be removed from service. • Cords shall be protected from damage from sharp edges, projections, pinch points (doorways), and vehicular traffic. • Cords shall be suspended with a nonconductive support (rope, plastic ties, etc.). • Cords shall be designed for hard duty. • Cords shall be inspected daily.

Table IX.5-1

Activity Hazard Analysis
Plum Brook Ordnance Works, Sandusky, Ohio

Activity	Potential Hazards	Recommended Controls
Setup of equipment and general field activities (continued)	Lightning strikes	• Whenever possible, halt activities and take cover. • If outdoors, stay low to the ground. • Limit the body surface area that is in contact with the ground (i.e., kneeling on one knee is better than laying on the ground). • Seek shelter in a building if possible. • Stay away from windows. • If available, crouch under a group of trees instead of one single tree. • Keep all body parts in contact with the ground as close as possible. • Remain 6 feet away from tree trunk if seeking shelter beneath tree(s). • If in a group, keep 6 feet of distance between people.
	Thunderstorms, tornadoes	• Listen to radio or TV announcements for pending weather information. • Cease field activities during thunderstorm or tornado warnings. • Seek shelter. Do not try to outrun a tornado.
Surveying	Slip, trip, fall	• Site workers will be required to wear hard hat, safety glasses with side shields, work gloves, and steel-toe boots when working in the field. • Provide adequate lighting in all work areas. • Whenever possible, avoid routing cords and hoses across walking pathways. • Flag or cover inconspicuous holes to protect against falls. • Work areas will be kept clean and orderly. • Garbage and trash will be disposed of daily in approved refuse containers. • Tools and accessories will be properly maintained and stored. • Work areas and floors will be kept free of dirt, grease, and slippery materials.
	Traffic accidents	• Place physical barrier (i.e., barricades, fencing) around work areas regularly occupied by pedestrians. • If working adjacent to roadways, have workers wear fluorescent orange vests. • Use warning signs or lights to alert oncoming traffic. • Assign flag person(s) if necessary to direct local traffic. • Set up temporary parking locations outside the immediate work area. • Motor vehicle operators shall obey all posted traffic signs, signals, and speed limits. • Pedestrians have the right-of-way. • Wear seat belts when vehicles are in motion.
	Wildlife hazards	• Workers should be cautious when driving through the site in order to avoid encounters with passing animals.

Table IX.5-1

Activity Hazard Analysis
Plum Brook Ordnance Works, Sandusky, Ohio

Activity	Potential Hazards	Recommended Controls
Soil Boring and Sampling	Overhead hazards	• Make sure no obstacles are within radius of boom. Always stay a safe distance from power lines.
	Faulty or damaged equipment being utilized to perform work	• All machinery or mechanized equipment will be inspected by a competent mechanic and be certified to be in safe operating condition. • Equipment will be inspected before being put to use and at the beginning of each shift. • Faulty/unsafe equipment will be tagged and if possible locked out. • Drill rigs shall be equipped with reverse signal alarm, backup warning lights, or the vehicle is backed up only when an observer signals it is safe to do so.
	Uneven terrain, poor ground support, inadequate clearances, contact with utilities	• Inspections or determinations of road conditions and structures shall be made in advance to ensure that clearances and load capacities are safe for the passage or placing of any machinery or equipment. • All mobile equipment and areas in which they are operated shall be adequately illuminated. • Aboveground and belowground utilities will be verified with NASA personnel, and delineated or flagged prior to staging equipment. • Whenever the equipment is parked, the parking brake shall be set. • Equipment parked on inclines will have the wheels choked. • Inspect brakes and tire pressure on drill rig before staging for work.
	Inexperienced operator	• Machinery and mechanized equipment shall be operated only by designated personnel. • Operators shall inform their supervisor(s) of any prescribed medication that they are taking that would impair their judgment.
	Jacks/outriggers	• Ensure proper footing and cribbing.
	Falling objects	• Remove unsecured tools and materials before raising or lowering the derrick. • Stay alert and clear of materials suspended overhead.
	Pinch points	• Keep feet and hands clear of moving/suspended materials and equipment. • Stay alert at all times!
	Fire	• Mechanized equipment shall be shut down prior to and during fueling operations. • Have fire extinguishers inspected and readily available.
	Fall hazards	• Personnel are not allowed to work off of machinery or use machinery as ladders. • Use fall protection when working above 6 feet.

Table IX.5-1

Activity Hazard Analysis
Plum Brook Ordnance Works, Sandusky, Ohio

Activity	Potential Hazards	Recommended Controls
Direct-Push Sampling (continued)	Noise	• Hearing protection is mandatory above 85 dBA.
	Contact with rotating or reciprocating machine parts	• Use machine guards; use long-handled shovels to remove auger cuttings. • Use safe lockout procedures for maintenance work.
	Heavy lifting	• Use proper lifting techniques. Lifts greater than 60 pounds require assistance or mechanical equipment; size-up the lift.
	Slip, trip, and fall hazards	• Practice good housekeeping; keep work area picked up and clean as feasible. • Continually inspect the work area for slip, trip, and fall hazards.
	Contact with potentially contaminated materials	• Real-time air monitoring will take place. If necessary, proper personal protective clothing and equipment will be utilized. • Stop immediately at any sign of obstruction. • Do not breathe air surrounding boring unless necessary. • Upgrade to respirator if necessary. • Avoid skin contact with soil cuttings. Wear gloves. • Stay clear of moving parts of drill rig.
	Drum handling	• Be careful not to breathe air from around open drum any more than necessary. Monitor with photolonization detector/flame lonization detector (PID/FID) equipment and upgrade to respirator if necessary. • When filling a drum (with either soil or water), be careful not to make contact with the contained waste. Wear appropriate gloves. Make sure lid or bung of drum is secure. • If moving a drum unassisted, be sure to leverage properly, use proper lifting techniques, and wear safety glasses and steel-toed boots. • When using a drum dolly, make sure straps and lid catch are securely attached. Leverage properly when tilting drum. Be sure toes stay away from drum.
High-Pressure Water Jetting Operations	Heavy lifting	• Use proper lifting techniques. • Lifts greater than 60 pounds require assistance or mechanical equipment • Size-up the lift.
	Slip, trip, and fall hazards	• Good housekeeping shall be implemented. • The work area shall be kept clean as feasible. • Inspect the work area for slip, trip, and fall hazards.

Table IX.5-1

Activity Hazard Analysis
Plum Brook Ordnance Works, Sandusky, Ohio

Activity	Potential Hazards	Recommended Controls
High-Pressure Water Jetting Operations (continued)	Fueling	• Only approved safety cans shall be used to store fuel. • Do not refuel equipment while it is operating. • Fire extinguishers shall be suitably placed, distinctly marked, readily accessible, and maintained in a fully charged and operable condition.
	Faulty or damaged equipment	• Equipment shall be inspected before being placed into service and at the beginning of each shift. • Preventive maintenance procedures recommended by the manufacturer shall be followed. • A lockout/tagout procedure shall be used for equipment found to be faulty or undergoing maintenance.
	High-pressure water	• Jetting gun operator must wear appropriate PPE including hard hat, impact-resistant safety glasses with side shields, water-resistant clothing, metatarsal guards for feet and legs, and hearing protection (if appropriate). • One standby person shall be available within the vicinity of the pump during jetting operation. • The work area shall be isolated and adequate barriers will be used to warn other site personnel.
	Unqualified operators	• Only qualified and trained personnel are permitted to operate machinery and mechanized equipment associated with water jet cutting and cleaning.
	Out of control equipment	• No machinery or equipment is permitted to run unattended. • Machinery or equipment will not be operated in a manner that will endanger persons or property nor will the safe operating speeds or loads be exceeded.
	Noise	• Sound levels above 85 dBA mandates hearing protection by nearby site personnel.
	Activation during repairs	• All machinery or equipment will be shut down and positive means taken to prevent its operation while repairs or manual lubrications are being done.
	Pinch points	• Keep feet and hands clear of moving/suspended materials and equipment. • Stay alert and clear of materials suspended
	Falling objects	• Hard hats are required by site personnel. • Stay alert and clear of material suspended overhead.
	Flying debris	• Impact-resistant safety glasses with side shields are required.
	Contact with potentially contaminated materials	• All site personnel will wear the appropriate PPE.

Copy 6

INTERNATIONAL TECHNOLOGY CORPORATION

DISCIPLINE SIGN-OFF REVIEW

Client Name: U.S. Army Engineer District, Nashville; CELRN-EP-R-M

Project Description: RI/FS of TNT Area B, Former Plum Brook Ordnance Works, Sandusky, Ohio

Contract Number: DACA62-94-D-0030 Delivery Order Number: 0034

Project Number: 775616 Task / Phase Number: 02000000

Document Type	Identify specific section or segment covered by this checkprint	Document Origin
☐ Technical / Cost Proposal		☐ Originator Developed
☐ RFP		☒ Edited Standard
☐ Contract / Subcontract		☐ Client Furnished
☒ SAP, SSAP, CDAP, or QAPP	SSAP, Revision 1, October 1998	
☐ SHP or SSHP		**Document Status**
☐ _____ Report		☐ Preliminary
☐ Risk Assessment / Evaluation		☐ Internal Draft
☐ Specifications & Plans		☐ Draft
☐ Design Calculations		☐ Draft Final
☐ Tables		☒ Final
☐ Drawings / Figures		☐ Other: _____
☐ Other: _____		

	Required Person	Signature	Date
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Backchecker			
Updater	M. Gunderson		10/15/98
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Technical Reviewer	B. Price		10/15/98
Technical Reviewer	M. Spangberg		10/15/98
Technical Reviewer			
Quality Assurance Officer	T. Smith	for T. Smith	10/15/98
Project Manager	M. Spangberg		10/15/98

NOTICE: By signature above, parties certify that the subject document has been prepared by and/or reviewed by them (as appropriate), that all review comments have been resolved, and that the document is ready for submittal.

RESPONSE TO OEPA TECHNICAL REVIEW COMMENTS
DRAFT WORK PLANS FOR THE TNT AREA B RI/FS
PLUM BROOK ORDNANCE WORKS, SANDUSKY, OHIO

Reference: *Ohio EPA Letter dated October 8, 1998, from Mr. Ron Nabors to Ms. Linda Ingram, Nashville District, Corps of Engineers.*

Site-Specific Safety and Health Plan

Comment 1. [Part IX.2.0, Site Characterization and Analysis, Page IX-2, Section IX.2.2 General Site Information] Please include a map of the referenced TNT Area B.

Response: *A new figure (Figure IX-2) has been added of TNT Area B.*

Comment 2. [Part IX.2.0, Site Characterization and Analysis, Section IX.2.2 General Site Information, Figure IX-1] Please identify U.S. Route 250 on the site and hospital location map.

Response: *The requested information is provided on Figure IX-2.*

Comment 3. [Part IX.2.0, Site Characterization and Analysis, Section IX.2.2 General Site Information] Due to the size of the Plum Brook Ordnance Works facility please include a map identifying the most direct route on the facility from the TNT Area B to the Main Gate.

Response: *The requested information is included on Figure IX-2.*

Site-Specific Sampling and Analysis Plan

Comment 1. The following is a brief summary of the soil sampling strategy to be performed at the TNTB in support of the RI. Please indicate if this summary is not consistent with planned activities.

- One soil sample (0-1 foot below land surface (bls)) will be collected at 360 separate locations within the 48-acre TNTB for screening of nitroaromatics using Ion Mobility Spectroscopy (IMS) methods;

- Up to 40 composite subsurface soil samples (2-10 feet bls, or to top of bedrock) will be collected based on the identification of hot spots during the shallow soil screening process; hot spots will be selected based on analytical results which exceed USEPA Region IX preliminary remediation goals

RESPONSES TO TECHNICAL REVIEW COMMENTS

DRAFT SITE-SPECIFIC SAMPLING AND ANALYSIS PLAN (SSAP) AND
SITE-SPECIFIC SAFETY AND HEALTH PLAN (SSHP), RI/FS OF TNT AREA B
PLUM BROOK ORDNANCE WORKS, SANDUSKY, OHIO

NASA Plum Brook Station Comments

Reference: *Conversation Record dated October 5, 1998 of telecon between Linda Ingram (CELRN) and Keith Peecook (NASA Plum Brook Station).*

Comment 1. [SSAP, Figure IX.3] The figure is missing from the SAP. Could not review sample locations.

Response: *It is unclear why Figure IX.3 was not included in Mr. Peecook's copy of the SSAP. However, the figure will be included in the final submittal.*

Comment 2. [SSHP, Page 4] Don Burton is listed. NASA PBS would prefer to see his name removed since he is no longer working on the project. Would like to see the USACE Technical Coordinator (Mrs. Ingram) listed as a USACE contact.

Response: *Mr. Burton will be removed from the reference and Mrs. Ingram will be added as requested.*

CELRN Comments

References: (1) Memorandum for CELRN-EP-R-M dated September 30, 1998, "Review Comments for the Plum Brook Ordnance Works TNT Area B SSHP"
(2) Memorandum for CELRN-EP-R-M dated October 1, 1998, "Review Comments Concerning Site-Specific Sampling and Analysis Plan, Remedial Investigation at TNT Area B, Former Plum Brook Ordnance Works, Sandusky, Ohio."

Comment 3. [SSHP, Section 1] State that the site safety officer and project manager are those as listed in the Sitewide SHP, 1997. Include current OSHA 1910.120 training certification for field personnel.

Response: *Key project personnel associated with the TNT B investigation are included in the SSAP and SSHP and supercede the sitewide document. Current OSHA training certification and medical monitoring certification for field personnel that will be working within the exclusion zone will be maintained on site. However, since these personnel are subject to change prior to field activities, they are not included in the SSHP.*

Comment 4. [SSHP, Table 4-1] Reword action levels to provide a minimum and maximum range.

Response: *The action levels provided in the table were corrected.*

Comment 5. [SSHP, Table 5-1] Add underground utilities as a potential hazard during invasive site activities. Confirm locations of underground utilities prior to sampling. There are active utility lines running to a NASA structure in the area.

Response: *Contact with underground utilities has been addressed in Table 5-1 (page 5 of 7). Locations of underground utilities will be confirmed with NASA PBS personnel during the kickoff meeting. However, discussions with NASA personnel during an earlier site visit indicate that active utilities in the area are above ground.*

Comment 6. [SSHP, Table 5-1] Frost bite should be considered a potential hazard since the field work is scheduled for October and November.

Response: *Agreed. Frostbite controls were added to Table 5-1.*

Comment 7. [SSAP, Section IX.2.0] The field geologists listed in the SAP do not seem applicable to this sampling. Please provide an updated key IT personnel table.

Response: *Agreed. Section IX.2.0 of the SSAP has been revised to include the updated information previously referenced in Section 2.0 of the Sitewide SAP; note that this section of the SSAP now supercedes the corresponding section of the sitewide SAP. See also comment 2 above.*

Comment 8. [SSAP, Page IX-5, Section IX.3.3] Here and elsewhere, paragraphs/sections led by bolded headings should be assigned section or subsection numbers, e.g. IX.3.3.1, IX.3.3.2, IX.3.3.2.1.

Response: *Bolded headings have been assigned section/subsection numbers as requested.*

Comment 9. [SSAP, Page IX-6, Decision Making Process, Data Uses, and Needs] Table 3-1 of the SAP has no entries for the TNT Areas or TNT Area B. Please provide such information in this SSAP.

Response: *A site-specific Summary of Data Quality Objectives for TNT Area B has been added to the SSAP as suggested (new Table IX-1).*

Comment 10. [SSAP, Section IX.4.1, First Sentence] Rewrite and clarify. Three hundred and sixty composited surface samples will be analyzed by IMS technology at (0-1 ft.)

Response: *The first two sentences have been replaced with "A total of 360 composited surface soil samples will be collected within TNTB from depths of 0 to 1 foot bgs and screened for nitroaromatic compounds using IMS technology."*

Comment 11. [SSAP, Section IX.4.1, Sentence beginning with "Two-foot composites..."] Will each two-foot interval from 2 to 10 feet be "composited" = four samples? If the sentence is describing samples composed of homogenized material from a given two-foot interval then the term "composite" is misleading. Please rewrite this sentence for clarity.

Response: *This paragraph was rewritten. The subsurface samples will not be "composite" samples. The statement has been rewritten to clarify – "Subsurface soil samples will be collected from two-foot intervals from 2 to 10 feet bgs; however, sampling will terminate at bedrock if it is encountered above 10 feet bgs."*

Comment 12. [SSAP, Section IX.4.1, Last Paragraph] Please describe how the grid sampling will be integrated with the building oriented sampling described in the previous paragraph and shown in Figure IX-3.

Response: *The "grid sampling" is part of the building-oriented sampling. Because the historic building locations are known but are not always readily discernable by remnants of foundations, the grid will be used to reference sample locations to known coordinates at the site. This will permit accurate location of these points in the future if required (i.e., during remedial actions, etc.).*

Comment 13. [SSAP, Section IX.4.1] Are the additional 10 subsurface soil samples included in the total in Table IX-2?

Response: *Table IX-2 (now Table IX-3) has been revised to reflect the revised sample quantities discussed in the text. See also comment 21.*

Comment 14. [SSAP, Section IX.4.1, Last Paragraph] Please include the unique identification system that will be used to flag all composite samples.

Response: *The requested information was provided in Table IX-4 (now Table IX-5).*

Comment 15. [SSAP, Page IX-9, First Portion of Page and Section IX.4.2] The procedure for collection of sample material for the composited screening samples (the compositing strategy developed by Tom Jenkins) should be described somewhere in this section. Please contact Ms. Becky Terry for further information.

Response: *The strategy will be to sample at the four corners and the center of a 1 foot grid.*

These 5 samples will be completed for IMS analysis. This has been added to Section IX.4.2.1.

Comment 16. [SSAP, Section 4.2.2, Confirmation Samples] Please clarify that confirmation soil samples will not be composited and that enough sample will be taken at that location to analyze the (sample) by IMS.

Response: *The text has been revised to state that confirmation samples will not be composited. Confirmation samples will be collected from locations based on field screening results; sufficient sample will be collected from each location for the confirmation sample and corresponding IMS field screening sample. Text has been added to clarify this.*

Comment 17. [SSAP, Section 4.2.2] Include a discussion of the frequency and technique that will be used to collect the QA samples.

Response: *Text has been added to present the requested information. Note also that the QA laboratory (Section IX.6.0) has been changed from the USACE Northwest Division Laboratory to Curtis and Tompkins.*

Comment 18. [SSAP, Section 4.2.2, Confirmation Samples] What are the proposed depths of the soil samples? Soil samples should be taken in strata to describe surface soil, 0-3 ft of soil, and 2-10 ft of soil.

Response: *Surface soils will be collected in the 0 to 1 foot range as discussed in the SSAP, while subsurface soils will be collected within 2-foot intervals between 2 to 10 feet bgs (if warranted by subsurface screening results). The exact depth of sample collection will be determined in the field based on the screening sample results. However, it should be noted that only confirmation soil borings advanced for the collection of subsurface samples will be continuously sampled for lithologic logging.*

Comment 19. [SSAP, Section 4.2.3, Surface Water and Sediment] Are five SW and five sediment samples enough for statistical analysis in risk assessment?

Response: *Five surface water and five sediment samples are sufficient for risk analysis; however, the UCL may be equal to the maximum concentration detected.*

Comment 20. [SSAP, Section 4.2.3] Will there be an attempt for getting SW samples from the headwaters of the seep?

Response: *Yes, but only if a sufficient quantity of water is available at the time the other 5 samples are collected. The text has been revised as follows, "In addition to the five samples from Ransom Brook, up to two samples will be collected as part of the same sampling event from seeps or surface water at the headwaters of the creek. Samples will only be collected if there is adequate water for analysis."*

Comment 21. [SSAP, Table IX-6] The table shows 10 SW and 10 sediment samples while the

text has reduced while the text has reduced the number to 5 per media. Correct the text or table, whichever is in error.

Response: *The table will be revised to show 5 samples per media will be collected. In addition, two contingency samples will be collected for each media at the headwaters if there is a sufficient quantity of water present.*

Comment 22. [SSAP, Table IX-6] Change "Setting Tanks" to "Settling Tanks".

Response: *Agreed. "Setting Tanks" will be changed to "Settling Tanks".*

Comment 23. [SSAP, page IX-11] Sentence on line one and two: Change to "It is likely that Ransom Brook contains minimal flow or is even dry during certain times of the year, such as in summer."

Response: *Agreed. The sentence will be changed as requested.*

Comment 24. [SSAP, page IX-11] What should be Section IX.4.2.3.1, Surface water Sampling, first sentence: Change appropriate portion to "and any required health and safety devices."

Response: *Agreed. The first sentence will be changed to ". . . and any required health and safety devices."*

Comment 25. [SSAP, page IX-12, IX.4.4] At their first occurrence pleas define "PLS" and "SPLS".

Response: *Agreed. The terms will be defined on first use.*

Comment 26. [SSAP, page IX-14, IX.5.1] Should the explanation of the example sample number read "this soil sample was collected from a depth of 4 to 6 feet at soil boring SB01"?

Response: *Agreed. The text will be modified as requested.*

Comment 27. [Table IX-7] (*now Table IX-8*) Change VOC Method from 8260A to 8260B and PCBs from 8081 to 8081A.

Response: *As discussed with the C.O.E., the VOC analytical method (Update II - 1994) will remain the 8260A. As shown on Table IX-8, the old PCB method as well as the other analytical methods on Table IX-8 have been revised to those in Update III (1996).*

Comment 28. [page IX-15] Change "a on-site" to "an on-site", "a off-site" to "an off-site", and "must contact" to "will contact".

Response: *Agreed. The text will be modified as requested.*

Comment 29. References: The IT 1996a, 1996b, and 1996c references and July date do not match the actual document title and final issue date. These three documents were issued together as *Work Plans, Site Investigations and Groundwater Investigation, Former Plum Brook Ordnance Works (PBOW), Sandusky, Ohio* dated September 1996. It probably is clearer to cite them separately, however, please correct their titles and issue dates to match those in the *Work Plans* document.

Response: *Agreed. The references will be modified as requested.*

Comment 30. Figure IX-2: Identify the structures show within the shaded region.

Response: *Agreed. The Hypersonic Testing Facility and the Liquid Nitrogen Dewars structures have been identified on the figure.*

Comment 31. Page IX-3, 2nd Paragraph: Please include a discussion of why the overburden water is not considered groundwater Reference George Yu's conversation with Ron Nabors.

Response: *The overburden water is not used as a drinking water source and is actually transient in nature. As agreed during the RI Workplan preparation the overburden or perched groundwater, which is transient, is not a potential source of potable water. No plausible pathways exist by which human receptors are exposed to perched groundwater (see also comment 2, Appendix A of the Baseline Human Health Risk Assessment [IT, September 1998]). However, due to the specific objectives of this investigation, no changes have been made to the SSAP.*

Comment 32. Page IX-5, Section IX.3.2: Add "Determine Variability of Contamination Using Screening Data" to the list of objectives.

Response: *Agreed. The objective will be added as requested.*

Comment 33. Page IX-7: Please discuss the analytical methods and the rationale of why these methods are being used.

Response: *Per our discussion, because of the substantial increase in cost, the SW-846 Update II (1994) for VOCs will be retained. The remainder of the analyses will be performed using Update III (1996).*

Comment 34. Page IX-8, Section IX.4.1, 1st sentence: Add "for nitroaromatics" to the end of this sentence.

Response: *Agreed. The paragraph has been been rewritten. It now specifies that the IMS technology will be performed for nitroaromatics.*

Comment 35. Page IX-10, Section IX.4.2.2, 4th sentence *(IT interpreted the question to apply*

to the 5th and 6th sentences): Does this bias the summary statistics that will be calculated from these results during the baseline risk assessment?

Response: *The statistics will be biased lower than if the samples were all collected from the "hot spots." However, this method of sample selection is more representative of actual site conditions and will provide better comparison between the IMS screening data and the confirmation data.*

Comment 36. Figure IX-4: Show surface water flow direction on figure.

Response: *Agreed. The flow direction will be shown for the streams on the figure, particularly Ransom Brook.*

Comment 37. Full Sized Figure IX-3: What do the solid, black lines represent. They are not identified on the legend.

Response: *The solid black lines represent the location of the survey grid that will be used to determine the sample locations. The Figure IX-3 will be modified to include this information.*